Storyboard-based world modeling

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Abstract

At Delft University of Technology, there is a project running on aggression detection in trains by multimodal devices. Using video and sound input an intelligent system, has to be developed which is able to make a context sensitive interpretation of aggressive behavior.

The research described in this thesis fits in the framework of the “train-aggression” project. The main focus of our research is how to represent the world knowledge of aggressive scenes. Our starting point was the “script theory”, developed by R.Schank [1977]. To visualize scripts we used storyboards. We analyzed the structure of storyboards and the way storyboards are able to represent happening in the world. Storyboards are able to tell a story. We introduced the underlying cognitive process of “storytelling”. To test our ideas, we ran some experiments and we designed 8 storyboards about aggressive behavior in trains. These storyboards were used as a script; we made video recordings of the scenes in train played by stand-up comedians. The researches of the first analysis of the experiments are described in the thesis.

Contents

1. Introduction

There is a well known saying about the relation between language and vision: “A picture tells more than thousand of words”. This means to describe a picture completely we need (too) many words. Taking a photo of a scene is a quick and easy way of representing that scene in a compact way. For data storage and communication about the world pictures are a favored modality. But for more advanced processing there are also disadvantages:

Figure1. Overloaded train in China

- Image processing is far from trivial, especially the semantic interpretation of images, i.e. the automated recognition of facial expressions.

- A picture can be very ambiguous, usually pictures can be interpreted in many ways depending of different context or mind set of the observer.

- To fuse the information from an image with information from other data sources, it is necessary to convert images to another data format, such as XML or text. This is a complex process.

In case people are confronted with a picture of an unknown scene it is difficult to make an interpretation. But in many cases pictures reminds people to well known scenes. They experienced these or many similar scenes before and are able to describe and interpret this scenes using knowledge from their memory. Thanks to our shared experiences or shared knowledge, we are able to communicate about the world. So humans may have their own individual World Model (WM) but they are also able to share a WM. A picture of a scene can trigger a scene from the shared WM and a general description of the scene appeals to this shared WM and is able to trigger similar scenes in the memory from other people.

In this thesis we research the possibility how to present the world or events in the world by pictures or sequences of pictures called storyboards. We make video recordings of scenes and represent these scenes in a compact way by pictures. In the other way around we design some storyboards and research which scenes they generate in the mind of other people. We focus on a specific context, aggressive behavior in and around trains.

Problem definition

So in more detail we try to solve the following problem:

- How can storyboards be used as a compact representation of a story, as coherent sequence of events from the real world?
- What is the general structure of a storyboard?
- How can storyboards trigger a similar story in the mind of humans?
- We research tools to design storyboards and how storyboards can be used as a movie script.

Research assignment

1. Literature survey of storyboards.
2. Design of a model how to design/analyze storyboards.
3. Design of storyboards.
4. Recordings of stories designed by storyboards scripts.
5. Analyze recordings.
6. Writing a research report.

This thesis is outlined as follows. In the second chapter we consider world modeling and the theory about scripts as developed by R. Schank. In the third chapter we present our developed model of cognitive processing of storyboards. In the fourth chapter we consider storyboards design and tools to represent them. In the fifth chapter we describe our designed storyboards about aggressive behavior in trains. In the sixth chapter a text story experiment result of designed storyboard will be given. In chapter seven we give an analysis on the recorded video material. In chapter eight we give the final script and related application model. In the final chapter we present our conclusions and recommendations.

2. World models and Knowledge representation

2.1 World Model

This thesis work fits into the framework of one of the MMI research projects on multimodal aggression detection in and around trains. The world we focus on are train compartments. In that world we have specific objects as seats, pathway, windows, doors, and human agents. Human agents such as travelers, conductors, police, catering service play a specific role such as traveling from A to B, control tickets, provide information. Occasionally unwanted behavior arises such as aggressive behavior of ticket evader against conductors, demolishment of objects. Our goal is to design a special surveillance system by microphones/camera's which are able to sense their environment, communicate and reason about the observations and come into action.

To sense the world and reason about the observed data, devices need a shared world model and an internal representation of that world. We have to define which objects can play a role in aggression. Our world is dynamic, so objects can appear and disappear or change their appearance. Even if objects are not visible, our devices should be able to reason about them. So we have to represent the dynamic objects in a shared representation of the world. Our devices should be able to make an interpretation of what is going on in the world. So we have to represent behavioral patterns of objects and a reasoning mechanism to reason about them. And last but not least our proposed system is supposed to be a real time system.

To summarize with respect to our World model we have to answer the following questions:

- Which models and architectures are available to model and represent the world?
- What can be used as an internal representation of the world model?
  - -What kind of object types should be possible to represent the world?
  - -Should dynamic properties of entities be part of the world-model?
- Which standard functionality should be provided by a world-model?
- How can a world-model be kept as consistent as possible?
  - -How can a world-model cope with ambiguous data?
  - -How can a world-model cope with uncertainties?
- How can a world model be filled with information?
- How can a world-model be provided by knowledge?
- Which information should be provided by the world-model?
- How can information be retrieved from a world-model?

- How is the relation between the decision module and the world-model?
- Which information should be provided by a world model to make a real time interpretation of ongoing activities in the world, to evaluate them and to predict future activities?

2.2 Knowledge representation by logic, frames, scripts

As early as 1977, Schank and Abelson invented the concept of "script"-using scripts to describe people's knowledge of experienced events. Their theory has contributed a lot to the study of natural language and cognitive science, and it is the most important theoretical background of this thesis work as well.

According to Schank and Abelson's theory "understanding is a process by which people match what they see and hear to pre-stored groupings of actions that they have already experienced. New information is understood in terms of old information." In order to understand the actions that are going on in a given situation, a person must have been that situation before. That is, understanding is knowledge-based [1].

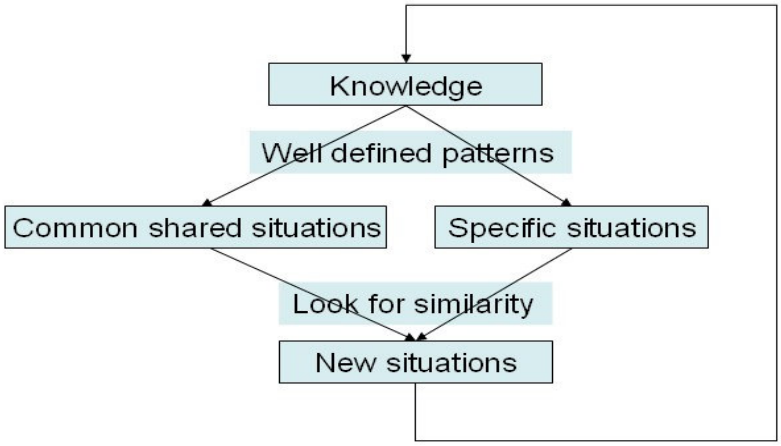


Figure 2 Knowledge processing of human-being

From the view of knowledge, we first take a look at how do we use our knowledge when we are trying to understand events. There are two classes of knowledge which help people's cognitive process, one is the general knowledge and the other is specific knowledge ***(Figure 2)***.We can easily understand other people's general behavior and the world we live in by our general knowledge since we are all human beings and we do live in a same world. For instance, if someone says he needs to have a nap or he wants a cup of water, or it is raining. You may not ask him why he wants to do so or why it's raining .You don't have difficulties on understanding these things since generally we all have these kinds of knowledge. At the same time, we also use specific knowledge to interpret those experienced events and situation which we have been through many times in our life. Consider a stereotypical situation, for example, when we are sitting in the train compartment, a conductor wants to see our tickets, we won't ask why he wants to see our

tickets. Our general knowledge and specific knowledge work together to help us understand most standard situations we meet. In our experiment, we ask some students to give related text to the same storyboards. It proved that most students seem to have no trouble in extracting the features and understanding the content of our storyboards since we are sharing the same specific knowledge.

But how do we organize the knowledge in our mind and how knowledge can be used for understanding? The answer is the scripts. Scripts appear as a set of familiar scenarios in our memory and they are a stored pattern of actions that we have been previously experienced. A script is also a standard event sequence, if a story is referenced to those frequently occurring scripts, then the story will be quite understandable to every person. Actually each of us can be looked like a processor which has been equipped with thousands of scripts, and we are acting according to the same, implicitly understood scripts, these scripts indicate a standard event sequence and causal chain of events, in this case. Scripts can also be treated as frames and the connections between these frames, each of them has default values that reflects a stereotyped situation. These frames in scripts are specified actions in a sequence and the connections between these actions are temporal and causal. When we meet those stereotyped situations, the scripts from our world model can help us to understand them almost without any thinking.

Scripts provide the logical connectivity for knowledge representation. The knowledge representations of those stereotyped events can be described by scripts as groups of causal chains, typically as going to a restaurant. Firstly, we have a couple of roles for actors (customer, waiter, cook, cashier, and owner), props (tables, menu, fast-food, check, and money), different scenes (Entering , Ordering, Eating, Exiting), after that, we have our entry conditions as input factor of the system: Customer is hungry, customer has money, when customer enters the actor begins to make interaction with other roles, use props, as time goes on .Finally, the results (outputs) will be given, the custom is not hungry after having meal and he/she is pleased with meal or service. Some branches and loops also have been considered in the system, such as the customer who doesn't have enough money will get out of the restaurant after seeing the menu (branches), and some customer are really hungry and he/she will continue asking waiter for menu (loops). From this example, you will see that every scripts has associated with a number of roles, props, scenes, when a script is called a couple of things will pop up into our head, now imagine a script called " on the train", is there a couple of roles, props and scenes come out?

Figure 3 Imagining a restaurant

The script above is called a situational script, which is a standard social situation in a specific location. These stereotyped sequences of actions have much more examples, such as, seeing a doctor, getting on/off a train; buy a train ticket from ticket machine, and so on. There are also other types of scripts include personal scripts, for instance, shouting at train conductor, and instrumental scripts like lighting a cigarette, drinking a bottle of beer.

If we look at these scripts, we will find that most standard events have lots of steps from the first step to the last step. In case if we just know the first and last step of going to a restaurant, it seems we don't have difficulties to infer what happened to the customer when he is in the restaurant. The whole scripts would convey more than a one-page's information not only those key steps we mentioned above. These key steps need to be identified and they contribute a lot for connecting and understanding a causal chain between two seemingly unrelated events, these key steps are temporal and causal related. For instance, as one of the storyboards we made called "no ticket", indicates how scripts work, basically, the story can be narrated by simple sentences. Passenger without ticket gets on a train – he makes fun with the conductor – he is not able to pay – he gets the penalty, etc. A storyteller needs not to mention every detail of the story, mentioning the reference scripts is clear enough for common listeners' understanding, as long as the crucial scripts need to be mentioned. It fits well with how a storyboard tells a story, so a sequence of still pictures in storyboards can be looked like visual scripts for representing the events of a story. A script is composed of a sequence of scenes; a scene is a cluster of interactions, which can grouped together to have a well defined goal, remarkable label. In the following chapters we are trying to resolve the questions on how to segment a script in scenes and how can we change patterns of interaction and goals. The scripts related to our storyboards are further described in Chapter 8. Finally, we hope these storyboards also can be used as a movie script for representing real aggressive situations in the video recording. In that case, we treat our storyboards as visual script.

2.3 Multimodal representation and retrieval

Our devices are supposed to sense the environment and to recognize and track different objects. Similar to the cognitive process of information processing, observed objects trigger a frame of reference. Human beings are always on the search of interpreting the world. One of the strategies is to map the observed objects to frames observed in the past. These frames are familiar and have a well defined interpretation. To provide our devices with learning facilities to design their own frames is a complex and time consuming process. As a first step we provide our system with predefined frames of reference. Every frame of reference has its characteristic salient features. Given that features the frame is activated. It can be expected that the same features are elements of different frames. So it is possible that competing frames of reference will be activated at the same time. By observing more features or by a process of reference solving the activated frames are reduced to preferable one. But it is possible that given new information the system has to give up the selected frame of reference and adapt to a new one.

Our devices are supposed to be multimodal and can sense objects from video and sound. In case of speech we can convert speech into text. In our case we consider key terms and the representing classes. So in case of cursing the dirty words trigger the class cursing which is represented by text or by a specific icon. In case of visual objects it is difficult to represent them by an appropriate word. So we represent visual objects by icons. To visualize the selection process we are aiming at a tool similar to Aqua browser [11] but then based on icons. By selecting some icon, possible frames of reference are popping up including the selected icon. By selecting more specific icons, one frame of reference in the most appropriate one. During the selection process highly discriminative icons are presented by the system for user selection.

In ***table1*** we display three frames of reference and representing key terms/-icons.

Table1 Key terms/-icons of storyboard

Hooligan	*No ticket*	*Noisy travelers*
-One or more persons -Shouting/singing -Flags, caps -Bottles -Other travelers looking away	-Interaction traveler-conductor -Identity card -Money	-Mobile phone, sound blaster -Other travelers moving -Other travelers start -Interaction

To define our frames of references we have to observe recordings and select key-concepts which are good representatives of that frame. That is to say these concepts are dominant concepts for that scene and/or highly discriminative to our scenes.

Scenes can be characterized as follows:

- Typical sequence of behavior patterns (i.e. People enter a train; Conductor checks tickets, good bye, and thanks).
- Scene has a goal (scene and face with relation).
- A scene in logical order (predictable).
- Specific context (typical features).

3. Cognitive models of storyboard processing

In a storyboard users are confronted with a sequence of pictures, every picture are represents a characteristic scene. These pictures are supposed to tell a story. So in one or the other way the pictures are related to each other. Human usually try to understand what is going on in their environment. From the "Cognitive dissonance theory" designed by Festinger [3] in the field of social psychology, we know that human beings feel uncomfortable if they don't understand the events which are going on in their internal and external world.

3.1 Cognitive perception

Human beings sense their environment in the following successive steps:

Step1
At first glance human beings perceive different objects. The most salient objects get most attention. To be salient an object should have specific features. Moving, hard colored, smelling, sounding objects trigger our attention. This can be explained from human nature. Threatening objects take a lot of our attention. From the survival of the species from Darwin we can conclude that the fittest species are those who are able to master danger from the environment. Human senses are very sensitive to thread from the environment. From cognitive psychology we know that the amount of cognitive processing capacity is limited. In case of danger survival gets all our attention. Once objects are localized we are able to track objects and to recognize them. Human beings are able to recognize only those objects which are defined in their world model. An object can be recognized by its salient features.

Step 2
Objects are related to other and some objects are grouped into patterns. Humans try to fit single objects in global patterns. This can be realized in two ways. Some people have a holistic view of the world. They perceive patterns and next the composing elements. Other people have a serial view of the world and first perceive the details and next try to compose them together. Relation between objects and common patterns are defined in the World model too. Some objects have a causal or a functional relation to each other. Again these relations are part of our world model. Of cause human beings are able by reasoning to define new relations, but at the perception stage only predefined relations are observed.

Step 3
Once the objects are localized and tracked, we try to give a semantic interpretation to them. There are many different levels of cognitive processing. At the highest level we have the process of problem solving, at the lowest level we consider the process where the frame of reference pops up immediately in human mind. During lifetime human beings are confronted with repeated scenarios either by direct observation or by storytelling. These scenarios cause a permanent trace in our memory, usually called a script. R. Schank developed a theory about roles and scripts for automated processing modeled after human cognitive processing. Human use scripts for as frames of reference for cognitive reasoning. Future events are predicted and events in the past get a natural place in the scripts and related interpretation.
At start the most probable script is selected. But in the cause of time it can happen that many new events don't fit in the current script. A new script can be selected as replacement of the old one. The process is similar to the process of cognitive reasoning where competing hypothesis occur.

The process of cognitive perception has been displayed in Figure 4. In the figure we see a human being, perceiving a movie of successive frames. A single frame has been analyzed for objects and relation using knowledge from our WM. Next single frames find their semantic interpretation using the best fitting frame of reference or script. Next we see a process of proofs and refutations during which process humans try to verify the script or select and adapt to a new script.

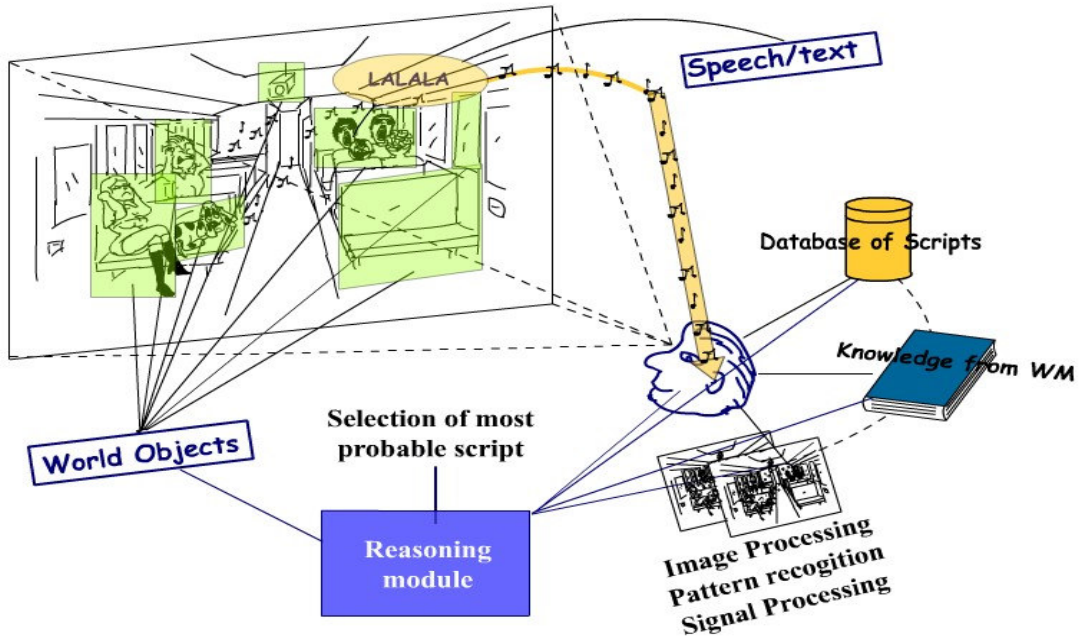


Figure 4 Process of cognitive perception

3.2 Storyboard model

A storyboard is a sequence of related frames telling a story. In this section we will describe the general structure of a storyboard. Our field of application is aggression in trains.

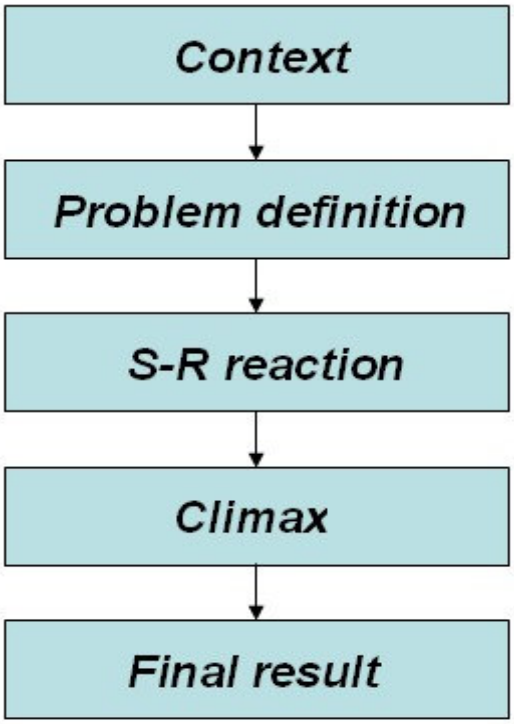


Figure 5 Storyboard model

1. Context
In the first frame(s) of a storyboard a general context will be presented. The situation, time and location will be displayed.

2. Problem definition
In the next frames key player (s) are introduced and an indication of the main theme/topic, in our case a problem of aggression. One or more people are violating the rules of general accepted correct behavior. So the aggressor is presented.

3. Stimulus-Response reaction
The story may continue in two ways of increasing violence or decreasing violence. In case of increasing violence the aggressor shows behavior of overt aggression. He demolished objects in his environment or starts verbal or nonverbal aggressive behavior against other people. This can result in more aggression of the aggressor or aggression against the aggression. So we observe a spiral of increasing violence. Increasing violence can be neutralized or decreased by counteracts. Officers/employees, whose job is to establish law and order, they inform the aggressor that he is violating the rules. As a

result the aggressor adapts his behavior and gives up his plans of aggression. But the second option is that the aggressor increases his aggressive behavior. Usually we observe a sequence of stimulus-response reactions.

4. Climax
The S-R behavior of step 3 results in a climax of an explosion of aggression, a peaceful arrangement, a successful repression of aggression, or some actors leave the scene.

5. Final result
The last frames show the final result (happy or unhappy end) or the start of a new scene.

In chapter 5, we will validate the proposed model.

3.3 Violence measurement

As described in section 3.2 a storyboard has an S-R cycle of increasing/decreasing violence. In this section we design a system to measure the amount of positive or negative aggression in an automated way. The next features play an important role in the assessment of violence.

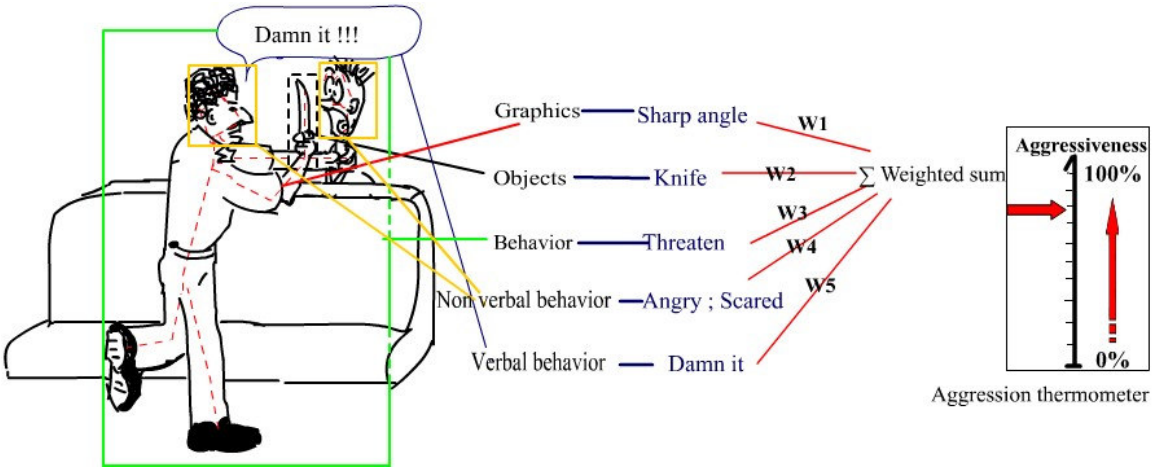


Figure 6 Assessment of violence

- Graphics of the scenes

By the choice of the colors, shadows, grayness has an impact on the aggression assessment of a scene. Fat lines with sharp angles are indicators of violence opposed to soft and smooth drawings.

- Objects related to aggression

Some objects as guns, knives and sticks are strongly associated with violence. So if those objects are displayed the probability of violence increased. In our World Model those objects have a high positive value on the special violence parameter.

- Behavior

Behavior as kicking, smashing, shaking are indicators of violence as opposed to behavior as kissing, caring. Again we have to define those behaviors in our WM and associate with them the relevant value of the aggression parameter.

- Non verbal behavior

Facial expressions as other body language expressions can be used to express violence or non-violence.

- Verbal behavior

Verbal expressions can be used to express violence or not. Especially in annotated storyboards or pictures with text balloons text plays an important role.

We notice that the features above have a probability to indicate aggression or not. This strongly depends of the context. In a setting of sarcasm or joking overt behavior of aggression can be measured as non aggressive. In some cases the semantic meaning of some features will be clarified in successive frames. The overall measure of aggression is the weighted sum of all measured features in the scenes.

4. Design of Storyboards

4.1 Story design

A storyboard is assumed to tell a story. In designing a storyboard a sketch of a story has to be made. A story is usually a verbal report of past experience. Of course when people are asked to report about past experiences it can be expected that there is a strong link with the reality. But stories can also be based on the phantasy of the storyteller. It can be argued that the imagination of storytellers is based and molded by past experiences. Some researchers in psychology take an empiric viewpoint. They believe that people are born tabula rasa and that during lifetime experiences come to our mind via our senses and are written in our memory. These memories compose the building blocks of our perception, and storytelling. But in case of science fiction, the link with the reality and past experiences is rather weak. But even if the context is the Galactic world, the themes of stories are similar to themes which are dominant in human life for century, such as love, passion, power, aggression etc. The context is artificial and some events are not realistic, that is to say can never happen in real life. In fairy tales and stories for children authors use their phantasy to describe situations which are not realistic, that is to say don't obey the laws of physics.

In case of designing stories about aggression in trains it can be assumed that the stories are more realistic, that is to say based on real life experiences. The process of designing story can be split up in the following steps:

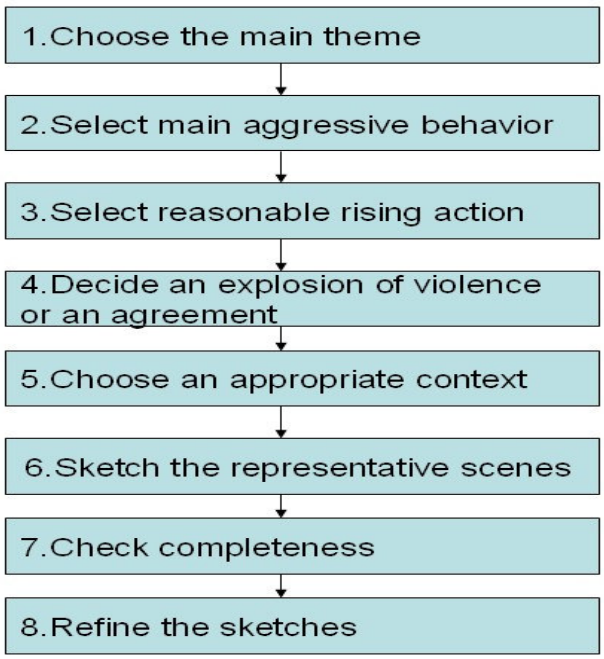


Figure 7 Main steps in the design process of storyboards

Step 1
The choice of the main theme. At first it has to be decided what is the dominant theme in the context of aggression in trains. Is the story about hooligans, travelers with non adapted behavior, pickpockets, or travelers without a ticket?

Step2
Once the main theme is chosen the storyteller has to decide about the main aggressive acts or behavior. Options are hooligans demolish a train, start fighting with other travelers or the conductor.

Step 3
Once the main aggressive act is chosen we have to decide about a reasonable rising action. The behavior during the risen action should culminate in the aggressive act. So during the risen action there is a sequence of acts with increasing tension, thread of aggression.

Step 4
After the main aggressive act follows the plot, there is an explosion of violence or there is an agreement between the main actors.

Step 5
An appropriate context has to be chosen. The story starts inside or outside the train, the choice of the actors and objects.

Step 1-5 usually takes place as a brainstorm session. The next step is to write down the story in one or the other way. In this thesis we focus on storyboards as the main tool to capture a story.

Step 6
Once the main steps in the story are chosen, we have to design one or more representative scenes for every step. A scene is specified by a sketch.

Step 7
Once we have a rough outline of the story, we look if the story is complete or over complete. We will add or delete sketches.

Step 8
The next step is the refinement of the sketches. A sketch should express the semantic content of a scene. The main actors should be presented in a prototype way. We see for example a hooligan showing non adaptive behavior, travelers who show irritation or disagreement, a conductor gives a reprimand or correction of behavior.

4.2 Designing a scene

We mentioned already that every scene is represented by a sketch in the storyboard. A sketch should fit in the whole story but a sketch should be able to tell a whole story. In analyzing a sketch an observer is triggered by the following salient features.

1. Foreground-background
Usually acts of aggression or actor are placed in a context. The observation is context sensitive. The context contributes to the understanding of the scene. A rich context is confusing and introduces ambiguity. The main features should be on the foreground in a centralized position.

Figure 8 Main features on the foreground

2. Center of focus
It proves that inspecting a scene humans start in the centre. Human usually focus on the centre of the observed scene and not on the periphery. Only on purpose we can focus our attention on the periphery of our viewpoint. So when we want to catch the attention of the observer the main features should be in a centralized position.

Figure 9 Main features in centralized position

3. Illusion of movement
In natural observation humans are triggered by fast moving objects. Moving objects are able to generate danger and in our struggle for survival humans are sensitive to that. In

case of sketches we have only single pictures. But in a sketch we can give an illusion of movement. For example by running persons, rolling wheels are accentuated by rounding circles. In movies we have a time delay between causal and resulting events. But in a sketch we can draw them in one picture and give an illusion of action and reaction.

Figure 10 A running person

4. Body language

Emotions play an important role in aggression detection. Emotions can be displayed by facial expressions or by body postures.

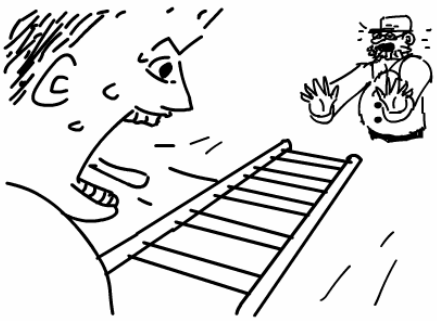


Figure 11 Angry expression

5. Graphical features

We can use special graphical features to accentuate emotions in a sketch. A colorful, bright scene expresses a happy open environment. Using dark colors or black shades express danger, fear etc. In the same way we can suggest by dark brushes or fat dark strokes a threatening environment.

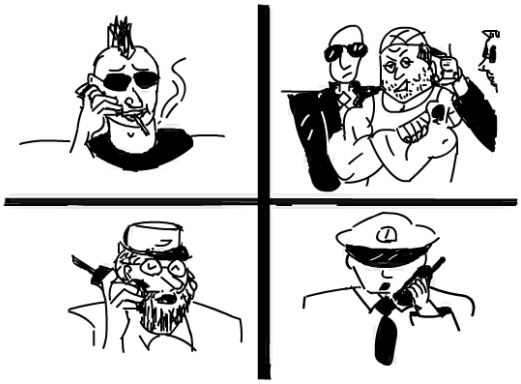


Figure 12 Before a fight

4.3 Segmentation of video sequences

Designing storyboards is a bottom up process. We design isolated scenes. But these scenes are merged together by the underlying story. Human observers fill in the gap using their imagination. The art of designing storyboards is of course to design the isolated scenes in such a way that they trigger the imagination to generate the same story. In chapter 6 we asked observers after reading the storyboard to write down the corresponding story. It proves that the generated storyboards trigger similar stories. In that chapter we analyze how it is possible that isolated frames generate a movie in our mind. The key solution is that the isolated frames appeal to scripts in our memory. Some scripts belong to the shared memory of all humans. This means that during life they were observer of those scripts or are informed of those scripts. Even rare events can have a strong printing in our memory. If the events have strong emotional aspects then the impact on our memory and the printing process can be huge. In our analysis we look for the feature in a scene which has a strong impact on the mind triggering process.

From the other way around our generated storyboards are used as guidelines for actual recordings. Interesting questions are the following:

1. ***Are we able to segment the video recordings in meaningful units?***
2. ***Are we able to label those segments?***
3. ***Is it possible to choose a frame from the video recordings which is a good representative of that segment?***
4. ***Is there a correspondence between the frames from the storyboards and the segments in the video recordings?***

Ad1
Usually, in segmenting video recordings we can take two approaches a bottom up and top down. In the bottom process we don't consider semantic processing of the video but only sensory triggers. An important trigger is the movement of the camera. If the camera's viewpoint moves from outside to inside of the train we can expect that we are changing scenes. Let us assume that the camera is focused on the behavior of a hooligan and then moves to the entering conductor, and then we can expect a new scene. So strong

movements of the camera, that is to say, changing viewpoints/focus of the camera are possible triggers of segmentation.

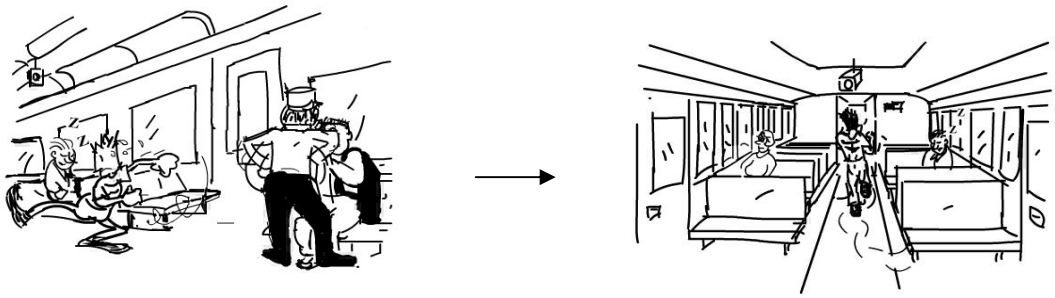


Figure 13 Changing viewpoint

Not only the movement of the camera but also strong movements in the scene are indicators for changing scenes. Take for example a hooligan who starts running in the train. In the same way the onset of strong movements by changing body movements or position of the actors in the scenes are good indicators of changing scenes. So for example, a struggle in a train or passengers entering or leaving a train ***(Figure 14, 15)*** accentuates new scenes.

Figure 14 Entering a train

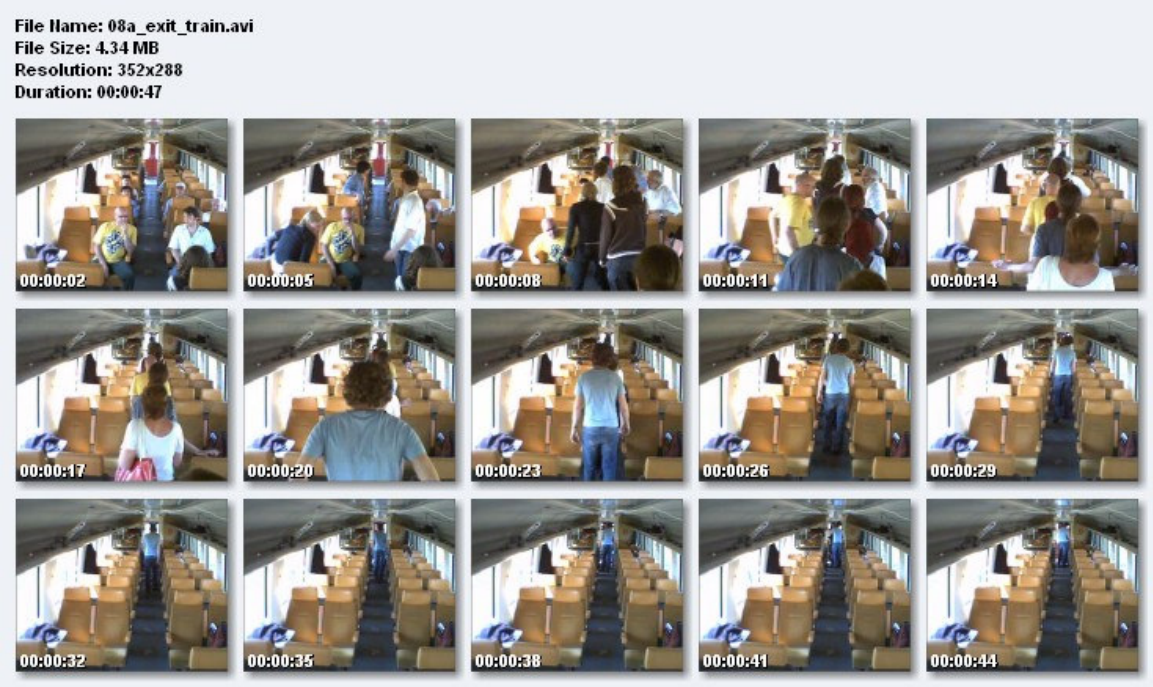


Figure 15 Leaving a train

To conclude movement is a strong indicator of changing scenes. It is possible to capture the motion of in an automated way. By correlation of frames or by tracking faces we are able to capture movements in an automated way. Unfortunately it can be expected that many movements belong to a scene and not to the transition from one scene to the other. That is the point where we start a second top down process of analyzing the scenes. Human observers are trained in analyzing behavioral patterns. We are especially sensitive to the onset and offset of movements and cyclic behavioral patterns. We always try to understand what is going on. By nature we are sensitive to thread and try to escape from it. Regular movement patterns are analyzed without much consciousness, but when a scene is changing more alertness of the human observer is needed, and scenes can expect a higher level of semantic processing.

Ad2

Once we have localized the borders of scenes we analyze the behavior in the scene. As observer we try to understand what is going on. We try to assess what are the goals of those behavioral patterns. Once we understand the goal after (deep) semantic processing we are able to label a scene. In real time processing we use a probabilistic approach. The labeling process is dynamic from nature. Goals can change in course of time or have to be updated because of changing information.

Figure 16 Labeling borders

Ad3

Once we have localized a scene, set the borders and an appropriate label we can select a frame which is most representative for the scene. In case we have to introduce the environments we select that frame which contains all the main actors and representative feature from the environment. Problematic are those situation of strong interaction. To represent the cause and result of an action we have to fuse frames or represent it by more frames.

Figure 17 A crowded train compartment

Ad4

In sketching a scene the designer has the freedom to visualize only the most important features. Disturbing features or redundant or ambiguous features can be leaved out of the scene. Next a designer is able to fuse different scenes. His sketch is an impression of what is going on not a realistic registration. In the same way a designer is able to add features which are not observable. As mentioned before he is able to accentuate movements or can add text or other eye-catchers. So we expect that there is not a 1-1 correspondence between the frames of a scene and a scene in a storyboard. A scene in a storyboard can be represented by more frames in the actual video recording.

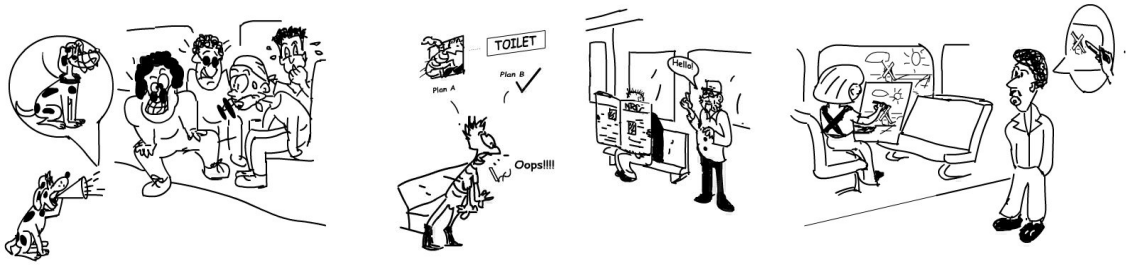


Figure 18 Eye-catchers in storyboards

4.4 Storyboards and tools

A storyboard is a graphic narration made with drawings and a sequence of related frames telling a story. It was early used in movie making industry, and it provides an effectively plan for video shooting. Nowadays, it is also widely used in many other fields as a very important planning/pre-production technique, for instance, making storyboards on creating software prototypes or designing a user interface for computer software.

Generally, a storyboard is an expression of everything that will be contained in the program -- how menu screens will look like, what pictures (still and moving) will be seen when and for how long, what audio and text will accompany the images, either synchronously or hyperlinked [6]. The figures ***(Figure 19)*** are the typical samples of storyboards.

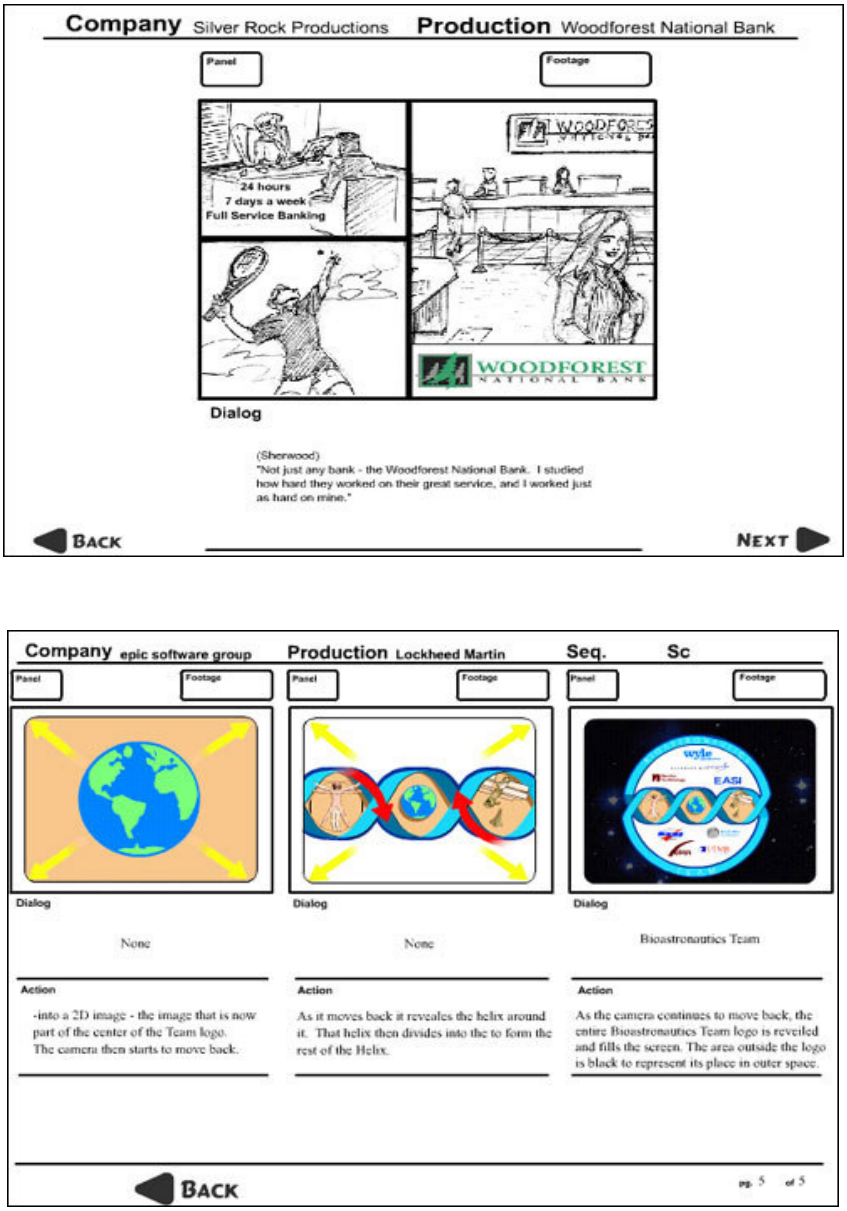


Figure 19 Samples of Storyboards

It is designed to visually communicate the story concept and somewhat like a cartoon of the film. Storyboards often just show the key frames of scripts, it fits the theory what we mentioned earlier in Chapter 2, these key frames indicate the key situations of a story with temporal and causal correlations. Each of us equipped with thousands of scripts,

every time when we go through or imagines those familiar scenarios in our mind, the scripts work immediately. More importantly in our work is to sketch these situations out of our mind. So in this case, storyboard is not only a simple story carrier, but also a visual script.

Most commonly, storyboards are drawn with pen or pencil with on papers, actually making a storyboard doesn't have a fixed way. Generally, there are several ways for designing visual material, you can just make a drawing on the paper, take pictures for your scenes, and scan a couple of photos, cut out pictures from magazine, and so on. Then we can add notes or text, text balloon on each image, label sequence of each scene and mark the time taking if needed, just do whatever is convenient and easy for the goals. Storyboard carrier can also have different views ***(Figure 20)*** from simplest paper sketch to professional software such as BoardMaster, FrameForge 3D Studio.

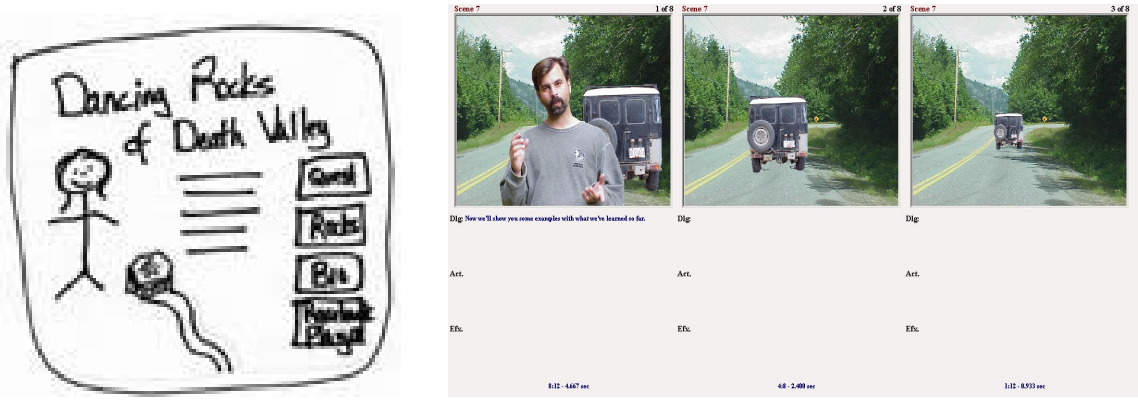


Figure 20 Samples of Paper sketch and storyboard software

Each of them has their own advantages, however most of storyboard software are designed for more professional use in movie making fields, and some of them even provides scene model so that user can drag objects from the scene library directly into the stag. However, most of them are lack of the necessary environments for the train compartment. What needed in this thesis work is sketching some key frames in scripts for storytelling. They don't need to be painted as long as the main graphic elements and behaviors are able to be recognized, few pictures contain some simple text and marks, and those pictures are able to fulfill a storytelling.

Macromedia Flash MX is one of most popular and standard authoring tool for producing high-impact 2D cartoon, frame-by-frame animation, especially on web applications, Flash has been selected, because all the black-and-white pictures in our storyboards are keyframes. As mentioned in chapter 2 these keyframes are also the key steps in scripts so that they can provide connectivity to the whole story. They are all in a visual modality, so they can also be treated as visual scripts. So the semantic meaning of keyframe fits well with our scripts theory. Furthermore, the drawing tool in Flash is a powerful weapon for people who don't have enough background on drawing. It would be better to use Macromedia Flash MX to cope with most of drawing work. After drawing all the pictures, we first leave the annotation blank and consider these storyboards as pure visual scripts

(Figure21). These non-narrative pictures have been first inserted into a small booklet, and then we ask ten students to give the related text to each picture. The other storyboard carrier is an interactive digital storytelling movie which is made by Macromedia Flash MX. ***Figure 22*** shows a brief outline of the digital storyboard. In the next chapter, we will take a further look at the content of these storyboards.

Figure 21 Storyboards booklets

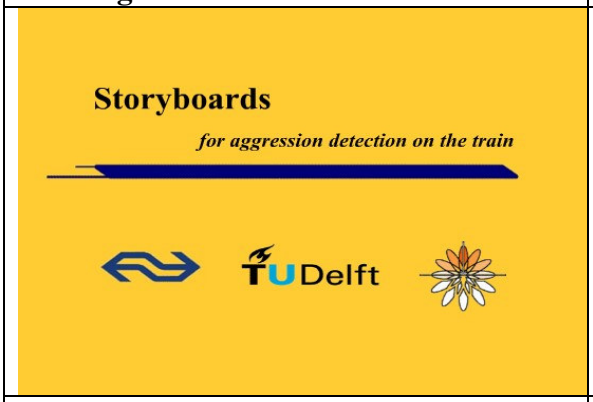
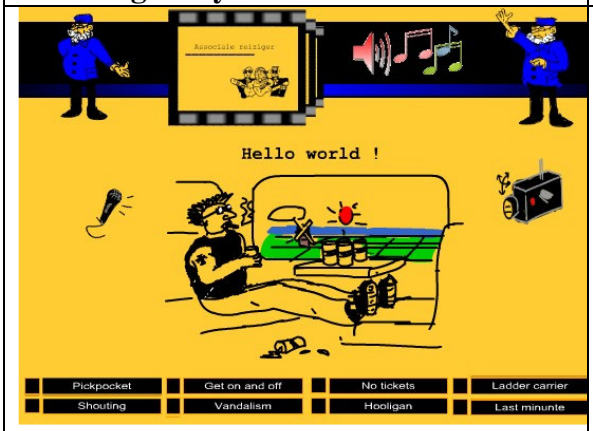
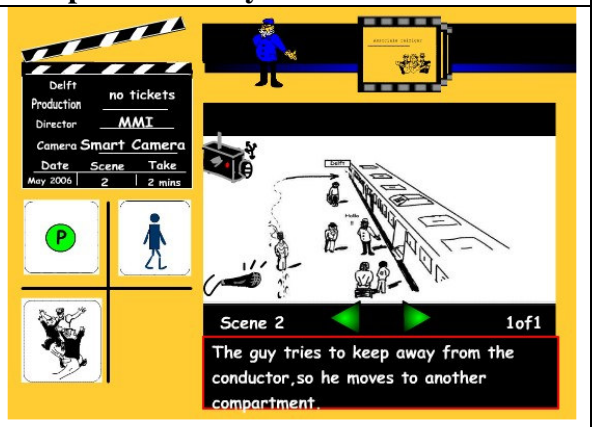
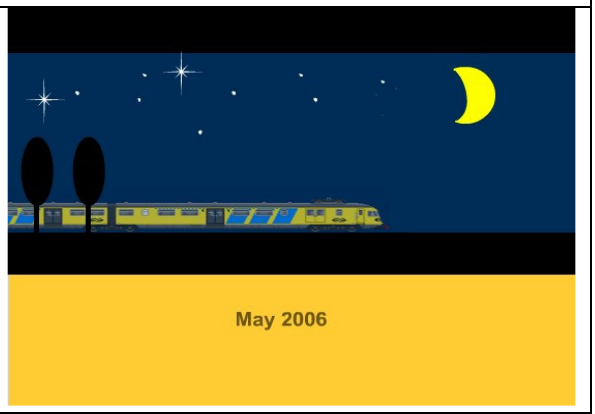
Loading film theme	Welcome stage
	
Choosing Story	**Sample from storyboard of "No ticket"**
	
Sample from storyboard of "Hooligan"	**Tail leader**
	

Figure 22 Interactive Digital Storyboards

5. Storyboards of aggressive behavior in trains

5.1 Prototypes analysis

In order to create aggressive stories in a special world around the train compartment, the prototype of aggressive behaviors need to be selected correctly. Traditionally, psychology has defined aggression as behavior against another that intentionally inflicts harm. Problems arise though when angry and aggressive responses get out of control and aggressions might be further developed into violence. So aggression also can be looked like a low-level of violence. According to [5] "It is simply to point out that believing crowds to be generically violent may do more to produce violence than to explain it." That means the potential aggressive behavior and violence could always occur at a higher possibility in public places, the train compartment is one of those typical environments, especially in rush hours when the compartment is full of passengers. So what are these possible sources of aggressive behaviors?

In the world of train compartment, there are a couple of very important roles; passenger usually would like to have a safe, healthy and comfortable travel. The train staff such as conductor, catering service, and police will play an important role on maintaining the regulation of the train compartment, also sometimes, a lot of unwanted roles will also appear in this world, such as ticket evader, pickpocket, demolisher, rules breakers. The house rules of Dutch railway (See the Appendix A) can be regarded as the basic regulations of this world. Aggressions naturally come from the interaction between normal passengers and the rules breaker, or rules breaker and train staff. These potential aggressions and conflicts can be the obvious aggressive behaviors, such as fighting, shouting; some aggressions are shown or indicated by a causal of functional relation, or abnormal behavior, in that case, the necessary reasoning process needs to be concerned.

5.2 Scenarios and stories

In the most cases, anyone who is not willing to follow the house rules of train compartment will possibly make trouble in the compartment, these trouble makers will be the most important actors for our stories. After sharing understanding within aggression detection team, a set of interesting scenarios have been worked out by the brainstorm sessions, in another words, we are sharing our world model on those stereotypical situations on the train, not only the normal situations, but also those abnormal and aggressive ones. The list below ***(Figure 23)*** shows the possible aggressive behaviors and related scenarios base on the House Rules of Dutch train compartment, the most related stories have also been mentioned. Eight stories have been created more or less based on

these rules; actors will play some certain aggressive actions to cause troubles. Except this, major graphic elements include objects (roles and props); clear feature of aggressive actions, potential aggressive feature as well as the facial expression have been designed. The House rules of the train compartment are more or less involved with the stories, but not in a "one on one" way because most the obvious aggression will have same aggressive behavior forms like cursing and fighting, it is tedious to make every story come to an aggressive result. One of the purposes for the final goal is through designing storyboards to find more widely elements which can represent the specific world of train compartment from individual world model. Our storyboards were able to generate interesting story to show a storyworld. The comic effect and fun of story itself are also concerned on the scenario design, we expect these scenarios can be reasonably interconnected by our visual scripts of storyboards.

Valid ticket 	Tickets case: * Normal ticket checking *Passenger doesn't have valid tickets. Interaction between Conductor and passengers. related story - "No ticket"
Emergency	Emergency: * Dangerous situations. * Drastic chaos * Life threatening crisis related story - "Vandalism" " Ladder carrier" "Hooligan" "Pickpocket" " No ticket"
Boarding and leaving the train	Normal situation: * Entering *Leaving. Abnormal situation : * Disordered boarding related story-" Getting on and off"

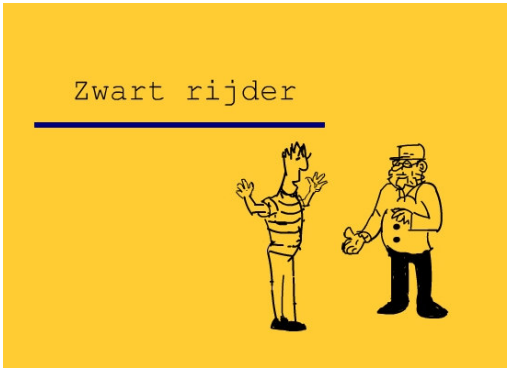
Noise 	Normal situation: *Voice under self-control and won't disturb others. Abnormal situation:* Excessive loud voice and do disturb other passengers. (speaking and singing) related story-" Shouting"
Bicycle 	Normal situation: * Feasible belongings Abnormal situation: * Taking huge luggage and possible obstructing others. related story-" Ladder carrier"
Hand luggage 	Normal situation: * Hand luggage on the racks Abnormal situation: * Using personal belongings to take seats or obstructing others. related story- "Last minute"
No smoking 	Abnormal situation: *Smoking in the train compartment. related story - "Hooligan"
Tidiness 	Abnormal situation: *Passenger put the feet on the seats. * Passenger leaves around the rubbish * Vandalism or graffiti related story - "Vandalism" "Hooligan"

Figure 23 Related scenario list

After finish designing these stories, drawings of those representative scenes has be made, each picture are supposed to be the key step of the scripts and key frame of the visual scripts, together with these meaningful pictures, narrative storyboards have been made. If we take a look on the structure of these storyboards, the general structure of our storyboards will follow in an S-R cycle structure, which has been previous mentioned as the story model in Chapter3. Most of the stories are designed to match the S-R cycle of increasing/decreasing violence measurement, basically, first key frame shows a general context of the situation, in the next frames key roles are introduced and an indication of the main theme/topic, aggression will be created as the time goes on, as the aggression may continue increasing or decreasing, we will observe a sequence of stimulus-response reactions. Then a climax of story will come and then work the final result out. In the next section, you will see the outlines for each storyboard. To see more detailed storyboards, please turn the pages down to the appendix C.

5.3 Outline of Storyboards

All of these stories are standard event sequence with a temporal and causal related relationship, the story structure follow the storyboard model as we described in chapter 3, here are basic outlines of storyboards.

Story sequence	Brief outline
1 No ticket 	"No ticket" is a story about a ticket evader sneaks through the railway platform, train compartment to avoid ticket checking. However, he was not so lucky that day; he finally got the punishment.
2 Hooligan 	A hooligan plays very bad behaviors, drinking too much, smoking, speaking dirties, dirty hand pose, shows no respect to conductor, he even asks help from his hooligan mob to against the train conductor, at last, policeman comes and kicks the hooligan out of the train.

3 Shouting 	This story describes a tied passenger is suffering from different kinds of noise of other passenger, loud speaking with mobile phone, enthusiastic Ajax fans' singing. At the end of the story, a personalized dog stops his nightmare.
4 Graffiti 	A painter's sketchy artwork of outside landscape triggers a guy's intuition on drawing, instead of drawing on the paper, he draws directly on the window of the train, when other passengers ask him to stop his action, aggression gradually goes towards even worse, one of the passenger faces a life threatening crisis, as the result, policeman comes after "112" is called.
5 Get on and off 	This story is about how a little girl gets off from crowded train in the peak hour, conductor makes effort to keep the order on boarding and leaving the train.
6 Pickpocket 	A pickpocket's pilferage is detected by camera; he was tracked and positioned throughout the train compartments, finally, he got arrested.

7 Ladder carrier 	A ladder carrier wants to get on the train with his long ladder, however, that is not allowed boarding the train with such a huge luggage. An aggressive story happened between this ladder carrier and train conductor.
8 Last minute 	For catching a leaving train in the last minute, a passenger tries his best to get on the crowded train, but when he achieves his goal, the train compartment can't stay in peace any longer.

Figure 24 Outlines of the storyboards

In the next chapter, we will take a look on world modeling. Firstly we will give an introduction to see the hypothesis of our world model, and then we need to find the components of our WM in the storyboards. An experiment has been made that ten students have been asked to look at these storyboards and give related the text stories. We expect that the WM in storyboards which we find in our storyworld can also be found in the text stories as well as it in the video recordings.

6. World Modeling

6.1 Hypothesis of WM

In chapter 2, we have presented an introduction to WM (world model). Each of us has an internal WM, the knowledge of real world, which we got from our daily experience, are organized by thousands of scripts, and together with these scripts, they are stored in our internal WM as permanent scenarios and patterns, we use them to interpret what's going on in the external world. Like everyone uses their internal WM to interpret the external world, an automated aggression detection system will also need WM to understand the information which is transferred from the sensors (cameras and microphones), then this WM can guide system to perform a context sensitive observation. Context sensitive observation will definitely need the context are well annotated and predefined, in this master thesis, we categorize the specific world model around train compartment with the components of objects, features and their relations. However, an individual world model could only be a very limited view, so it is important to extract a shared WM from individual WMs.

To find this well defined WM, we first sketch our mind by designing eight storyboards, which describe a couple of aggressive stories that could happen within the context of train compartment, at the same time, it provides a basic trace so that people can share their internal scripts, in the text story experiment, we asked ten students to look at the storyboards and give the possible related text on each picture, we expect they can find most relevant salient objects and relations from our storyboards. At the same time, based on these storyboards we record a set of video clips, following these visual scripts (storyboards), we expected that we can also find wanted world objects and relations in the realistic world. In another word, our world modeling is based on a way of conveying information from individual WMs to get a shared WM which can have extracted and refined scripts. The affiliation below shows the hypothesis of the WM.

❶ $\text{Objects}_{SB} \cap \text{Objects}_{T} \cap \text{Objects}_{VR} \subset \text{WM}$

$\text{Features}_{SB} \cap \text{Features}_{T} \cap \text{Features}_{VR} \subset \text{WM}$

$\text{Relations}_{SB} \cap \text{Relations}_{T} \cap \text{Relations}_{VR} \subset \text{WM}$

❷ Storyboard i (i=1,2,3…..i)

set

$$\{Objects\}_{SB} \approx \{Objects\}_{T} \approx \{Objects\}_{VR}$$

set

$$\{Relations\}_{SB} \approx \{Relations\}_{T} \approx \{Relations\}_{VR}$$

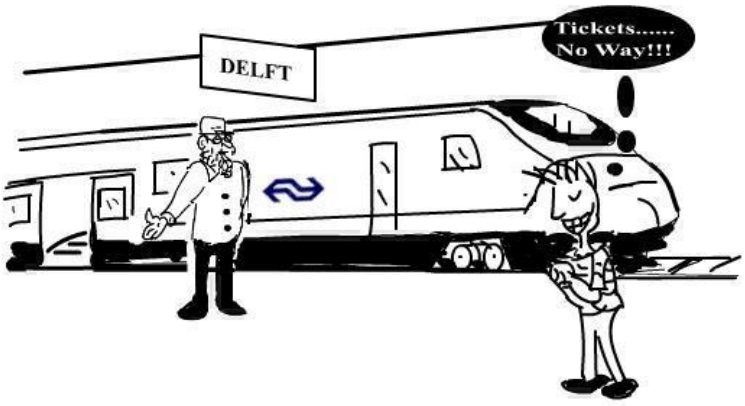
set

$$\{Features\}_{SB} \approx \{Features\}_{T} \approx \{Features\}_{VR}$$

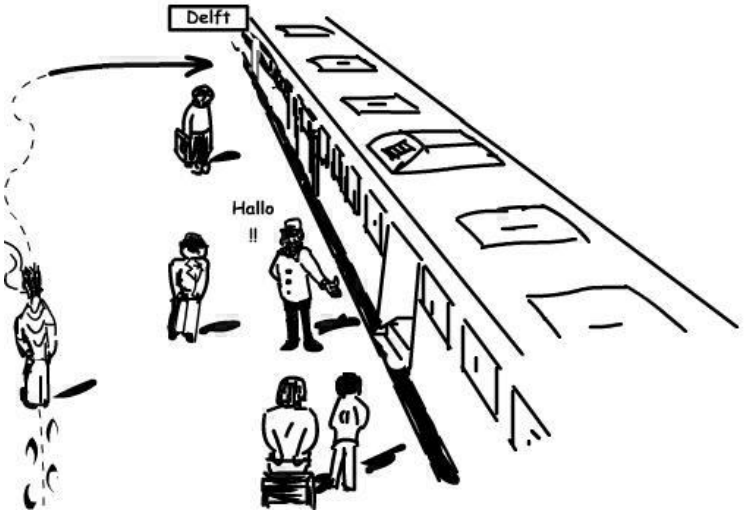
Where, Storyboard=SB, T=Text, VR= Video recording.

6.2 The WM in Storyboards

We designed several storyboards, we are interested in the underlying WM, as an example, we describe the storyboards of the "no ticket".

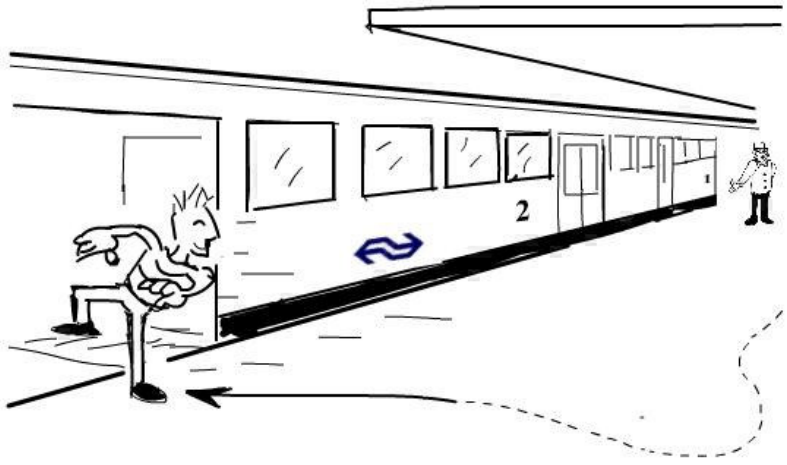
<table>
<tr><td>Storyboard #1 "No ticket"</td><td>Objects</td></tr>
<tr><td rowspan="4"> 

1. A train has arrived at Delft station, the train conductor is standing in front of the train, welcomes his passengers' boarding. Passenger A, who is experienced ticket evader, after seeing the conductor, he begins thinking of how to take his risky trip.</td><td>-Train
-Platform
-Information board of "Delft"
- "NS" logo
-Conductor
-Passenger A
-Track
-Gate</td></tr>
<tr><td>Relations</td></tr>
<tr><td>-Train stops at platform.
-Passenger is walking
-Gates are open
-Conductor shows "Welcome boarding" gesture.
-Passenger A is thinking</td></tr>
<tr><td>Features</td></tr>
<tr><td></td><td>-Passenger A shows a strange expression.
- Text balloon "Tickets No way!"</td></tr>
</table>



2. All the passengers are preparing to get on the train from nearest gate, but it seems Passenger A is wandering around the platform and he seems not like to get on the train as soon as possible.

Objects
-Train -Platform -Information board of "Delft" -Conductor -Passenger A -Crowd -Luggage
Relations
-Gates are ***open*** -Conductor ***shows "Welcome boarding" gesture.*** -Other passengers ***are getting on*** the train .
Features
-Passenger A passes by crowd and ***keeps away from the conductor.***

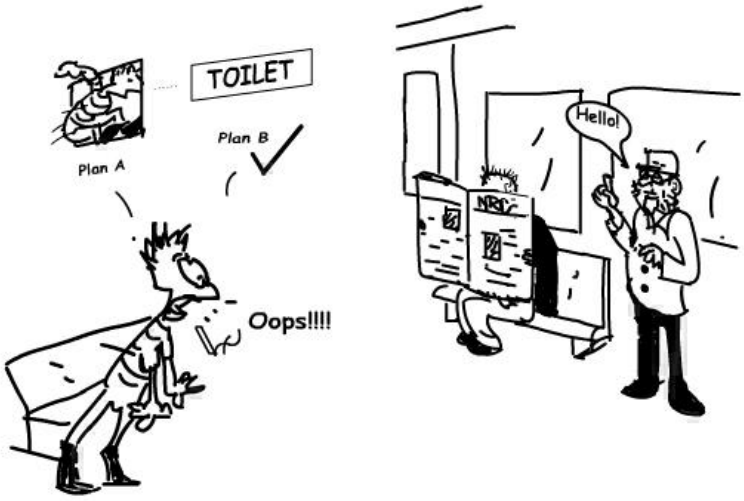


3. When Passenger A walks several compartments away from the conductor, then he suddenly gets into the train.

Objects
-Train -Platform -Conductor -Passenger A - "NS" logo - Class 2
Relations
-Conductor ***stands far***. -Some gates are ***close*** -Passenger ***shows*** a ***happy expression.*** --Passenger A ***looks back*** to conductor when he ***gets into*** the train.
Features
-Passenger A ***quickly moves*** into the train compartment.

4. After boarding, all the passengers are seated, each passenger is doing individual actions, sleeping, reading newspaper……Passenger A pretends as calm as he can, but camera makes him feel unsafe.

Objects
-Train compartment -Cameras -Seats -Passenger A -Other passengers -Newspaper -Rack -Corridor -Windows
Relations
-Cameras are ***looking around.*** -All the passengers are ***sitting on*** the chairs. -Other passenger, one is ***sleeping***, the other is ***reading newspaper.*** ***-Train is moving.***
Features
-Passenger A ***shows*** a ***doubtful expression, looking up at*** the camera.



5 But the silence doesn't last for long, "all tickets, please." train conductor comes up in the compartment, Passenger A looks very nervous and a couple of ideal comes into his mind, then he decides to hide himself in the toilet.

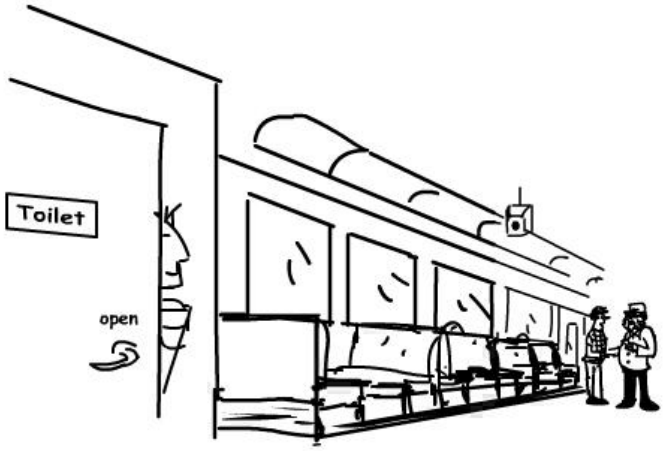
Objects
-Train compartment -Seats -Passenger A - Other passengers -Newspaper -Corridor -Conductor -Windows
Relations
-Conductor ***shows up*** and ***asks for tickets.*** - One passenger is ***reading newspaper.***
Aggressive aspects
- Passenger A ***suddenly stands up*** from the seat. -Passenger A is ***surprised*** with his ***mouth wide open.***

6 When the conductor starts checking tickets, passenger A leaves his seat immediately.

Objects
-Train compartment -Cameras -Seats -Passenger A - Other passengers -Newspaper -Gate -Rack -Corridor -Ticket -Windows -Conductor
Relations
-Conductor is ***checking tickets*** with other passengers -the passenger is still ***sleeping.***
Features
-Passenger A is ***leaving*** from his seat ***quickly***, cold ***sweating.***

7 Passenger A is moving fast to the toilet.

Objects
-Train compartment -Cameras -Seats -Passenger A -Other passengers -Door -Rack -Corridor -Windows
Relations
-The passenger is still ***sleeping.*** Another passenger is ***looking outside*** of window.
Features
-Passenger A ***Fast moving*** in the train compartment.



8 Passenger A locks himself in the toilet; he believes that the busy conductor doesn't notice his special move at all and the toilet is a very good shelter.

Objects
-Train compartment -Cameras -Seats -Passenger A -Other passengers -Rack -Corridor -Ticket -Windows -Conductor -Toilet -Door of toilet
Relations
-Conductor is ***checking tickets*** with other passengers -Passenger A ***enters the toilet.***
Features
- Passenger A shows a ***strange smile***.

9 Been a while, the door is being knocked; passenger A is still in the toilet and he doesn't know that the conductor will stand right there in front of him.

Objects
-Train compartment -Cameras -Seats -Other passengers -Rack -Corridor -Windows -Conductor -Toilet - The door of the toilet
Relations
- Conductor is ***standing at*** the door of toilet.
Features
- Conductor is ***knocking*** at the door of toilet.

10 Passenger A thought the danger was already past, that is bad luck, the conductor asks for the tickets when he comes out of the toilet. He can only play innocent and gives a lot of excuses.

Objects
-Train compartment -Cameras -Seats -Other passengers -Rack -Corridor -Windows -Conductor -Toilet - The door of toilet
Relations
-Conductor is ***asking for*** tickets. - They ***start*** a ***conversation.***
Aggressive aspects
- Passenger A ***spreads his hands, showing innocent.***

11 Passenger A is not willing to pay any money for the tickets; he is getting angry and more aggressive both on words and actions. He is not aware of the coming policeman is standing behind them.

Objects
-Train compartment -Cameras -Seats -Other passengers -Rack -Corridor -Windows -Conductor -Toilet - The door of toilet -Policeman
Relations
- Policeman ***shows up*** in the compartment -Conductor is ***under attack.***
Features
- Passenger A is ***making aggressive pose.*** - Passenger A has an ***angry*** looking. - Passenger A is ***speaking strongly.***

12 Passenger A was finally arrested by the policeman, and he feels regret for that.

Objects
-Train compartment -Seats -Corridor -Windows -Conductor -Gun - Baton -Policeman
Relations
-Policeman and conductor are very ***happy.*** -Conductor ***shows "good-bye" gesture.***
Features
-Passenger A is ***crying.*** -Policeman is ***collaring*** the passenger A. -Policeman is ***holding*** a baton ***at hand.*** -***Arrest***

Figure 25 Storyboard of "No Ticket"

In this example, we first show a general context frame and give some general background situations, the train just arrived at Delft station, the conductor came out of the open gate, and welcome the passengers, the passengers are preparing to get on the train, then we guide to a problem definition part to what will be theme of the story , the key roles are introduced, a guy without ticket uses several ways to avoid being checked, simultaneously, a set of facts and features have also been gradually added in S-R cycle, as the event moving forward, when the ticket evader and conductor meet each other, the aggression will almost be triggered, because at this time, all the aggressive preconditions will be ready, such as the objects, properties , key roles , objects and actions have been continuously input to create an aggressive environment, after that, we continue push to trigger a high level of aggression, the ticket evader and conductor can starts verbal or nonverbal aggressive behavior against each other , we choose to let the violence increased, so after the Stimulus-Response reaction, the aggression behavior comes to a climax, they are almost to have a fight, then the policeman comes and arrests the troublemaker, then the story comes to an end. After this, the compartment will come back to a normal situation. Similarly, other stories will also follow this story model.

In appendix C, all the storyboards have been fully described like what we have seen in ***Figure 25***. The annotated text shows the original meaning for that picture, the list on the right shows the analyzing factors, including objects, relations, and features, the objects can contain human agents (roles) and props, such as conductor, Passenger A, policeman, other passengers, and the props belong to these roles, cigarette, knife, beer, tickets……,

some objects are the properties of our main world of train compartment, such as chair, gate of train compartment, toilet, at the same time, each human agent plays a role with predefined behavior, such as a conductor will check the tickets, provide information, as the passengers, they can read newspaper , have a nap, however, some passengers will play a very awful behavior, such as a ticket evader, hooligan, annoying passenger. The most relations in our table are described as verbs, adjectives, and verb phases that refer to the objects, which is in bold and inclined font style. For instance, human agents will have dynamic properties and certain behavior patterns, such as walking, running, making pose and gesture, kicking, fighting, and quarreling. Features are the most salient part of the picture, the involved objects or relations are often close to the theme of current picture, aggressive features can be further extracted from these features of pictures, which often need to compare with the context to see whether they indicate aggressive aspects. We also attribute those repeated factors into one key concept. After that, the most actual objects, relations and aggressive features from storyworld have been chosen. Having analyzed all the storyboards, the refined results are listed in ***Table 2***, where theses elements are summarized as the basic components for our WM of train compartment.

Table 2 Summary of WM Components from Storyboards

Storyboards	Objects	Relations	Aggressive Features
No Ticket	O1-Train O2-Platform O3-Information board O4- "NS" logo O5-Conductor O6- Individual Passenger O7-Track O8- Ticket O9- Ticket punch O10- Class 2 O11- Crowd, A lot of passengers. O12-Gate of train compartment O13-Other Individual Passengers O14- Camera O15- Newspaper O16- Train compartment O17-Rack O18-Luggage, Suitcase Baggage. O19-Corridor O20-Windows O21-Toilet	R1-***Stop at***, (Train ***stops at*** platform). R2-***Walking, Normal Moving*** (Passenger is ***walking.)*** R3-***Open*** (Gates are ***open.)*** (***Open*** the door) R4-***Showing "Welcome boarding" gesture.*** R5- ***Thinking*** (Passenger is ***thinking****).* R6- ***Getting on the train***(Passengers ***are getting on the train****)* R7- ***Standing far away from*** (Conductor ***stands far away from*** Passenger.) R8-***Close*** (Gates *are* ***close***.)(***Close*** the door) R9- ***Showing a happy expression.*** (Smiling) R10- ***Looking at*** (Passenger ***looks*** back ***at*** conductor) (Passenger is ***looking*** up ***at*** the camera.) R11- ***Train is moving*** R12- ***Looking around.*** (Cameras are ***looking around;*** Passenger is ***looking around***.) R13- ***Sitting on***, ***Seated*** (Passengers are ***sitting on*** the chairs.) R14- ***Sleeping*** (Passenger is ***sleeping***) R15- ***Reading*** (Passenger is ***reading*** newspaper.***)*** R16- ***Showing up*** *(*Conductor ***shows up*** in the compartment) R17- ***Asking for tickets*** (Conductor ***asks for tickets.****)* R18- ***Punching the tickets***(Conductor is ***punching the tickets***) R19- ***Checking tickets***. (Conductor is ***checking tickets***.) R20- ***Leaving from one's seat.*** R21- ***Go to, enter into.*** R22- ***Looking outside*** (Passenger is ***looking outside*** of window) R23- ***Standing at*** (Conductor is ***standing at*** the door of toilet.)	F1- ***Showing a strange expression, (strange smile, doubtful, weird expressions…..).*** F2- ***Key aggressive words*** ("Tickets, No way!" "Fuck you"…) F3- ***keeping away from the conductor or policeman*** F4-***Quickly move***, ***Fast moving, running, rushing.*** F5- ***Suddenly stands up*** (from the seat.) F6- ***Showing surprise expression*** *(with* his mouth wide open.) F7- ***Showing explanation gesture***. *(Spread his arms and hands* shows his innocent*).* F8- ***Making aggressive gesture, fighting.*** (Hands are pointing to people's face.) F9- ***Showing angry expression.*** F10- ***Speaking strongly.*** F11- ***Depressed expression, Crying.*** F12- ***Collaring*** (Policeman is ***collaring*** the passenger.) F13- ***Knocking*** (Passenger is using a hammer ***knocking at*** the windows) F14- ***Gun***

	O22- The door of toilet O23- Policeman O24-Gun O25- Baton	R24- ***Conversation, talking, speaking, explaining*** *(*They ***start a conversation.****)* R25- ***Showing a "good-bye" gesture.*** R26- ***Looking for*** (Passenger is ***looking for*** a gate to get in)	F15- ***Baton, Clubs, Stick*** F16- ***Under attack.*** (Conductor is ***under attack.***) F17- ***Arrest***
Hooligan	O26- Hooligan O27- Tattoo O28- Flags O29 -Mohican style O30- Cigarette O31- Beer Can O32- Bench, chair, seat O33- Cell phone O34- A small group of passengers O35- Clubs O36- Door of compartment corridor O37-Drunkard O38-Floor O54-Table	R27- ***Be on*** (Beer cans ***is on*** the table.) R28- ***Calling, Making a phone call*** R29- ***Drinking*** (Passenger A is ***drinking.***) R30- ***Quicker than*** (Policeman comes ***quicker than*** hooligan group.) R31- ***Moving in the compartment*** (The small group is ***moving in the compartment.***) R50***-Holding something in hand*** (hooligan holds a baton in his hand)	F18- ***Accessorized with abnormal accessories*** (Passenger A is ***accessorized with Flag & Tattoo***) F19- ***Showing an unhappy, miserable, down expression.*** F20- ***Lying on*** (Beer can is ***lying on*** the floor.) F21-***Throwing*** (Passenger A ***throws*** beer cans.) F22- ***Feet on the opposite bench*** F23- ***Smoking*** F24- ***Showing a warning, blaming, pointing to…. Gesture.*** F25- ***Showing a dirty gesture.*** F26- ***Kicking*** F27- ***Drunkard*** F47**-Hooligan**

Shouting	O39- Dog O40-Soccer fans	R32-***Quiet compartment*** R33- ***Ring of cell phone.*** R34-***Normal compartment*** R35-***Making up***(Passenger D is a ***lovely girl*** and she is ***making up)*** R36-***Singing*** R37-***Sitting near, beside*** (The small group is ***sitting near*** with Passenger A and Passenger D.) R38-***Stop doing***(Soccer fans ***stop singing)*** R39-***Lay one's hands on*** (Passenger ***lays hand on*** her dog).	F28- -***Voice is too loud.*** F29- ***Annoying*** (Passenger C is annoying) F30 - ***Sealing one's ear.*** F30- ***Dog is barking*** F31- ***Showing scared, frighten expression.***
Vandalism	O41-Knife O42-Police Cars	R40- ***Kneeing on*** (Passenger A is ***kneeing on*** the chair.)	F32- ***Drawing*** F33-***Dirty words*** F34-***Knife*** F35-***Call the police***
Get on and off	O43-Hat	R41-***Hanging something in the air.*** (A hat is ***being hung in the air.***) R42 –***Getting off the train.***	F36-***Shouting, yelling*** F37-***Crowd Partial Movement*** (The crowd ***makes a way*** for the little girl.)
Pickpocket	O44-Wallet O45-Money O46- Handie-talkie O50-Thief O51- Computer Screen.	R43- ***Putting luggage onto the rack.*** R44- ***Sweeping sweat.*** R45- ***Pushing a button.*** R46- ***Giving, passing***	F38-***Crowded, Full of People.*** F39-***Lower one's head to, heading down.*** F40- ***Hitting, Hitting down.*** (Thief ***hits*** the man with no conscious.) F41- ***Stealing*** F42- ***Falling down.*** F43-***Jumping*** F48 **-Thief**

Ladder carrier	O47 Long ladder O52 Unfolded Bike O53 Huge belonging		F44- ***Showing Stop gesture.*** (Conductor shows "stop" gesture.) F45-***Disagree*** (Shaking head, disagrees expression) F46- ***Alarming*** (Camera is ***alarming.***)
Last minute	O48 Clock O49 Compartment number information	R47- ***Breathless and in sweat, exhausted*** (Passenger A is ***breathless and in sweat.***) R48- ***Opening ,Closing*** (The gate is closing) R49- ***Arriving ,Leaving***(Train is leaving)	F49- ***Jumping into, piling into.*** F50- ***Noisy compartment.***
Add-on	Male passenger Female passenger Elder Child Catering service Drunkard Beggar Robber Gun Hammer Blood Baby carrier ID Card Discount Card Umbrella	Lighting status Gesture of " turn down your voice"	Smashing Pushing

6.3 The observed WM in text stories

When we look at a comic book and cartoon, we usually not only see the pictures but also see the text balloons or listen to the speech, at that time, image and text work together to make the whole procedure vivid and meaningful, it's an easy way to convey information and help people's understanding. One way to display our storyboards is to use small booklets, different with the common cartoon book; these booklets are only given by pictures but without text. Ten students were asked to look at these storyboards and make descriptions on what they see and what is popping up in their mind. Except that, we also concern whether these isolated pictures can generate a movie in their mind. And are the same features can be found from same reading material? Are the similar scripts from their memories have been recalled?

Again, we use the story of "no ticket" as sample to show the observed results, before we shows the observed results, we first take a look on what are the those objects, relations and features exist in the text story, the sample below shows different text descriptions are given to a same picture; the highlighted parts are the objects and key terms to show the relations between them. The highlighted words have been filled into ***table 3***; in this case, we are going to see whether the similar features can be found from different people, where T1 means the text story from student 1.

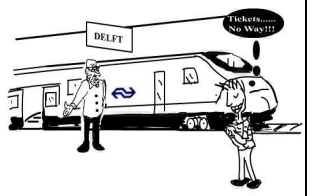
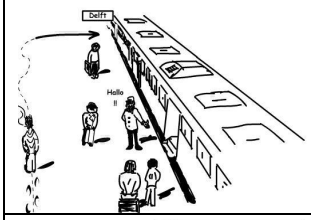
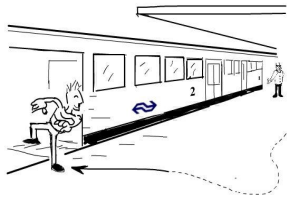
T1: A youth wants to get on the train without ticket; even he saw the train staff.
T2: At Delft station, there is a guy who would not buy a ticket.
T3: One guy is thinking of taking the train without paying for the ticket.
T4: A young man who did not want to buy tickets was waiting for the train.
T5: A man is going to get to the train, but his didn't buy the ticket.
T6: A passenger decides not to buy train ticket.
T7: A passenger wants to take the train from Delft station.
T8 (Text balloon):
Passenger A: Stupid people buy the tickets to get on the train. Let me buy the tickets. No way!
T9 (Text balloon):
Guy: Buy the ticket……no way!
T10 (Text balloon):
Black passenger: tickets? No way!

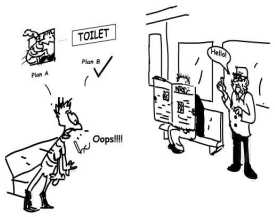
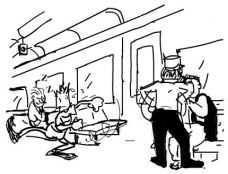
Table3 Objects and relations in text sample

Objects	Key terms
T1: A youth, train, ticket, train staff.	Wants, without, get on, even A saw B
T2: Delft station, a guy, ticket.	Would not buy
T3: One guy, train, ticket.	Thinking, without paying, taking
T4: A young man, tickets, train.	Did not want to buy, waiting
T5: A man, train, ticket.	Didn't buy, get to
T6: A passenger, ticket.	Decides not to buy
T7: A passenger, train, Delft station.	wants , take

T8 Tickets, train. Passenger A	Buy, get on, No way!
T9 Guy, ticket	No way!
T10 Black Passenger: tickets	No way!

We find that different words have been used to describe same objects and the relations, some relations are even out of our stationary in ***Table 2***. However, from the view of semantic level, most of the components in the text stories can be referenced to those basic components in storyworld. In the Figure 26, we choose most repetitive words in the text to show the observed result, the referenced code in ***Table 2*** has also marked.

Frames	Observed objects	Observed relations	Observed features
	A young man-O6 Conductor – O5 Train-O1 Delft-O3	Thinking-R5 Get on-R6 ***"O6-R5-R6-O1"***	"Ticket, no way" -F2 ***"O6-R5-F2"***
	The young man -O6 Conductor-O5 passengers-O11 Door of compartment-O12	Moving forward-R2 Looking for –R48 O5: Standing -R23 ***"O5-R23"*** ***"O6 –R26-O12"***	Keep away from -F3 ***"O6-F3-O5"***
	The young man -O6 Conductor-O5 Door of compartment-O12 Train-O1	Get on-R6 Standing far away from- R7 Happy-R9 ***"O5-R7-O6"*** ***"O6-R6***", "***O6-R9"***	Keep away from -F3 Quickly move-F4 ***"O6-F3-O5"*** ***"O6-F4-R6-O1"***
	The young man -O6 Other passengers -O13 Newspaper-O15 Camera –O14 Chair- O32 Compartment -O16	Reading -R15 Sitting on –R13 Looking around - R12 Sleeping- R14 ***"O6-R13-O32"*** ***"O6-R12"*** ***"O13-R15-O15"*** ***"O13-R14"*** ***"O14-R12"***	showing uncomfortable looking, nervous embarrass-F1 ***"O6-F1"***

	The young man -O6 Chair- O32 Compartment -O16 Cigarette-O30 Ticket-O8 Toilet-O21 Conductor-O5	Appear, come to -R16 Checking ticket -R19 Thinking-R5 Go to - R21 ***"O6-R5-R21-O8"*** ***"O5-R16"*** ***"O5-R19"***	suddenly stand up from seat-F5 Surprised-F6 ***"O6-F5" "O6-F6"***
	The young man -O6 Compartment -O16 Conductor-O5	Checking ticket -R19 Leaves his seat -R20 ***"O6-R20"*** ***"O5-R19"***	Run away,flee-F3 Run-F4 ***"O6-F3"*** ***"O6-F4"***
	The young man -O6 Toilet-O21 Compartment -O16	Runs through-R31 Go to –R21 ***"O6-R31"*** ***"O6-R21-O21"***	Run-F4 ***"O6-F4"***
	The young man -O6 Toilet-O21 The door of toilet - O22	Close-R8 ***"O6-R8-O22"*** Enter-R21 ***"O6-R21-O21"***	It is safe here, hide, nobody found me -F1 ***"O6-F1"***
	Conductor-O5 Toilet-O21 The door of toilet - O22		Knocking-F13 ***"O5-F13-O22"***
	Conductor-O5 The young man -O6	Ask for ticket-R17 Conversation-R24 ***"O6,O5-R24"*** ***"O5 -R17-O6"***	Explaining, innocent –F7 ***"O6- F7"***

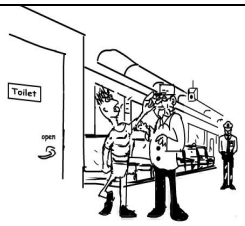
	Policeman-O23 The young man -O6 Conductor-O5	Show up- R16 ***"O23-R16"***	Shouting -F36 Speaking Fiercely-F10 Want to fight-F8 Angry –F9 ***"O5,O6-F36"*** ***"O5-F10"*** ***"O5-F8"*** ***"O5-F9"***
	Policeman-O23 The young man -O6 Conductor-O5	Happy-R9 ***"O5-R9"*** ***"O23-R9"***	Arrest -F17 ***"O23-F17-O6"***

Figure 26 Observed results of storyboard "no ticket"

From this table, we found that the objects, relations and features, which we designed in the storyboard, have been well recognized. We totally have 65 frames in eight storyboards, so it's a mass of information extraction work. To see more text stories and observed results, please see the appendix C.

6.4 WM in video recordings

We recorded scenes by stand up comedians based on our storyboard – scripts; again we analyze a set of frames for objects, relations and features. One of our video recordings "mobile phone" is selected as an example; we expect that most components in the storyworld can also be found in the real video recordings. These video recordings are recorded as realistic as possible, so each of them can be treated like a part of real world.

Sample of video recording "mobile phone"

Video recording:
File Name: [mobile phone]
File Size: [13.61MB]
Resolution: [352] x [288]
Duration: [00:02:25]
Totally Frames: [2178]
Default frame rate: [15frames/second]

Frames	Observed objects	Observed relations	Observed features
 Frame 150	O6- Individual Passenger O13-Other Individual Passengers O15-Newspaper O16- Train compartment O17-Rack O19-Corridor O20-Windows O32- Bench, chair, seat	R13- ***Sitting on*** R14- ***Sleeping*** R15- ***Reading*** R32-***Quiet compartment*** R37-***Sitting near, beside***	
 Frame 470	O6,O13,O15, O16,O17,O19, O20,O32. O33 - Cell phone	R13, R14, R15,R37 R28- ***Calling, Making a phone call*** R33- ***Ring of cell phone.*** R34-***Normal compartment***	
 Frame 540	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28,R34 R9- ***Showing a happy expression.***	
 Frame 740	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R39-***Lay one's hands on*** R24- ***talking, conversation, speaking, explaining***	F28- -***Voice is too loud.*** F36-***Shouting, yelling*** F29-***Annoying*** F19- ***Showing an unhappy, miserable, down expression.***

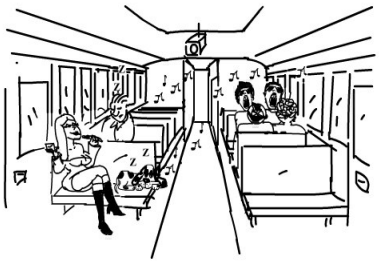
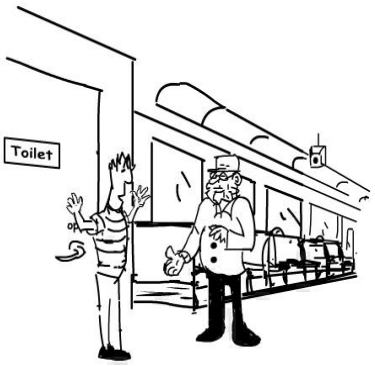
 Frame 900	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24	F28,F29,F36
 Frame 943	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24 F7-***Showing explanation gesture.***	F28,F29,F36
 Frame 1400	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24 Show a gesture of “turn down your voice”	F28,F29,F36
 Frame 1530	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24	F28,F29, F19,F36
 Frame 1694	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24	F28,F29, F19,F36

 Frame 1790	O6,O13,O15, O16,O17,O19, O20,O32. O33	R13, R14, R15,R37 R28, R24	F28,F29, F19,F36 F10- ***Speaking fiercely.*** F9- ***Showing angry expression.***

Figure 27 Observed results in video recoding of "mobile phone"

During watching these short movies, compared with context some typical scenes have been selected which can be found from storyboard. At the same time, they are also a characteristic scene in the movie. Those are the things we can understand with the shared knowledge from different internal WMs. ***Figure 28*** show more key frames which are the overlapping of WMs, they are highlighted part of shared world model. The features are referenced to the basic components code in ***Table 2.***

F3- ***keeping away from the conductor*** F5- ***Suddenly stands up*** from the seat.		
F22- ***Feet on the opposite bench*** R24- ***talking, speaking, explaining***		

F28- -***Voice is too loud.*** F29- ***Annoying***		
R13- ***Sitting on*** the seats. R14- ***Sleeping*** R15- ***Reading*** newspaper.		
F7- ***Showing explanation gesture***.		
F8- ***Making aggressive gesture, fighting.*** F12- ***Collaring***		

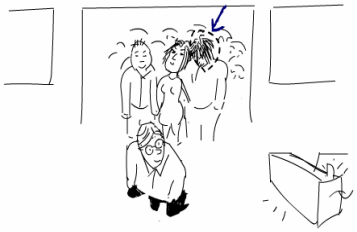
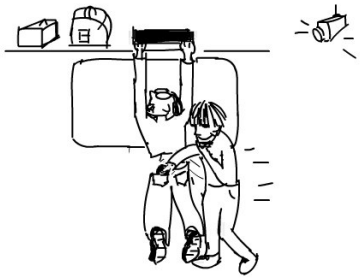
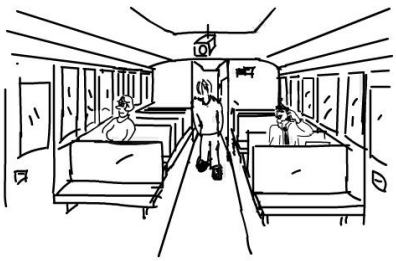
R6- ***Getting on the train*** F38- ***Crowded, Full of People.***		
F41- ***Stealing*** F38- ***Crowded, Full of People.***		
F19- ***Showing an unhappy, miserable, down expression.***		
R31- ***Moving in the compartment*** R2-***Walking***		

Figure 28 Characteristic scenes in both Storyboard and Video recordings

6.5 Conclusion

Our Storyboard-based World Model is consisting of objects, relations and features, where the feature are more or less connected with aggressions since one of the final application is automated aggression detection in the train, and our context is around the train compartment. In previous sections in this chapter, we first predefine the objects, relations and aggressive features in terms of storyboards' original ideal, and then we ask ten students to look at these storyboards to give related text, after that, we look at the video recordings to see whether these elements can also be found in the real world. We use information retrieval process to get communication between different internal world model, and those recognized part will be a part of shared world model. Of course, the storyboards- visual scripts play a most important role and interconnect all the processes. The storyboards are a predefined trace and context so that other process can follow it; they trigger those familiar scenarios from individual WM, at the same time, they provide a very good modality to gather and store the information of real world.

From the objects, relations collection and feature finding in storyboards, text stories, and video recordings, we find that people usually don't have difficulty to understand those common objects and relations, aggressive features are most attractive to human being since everyone have the instinct of avoid being threaten.

When we look at the observed results from different students in text story experiment, we find objects are more effective to show the components of an environment, they have noticed the most salient objects in the scene, such as moving actions, a simple mark, weapons, special expression, gesture, violence. From the analysis these sentences, we find that once these elements have been loaded into their individual WM, a context will form, they choose the suitable scripts to interpret what's going on in the storyworld, they begin to play a role as a storyteller, they won't mention every objects, only by mentioning the most necessary scripts and theme of pictures can be enough for a fluent storytelling.

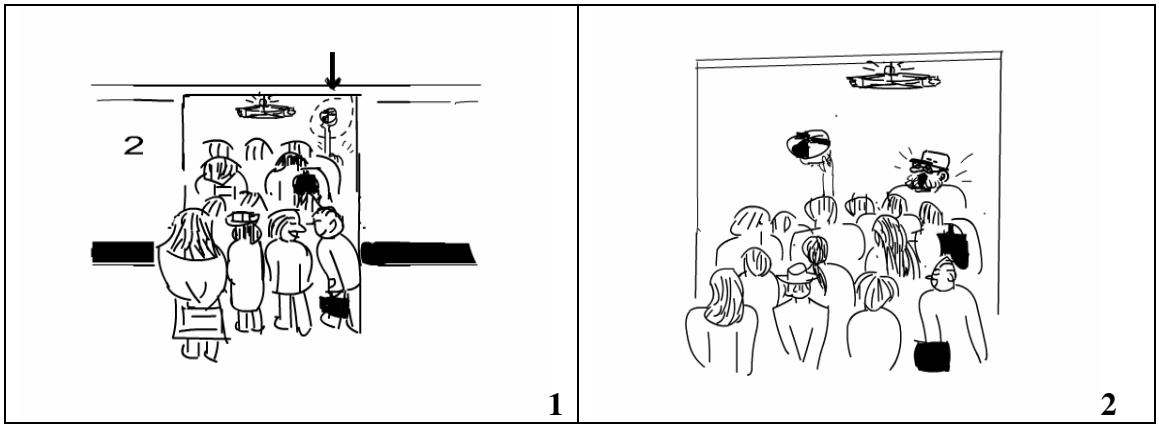
Figure 29 "Knocking"

On the other hand, from the observed results, we found the referenced code in our ***Table 2.*** There are clear traces shows that these text stories are following our predefined scripts. They always compare the context to give a reasonable interpretation. For instance ***(Figure 29),*** if we never saw the storyboards, we will only know that there is a man is knocking at the door of the toilet, but what happened in the past and what will happen in

the future? So the storyboards –visual scripts provide certain contexts which can connect those isolated pictures generate a successive movie in our mind. Another important feature is we can find a trace on the story structure, which follows the story model we described in chapter 3; those key steps on timeline indicate the story model and structure of S-R circle as we talked in Chapter 3 is going through the whole analysis from storyboard to the text stories.

However, the script in people's mind sometimes will be very different from each other; it's strongly related to the individual experience. We can easily recognize the objects which we are familiar with, at the this time, a couple of probable scripts are also selected to predict what will happen next, as time goes on, if the new objects and events in these storyboards, are out of our world model, we normally feel uncomfortable and start to search for causal relationship or adapt to a new script. People can have different looks on the same things, but we can always find something in common if we follow the reasonable scripts. That is also an explanation on why sometimes that even text didn't match the original thought of designer, but it won't lead to a bad understanding to the whole meaning of the storyboards as long as the key steps has been detected and followed.

Almost all the students said the storyboard of "get on and off" (Figure 30) is very hard to understand. It seems strange when people first look at it; you even won't think that it was at the gate of train compartment if you don't know the world is only around train compartment, 'should it in an elevator, or possibly on a bus?' these kinds of questions will be asked. Another reason students feel confused with it is because they can't find related script or experience to interpret the special objects in such a special situation, at the same time the sketch is too rough to see the salient feature of the object. The normal reaction of those students is first turn the pagers down to look through all the pictures when they have a holistic view and search a new script from their mind to fit it, the scripts are adapted to a new one when new feature has been found, then come to the beginning to speculate the possible meaning.



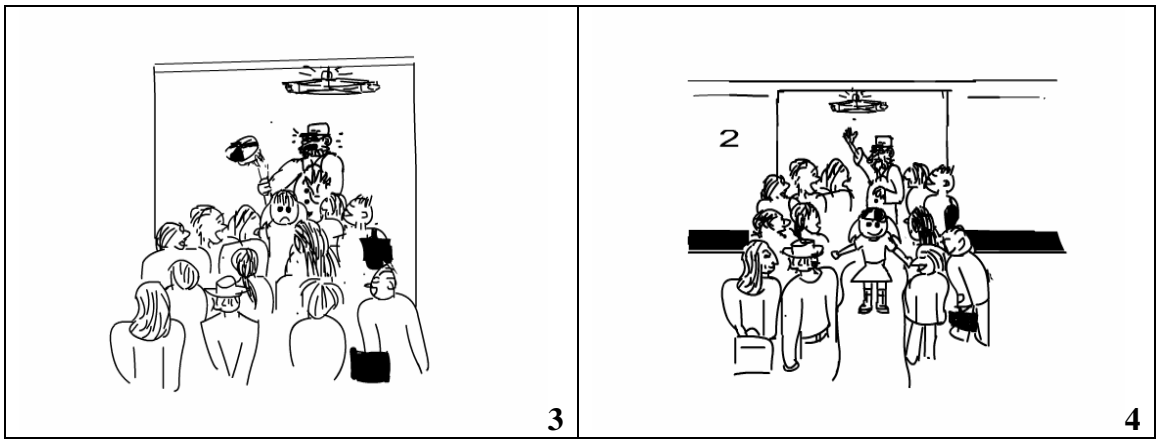


Figure 30 Storyboard of "get on and off"

If we look at the WM in video recording, the recordings come from a fixed camera; in this case, the backgrounds are almost constant, in another word, those video recordings only shows fixed scene, similar like what the observer look at the storyboard, once the roles and objects have been introduced, again observer seek a right script to interpret what's going on in the video, and possibly predict something will happen in the future, differently we don't need to regenerate a movie in our mind, just using our individual WM to interpret it, at the same time, we write down the objects, relations and features, it seems we don't have difficulty to recognize them, since real world is the root of individual WM. Finally, we find that all the observed objects and most of the relations and features in the video recording "mobile phone" can match the referenced objects in ***Table 2***; it shows that our storyboards have already covered a number of the basic elements in the certain context of train compartment; however, one typical gesture "turn down your voice" in the video recording hasn't been defined yet which has been found in ***Figure 27***, this indicate that the human behavior is so uncertain, storyboard-based world modeling still needs further enlarge the knowledge base to cover much broader part of real world. At the same time, we find that there is not a single word can interpret and define the complex behavior of human beings, the relations we described in the Table is still not enough, moreover, it is far from compact. We want to find a more universal solution to define the actions. In the chapter 7, we will compare with introduced theory to see more samples in video recordings. In the Chapter 8, we will write down a script of "taking train" and trigger scenes with certain objects, relations and features; we also try to use Shank's CQ theory to categorize the relations to see whether the relations can be described in a compact way, rule-based system and icon-based representation will be introduced.

7. Video recordings of aggressive behavior in trains

7.1 Short description of the video recordings

In the preceding chapters, we designed a couple of stereotyped situations which simulate a lot typical aggressions happened on the train. On May 10th 2006, all the project team members, a group of professional actors and the NS staff gather together at NedTrain, which is the maintenance center for Dutch railway. According to predefined scenarios, video recordings played by real actors have been taken, their professional acting skill make all the video recording very realistic, exactly like what is happening in our real life. Two fixed webcams have been used for making the video recordings; these movies are the data for testing and evaluating the final aggression detection system. Similar with the analysis of storyworld, these data has to be first analyzed to determine what factors constitute an aggressive situation, we need to extract the features from these movie clips, we expect the similarity of feature and S-R cycle will be found to annotate these real aggressive situation in the real compartment. One thing needs to claim that the storyboards we designed is not totally like a storyboard for the movie shooting since we only have fixed camera in the train compartment. Moreover, considering with the value of the final data, the movies are recorded according to certain scenarios, somewhat different with our storyboards; the recording comes much quickly to the event we concerned. In stead of preloading much information on introduction, problem definition, we come directly to those key scripts of aggressive behavior. The video recordings are more emphasized on small aggressive events and the interactions with each other, including body language, gestures, noise, dialogues, expression, physical fight, and so on. Those professional actors made these movie clips as realistic as possible, the relative themes include annoying passenger, passenger who doesn't have valid ticket, drunken passenger, beggar, pickpocket, exiting and entering train compartment, etc.

7.2 Key frame seeking

A movie can contain millions of frames, it is hard and relatively unnecessary to make analyzing on every of them for the feature extraction. From the view of information convey, that is too much and redundant, we don't need so many frames to convey information, because some of them will contain very similar information, but how can we seek key frames from video recordings for a relatively complete storytelling? We will use a video segment experiment to show what can be feasible key frames.

7.2.1 Fixed Rate

Table 4 Fixed Sampling

Video recording:
File Name: [No ticket boy]
File Size: [21MB]
Resolution: [352] x [288]
Duration: [00:03:44]
Totally Frames: [3374]
Default frame rate: [15frames/second]

Sampling	key frame sequence
every 7 frames	482
every 15 frames	224
every 30 frames	112
every 60 frames	56
every 120 frames	28
every 240 frames	14
every 480 frames	7
every 960 frames	3

To the movie of "No ticket boy", first we try to use a set of fixed rate of fps (frame per second) to search in the video recording to see what can be gotten. After looking at those selected frames, some interesting result has been found. If we choose the sampling rate of 1/7frames, 1/15frames and 1/30frames will show too much redundant information. If we look to 1/240frames, 1/480frames and 1/960frames each of them will more or less loss important information, choose 1/60frames and 1/120frames can get a better result. But however, every story will be different, this story is about a no ticket guy, it takes around 3 minutes (around 3/4 of total duration) to check this guy's ticket. And the recording comes from a fixed camera, so most frames are describing the interaction between conductor and this guy, if we don't have comparison between these frames, every frame looks the same. If we use these captured pictures for storytelling, imagine what will happen if we use hundreds of similar pictures to tell a story, what will a story can be, this story will lost balance and obviously not all of these pictures can be treated as key frame, and what will happen if we use the same sampling rate for a 2 hours' movie or for a 30 seconds long advertising movie.

7.2.2 Random sampling

In second step, we use a random sampling, then the story can be very strange, and they are hard to explain, the story can be understood only depending on a good luck. Actually, every story will follow a certain script; the script provides connectivity to everything in the movie; just like we have mentioned in last few chapters, the scripts in our mind will automatically generate a movie to fill in the gap between key scenes. When we perform a storytelling, the key scene will be highlighted by the scripts while the gap between these key frames needs not to be motioned, and the readers won't get troubles to understand them. At this moment, storyteller and readers are sharing their individual world model. Similarly, same perception processing take place when we are reading books, looking at storyboards, watching movie. If we follow the script we won't miss important events, and

we can get better understand the story. At the same time, following scripts also can be an effective and compact way to carry information.

7.2.3 Selection within borders.

In the following segment samples, the borders of scenes have been localized, we analyze the behavior in the scene. We try to assess what are the goals of those behavioral patterns. We can select a frame which is most representative for the scene. For instance, we want to introduce the environments we select that frame which contains all the main actors and representative feature from the environment. Problematic are those situation of strong interaction. To represent the cause and result of an action we have to fuse frames or represent it by more frames. The key frames we caught are extracted with the principle as long as the story can develop smoothly and no key situations omitted. A short annotation has been marked on each key frame to show the start and end point for the key situations. Most frames contains similar information between two key situations have been removed, few frames left to show the successive process between key frames. Similar with the still pictures in storyboard, these key frames in the video recordings are also can be connected for a storytelling because they are deriving from a certain scripts of shared world model. When we divide those situations, it means we use the script in our mind to understand the scripts in the movie, in other word, watching a movie is a process of sharing our world model.

7.3 Aggressive features in video recordings

7.3.1 Feature Analysis of video recording

“No ticket boy” ***(Figure 30)*** is telling a story about ticket checking on the train. Then we will take a look on what is a standard procedure of checking tickets ***(Figure 31).***We name the passenger at the left bottom corner as P1, Conductor is called as C.

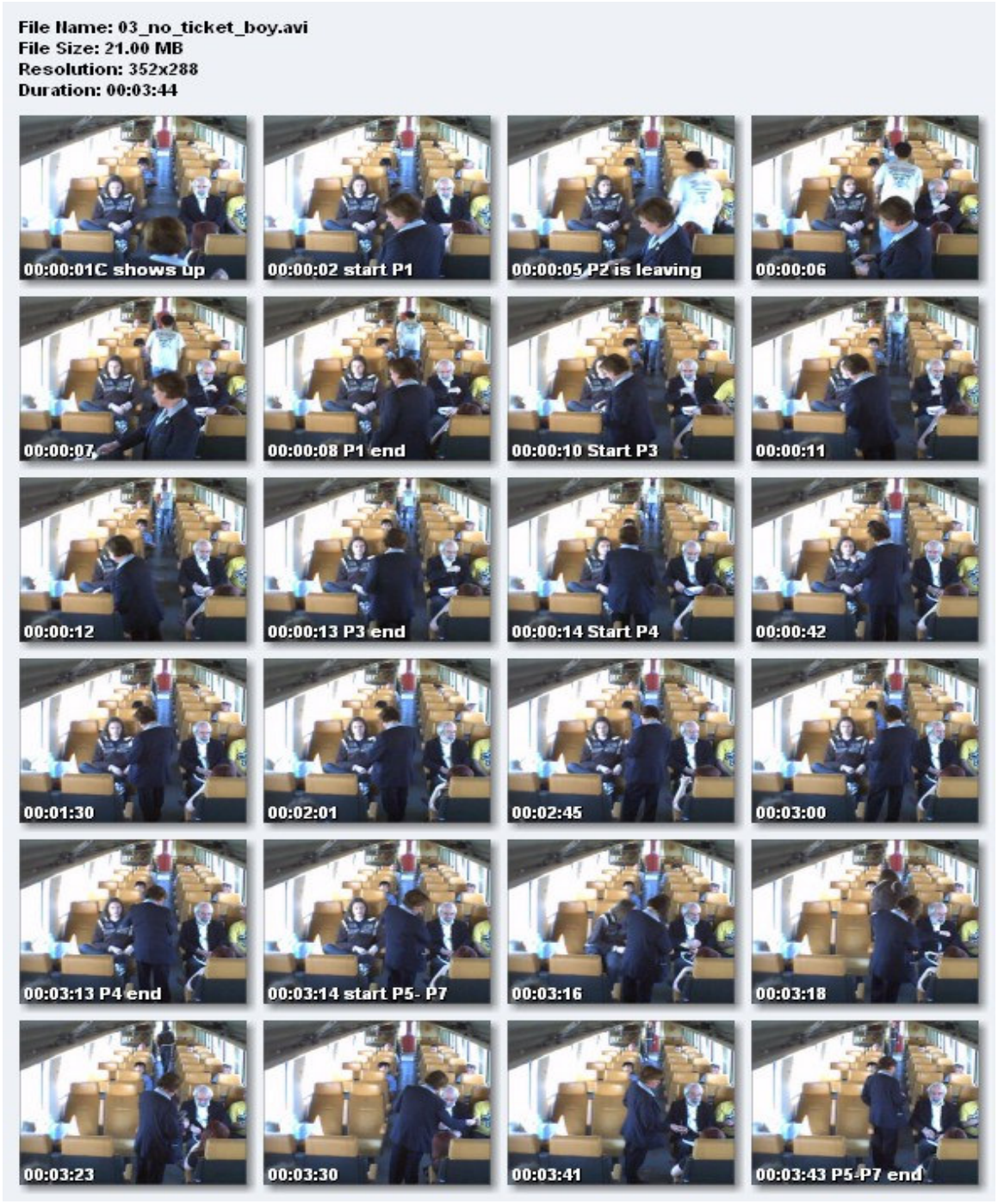


Figure 31 Extracted Screenshots of example "no ticket boy"

00:00:02 C begins checking with P1. She is asking for the tickets.

00:00:03 C is waiting for the tickets from P1

00:00:04 C is ready to catch the ticket.

00:00:05 P1 give the ticket to conductor.

00:00:06 The ticket is being punched by C.

00:00:07 C returns the punched ticket to P1

00:00:08 C finished checking with P1.

Figure 32 A standard "Ticket Checking" in video recordings

The totally time taking for this checking is 7 seconds (***Figure 32)***. At the same time, you may notice that during this first checking, a guy stands immediately and leaves away from the conductor.

Figure 33 A long time "ticket checking"

After that, conductor is moving a step forward to start another checking ***(Figure 33).*** The conductor comes to the second passenger (Passenger 2) and the conductor finish the checking in 4 seconds.

Figure 34"ticket checking" P5-P7

The conductor uses much longer time on checking the passenger 4, it's from 00:00:15 to 00:03:13, it's about 3 minutes. And the last three passengers together cost around 30seconds, this is a time distribution of this movie. These time points indicate this movie also can be divided into several parts.

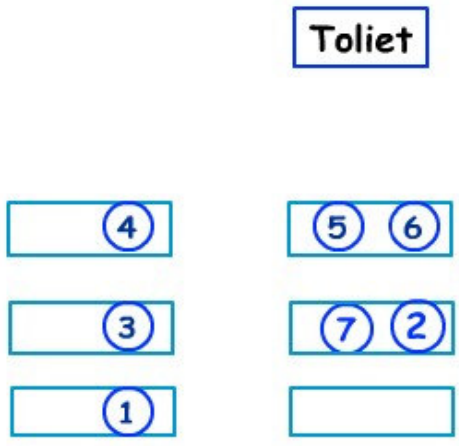
The table below shows the order of events flow in the movie, a lot of features which you can find in the frames, have been added, similar with the previous analysis, we have the objects of human agents and props, different with the storyboards, and we don't have much more introduction to know the story background except a simple initial situation to quickly show the place and time, it comes directly to the "ticket checking",

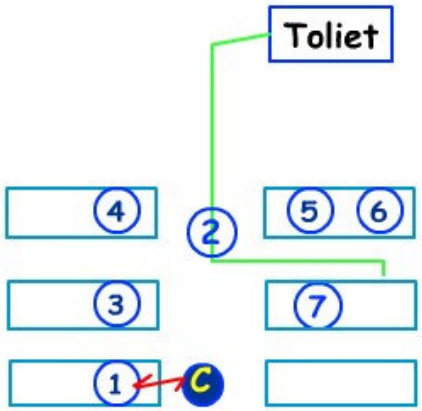
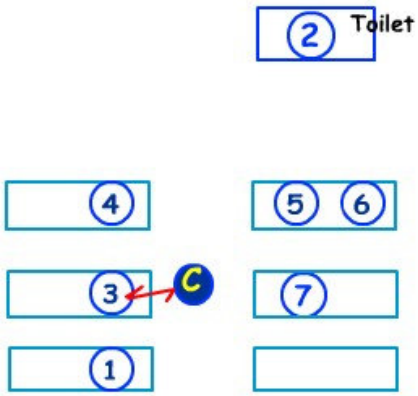
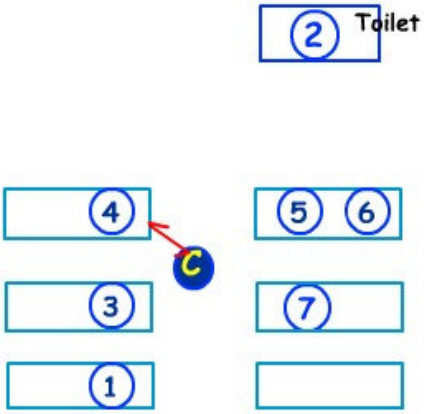
Table 5 Events flow in video recording

Human agents	Props	initial situation
conductor passengers (Passenger 1-7)	tickets ticket punch toilet chair	Passengers are sitting in the train compartment
Key steps on timeline	Feature and behaviors	
Starting checking tickets	Conductor shows up and asks for the tickets.	

Checking tickets (Checking tickets) with Passenger 1 (Checking tickets) with Passenger 3 (Checking tickets) with Passenger 4 (Checking tickets) with Passenger 5 (Checking tickets) with Passenger 6 (Checking tickets) with Passenger 7	Interaction between conductor and passenger Using ticket punch to make valid tickets approved. Passengers 1,3,5,6 are preparing the tickets for checking. Passenger 2 stands up immediately and walks towards to the toilet. Passenger 4 shakes his head and gives excuse. Conductor writes a fine. Passenger 2 opens the toilet door and has a glimpse. Passenger 4 didn't give conductor money, and then he leaves the compartment.

As we mentioned before aggressive behavior won't be always obvious to be observed, the context needs to be concerned on finding the correct situation. The interactions between those human agents and vivid behaviors are most important feature of movie clip. Except finding the obvious aggressive features, we also take a look with time and position analysis. It will be a good supplement to determine the aggressive situation. The characteristic recordings have been picked to extract typical features of aggressive behaviors in the train compartment. If we look at the relationship of conductor's position with other passengers positions, time taking, that's another meaningful aspect. There are totally one conductor and seven passengers in this short movie, the position relationship can be described as below, objects are: compartment, chairs (blue rectangle), passengers (labeled as number), and conductor (marked as C).The red arrow shows the interaction relation.

Key features in no ticket boy	Descriptions
Frame 1 	The picture is saying the initial status, these six passengers sitting on the chairs.

Frame 2 	The conductor starts checking tickets with Passenger 1 in 6 seconds while passenger 2 is immediately leaving towards to the toilet.
Frame 3 	Conductor takes 3-4 seconds to check passenger 3's ticket, while Passenger 2 is in the toilet.
Frame 4 	Conductor takes 3 minutes on checking Passenger 4 passenger tickets.

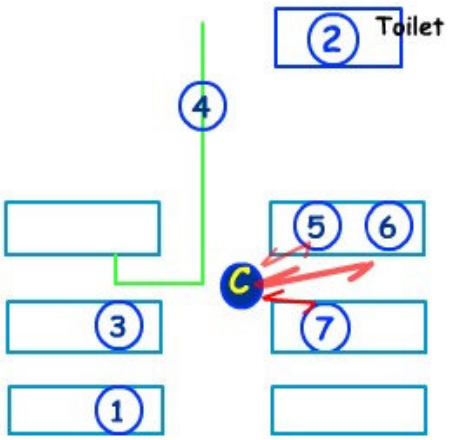
Frame 5 	Passenger 4 is leaving; conductor takes 30seconds to check tickets with passengers 5 - 7.

Figure 35 Time taking and position relationship

The aggressive aspects are indicated on how conductor's position affects other passengers. In the frame 2, passenger 2 is leaving immediately when conductor appears for checking tickets. A normal checking, averagely, conductor only uses 4-15 seconds when conductor is taking too much time on checking a specific passenger, this passenger shows great suspect on sticking interaction, possibly a troublemaker. Moreover, if you look at the leaving of Passenger 2 and Passenger 4, related with context, they won't have a same reason. Another aspect we look at is the structure of the video recording, here is an example to show the structure of these short movies-"the drunken passenger". We found that the structure is very close to our storyboard model.

7.3.2 Structure

Step 1

At the beginning, an initial situation will be introduced, a guy with a big toy comes into the compartment, and he puts the toy on the seat other side, while the conductor is checking the tickets. So far the key roles have been introduced.

Figure 36 Structure in video recording "Step 1"

Step 2

After that, he becomes to make some thing awful, he puts his feet on the toy, and the toy is right there on the other seat opposite. (So right now, he is an aggressor, his feet is on the bench which break the house rule of the train compartment. Problem definition finished)

Figure 37 Structure in video recording "Step 2"

Step 3(Stimulus-Response reaction part begins from 00:01:10)

Having finished checking tickets with this guy, the conductor gives warning to this guy because it's not allowed on the train.

Figure 38 Structure in video recording "Step 3-1"

Then the conductor is moving forward to check other passenger's tickets. Few seconds later, conductor is back and she sees that the guy didn't listen to her, his feet is still there on the bench.

Figure 39 Structure in video recording "Step 3-2"

This time the guy is out of control, (00:01:55-00:01:58) he throws toy to the pathway and talks in a bad manner.

Step 4 Climax
After that, he picks up the toy and leaves the compartment, notice that in 00:02:13, there is a bottle of beer in his hand.

Figure 40 Structure in video recording "Step 4"

Step 5 Final results
Then the situation comes again to the initial one.

Figure 41 Structure in video recording "Step 5"

7.4 Conclusion

We have followed the scripts to segment the video recordings of "no ticket boy" and "the drunken passenger" into several units. It shows that a reasonable segmentation of video recordings can be a very important fact to extract a shared world model. When we look at those scenes in video recordings, first we don't consider semantic processing of the video but only sensory triggers to the environment. Actually we can immediately know the environment and you won't feel a thing because we might have already travel by train for many times, these kind of scripts have already been equipped in our mind. We can easily understand what they are in the video recording, seats; pathway, windows, human agents and those props belong to them and the possible relations. All of these have formed a specific situation which is very close to our daily experience. Our internal world model helps us a lot on facing and understanding these familiar scenes, but this process won't take too long. Then we found moving objects or objects which have specific features or in a special behavior patterns will attract more attention from us, a second top down process of analyzing the scenes starts to found those most aggressive scenes. Aggressive behaviors can be split into several aspects; obvious aggressive factors can be easily recognized like fighting, offensive gestures, and motional expression, pose, and gestures. Especially when the props of weapons appeared, the train compartment will suddenly being covered by a violent atmosphere. Except these salient things, time taking of

interaction between conductor and passengers, affect of human agents' position, these previous situations and what happened in the history are also important on determining an aggressive situation since we can't just judge a situation by a single frame. We have to compare with related context to define the situation we meet.

8. Shared world model for aggression detection system

In this chapter, certain scripts of "taking train" will be given both in common description and Schank's Conceptual Dependency (CD) theory. We will use the aggression measurement to determine the aggressive degree of world of "train", all the features will be ranked in terms of the possibility they can trigger an aggressive situation. A more realistic design application of rule-based aggression detection system will be introduced.

8.1 Script of "Taking train"

A train will have a number of compartments that is the environment we are watching at. In each compartment we have a unit of cameras, cameras are working together to look after one compartment. The camera units of every compartment will be connected together and the whole train is under protecting by the surveillance system. All the observed objects, behaviors will be a part of our shared world model, that is, the system can use this shared world model to understand the scenes from these cameras.

The most basic key steps in the scripts of "Taking train" are getting on the train, and getting off the train. So we need our involved role in this script at least within these two basic steps, otherwise they are out of our world. Any passenger will follow the scripts of a basic trip between getting on and out of the train. We predefine a couple of basic scenes sequence of 1 "getting on the train" 2 "sitting on a moving train" 3 "getting off the train". And these three steps are the key steps of the scripts with the causal and temporal relationship. In the second step, we can't define everything in detail since human's behaviors will be so uncertain. In fact, we have left out considerable detail and possible options in each of the scenes. We have already contained a chain through the script that included all the principal actions. Everyone who has been in a train compartment often will be aware of many more details and can use them if the occasion arises. We will use an example to show how scenes can be triggered later in this chapter.

The components of a script include:

Entry Conditions
-- These factors must be satisfied before events in the script can occur.

Results
-- Conditions that will be true after events in script occur.

Props
-- Slots representing objects involved in events.

Roles

-- Persons involved in the events.

Track

-- Variations on the script. Different tracks may share components of the same script.

Scenes

-- The sequence of events that occur.

To every script, we only provide very limited value which mostly comes from our shared world model; for sure they can be further extended.

Table 6. Scripts: Taking train Track: From platform A to platform B

<table>
<tr><td colspan="2">Props</td><td>Roles</td></tr>
<tr><td>Elementary</td><td>Valid Ticket , Identity card</td><td rowspan="15">C- Conductor
P- Passenger
Ps-Small group of passengers
Po-Policeman
Cs- Catering Service

Entry conditions
Position of C

Status of P:
Entering Position
Moving status
Expressions
Belongings
Behaviors

Results
Aggression happened.
Aggression not happened.
C is happy or unhappy.
P is happy or unhappy.
P gets to the destination.
Ps are happy or unhappy.
Po is called.
P gets to the destination.
Ps get to the destination.</td></tr>
<tr><td rowspan="8">General</td><td>Newspaper</td></tr>
<tr><td>Wallets</td></tr>
<tr><td>Cell phone</td></tr>
<tr><td>Suitcase</td></tr>
<tr><td>Bag</td></tr>
<tr><td>Food and drinks</td></tr>
<tr><td>baby carrier</td></tr>
<tr><td>Umbrella</td></tr>
<tr><td rowspan="4">Unwanted</td><td>Strange attribute(Tattoo)</td></tr>
<tr><td>Alcohol related (Beer Can)</td></tr>
<tr><td>Weapons (Gun Knife)</td></tr>
<tr><td>Huge belongings(Unfold bike, Ladder)</td></tr>
<tr><td>Cigarette</td></tr>
<tr><td>Conductor & Police</td><td>Uniform
Ticket Punch
Weapons</td></tr>
<tr><td>Compartment –TC</td><td>Seat Door
Table Gate
Rack Corridor
Window Toilet</td></tr>
<tr><td colspan="3">Scene 1 “getting on the train”

P waits till the last leaving P has got off.</td></tr>
</table>

P enters the train compartment. P finds a sitting position. P moves to that sitting position.
Scene 2 "sitting on a moving train" P sits down at the sitting position. P starts doing individual activities. (Boolean ■ ◆ ●) ■ (P interacts with other P or Ps) (P doesn't interact with other P or Ps) ◆ (P interacts with C) (P doesn't interact with C) ● (P interacts with Po) (P doesn't interact with Po) P stands up from the sitting position. P moves to the gate of train compartment.
Scene 3"getting off the train" P waits for the next station. P leaves the train compartment.

8.2 Determining an aggressive situation

At the first level, our system could find and track the observed objects. Further; these objects can be mainly divided into several aggressive levels in terms of whether the objects and behavior is an overt behavior of aggression or how effectively that they can make the world of train compartment to reach aggressive situation. Some of non-aggressive behaviors could change to aggressive behaviors, and some of aggressive behaviors can get even more aggressive. That is why violence often derives from low level aggression. So we will look at the behavior of every passenger as long as they step into the world. Two situations need to be determined. At first we want to see whether an object itself contain special aggressive element. Secondly is in which situations the objects need to be noticed and tracked. So violence measurement needs to be considered. Here are the aggressive levels of the train compartment, once passengers reach any level of aggressive situation, a relative reaction will be chosen. One thing should be ensured that once the system can understand those aggressive element, the lowest action is tracing them and make sure the aggression can be get controlled in time. A couple of aggressive levels of the objects and the initial reactions are decided as below. These predefined levels could be further connected to a score board in a rule-based expert system.

*Level 1: If the object or behavior contains a low level of aggression factor, then an object needs to be traced. This is the lower prediction.
*Level 2: The objects in level 1 are further used for aggressive behavior or the aggressive behavior in level 1 is further stimulated as well as the behavior related to house rules breaking; Conductor needs to be noticed.

*Level 3: If the objects contain obviously aggressive objects which can be directly used for aggression or the behavior is overt aggression behavior, both conductor and police need to be informed.
*Level 4: at the highest level the fierce aggression scene and overt aggressive behavior have been detected, and then the alarm will be launched at once.

Table 7 Reaction levels

Level 1 =Need to be traced
Level 2 = Need to be traced, Conductor needs to be noticed
Level 3 = Need to be traced ,Conductor and Police need to informed
Level 4 = Need to be traced, Conductor and Police need to informed, Launch the alarm.

As we mentioned in Chapter 3.3, there are five aspects to be related to violence measurement:

The graphics of the scenes, generally colors, shadows, and grayness has an impact and at least creates an atmosphere on the aggression assessment of a scene. For example, colors and the emotions often associated with each other. Red is commonly associated with anger, love and danger; Blue is a calming color and a feeling of peaceful; Yellow is a happy color; Orange is positive and enthusiastic; Combined with yellow or orange, black is an aggressive color. Dark color will show more aggressive emotion, and bright color will show more passive feeling. Fat lines with sharp angles are indicators of violence opposed to soft and smooth drawings. So if a compartment is full of the color of dark, the compartment will be marked as Level 1 and need to be got noticed.

Table 8 Objects reaction levels

Unwanted objects	Strange attribute(Tattoo)	Level 1
	Alcohol related (Beer Can)	Level 1
	Weapons (Gun Knife)	Level 3
	Huge belongings(Unfold bike, Ladder)	Level 2
	Cigarette	Level 1

To the objects, as we listed in the script of “Taking train”, a couple of objects of passengers are unwanted to see around the train compartment, they more or less have a certain degree to aggression. Among these objects, strange attribute and alcohol related objects will have a slight effect on the aggressions. Because it depends on how bad the behavior will be act by the passenger, weapons will indicate more dangerous situation and are strongly associated with violence, such as guns, knives and sticks, bomb. So both Conductor and Police need to informed, at same the time, they will be concerned with a top-priority, once any aggressive behavior related, the alarm will be immediately launched. For instance, (Level 4) if a passenger is an obvious aggressor with a gun in hand and pointing to another passenger, then the alarm will be launched. Huge belongings such like unfold bike and long ladder, big cabinet are not allowed according to the Dutch railway system, once they are being detected, conductor will be informed. Smoking is also not permitted on board trains, initially cigarette is marked with level 1,

Smoking is Level 2, when once passenger starts smoking, then the burning cigarette will also increase to Level 2, at same the time, conductor will be noticed.

Behaviors are also indicators of violence, such as kicking, smashing, hitting, and other obvious aggressive body language (Level 2) when people is fighting or quarreling (Level 3), to determine an aggressive situation, these non verbal behaviors also play a very important role, and some predefined gesture and hand pose are also helpful on aggressive situation determining. For instance, the behaviors are not allowed in the train compartment like feet on the bench (Level 2), throwing the rubbish everywhere (Level 2), smoking (level 2). Even some typical attribute of the normal behavior can be treated like a special factor, such as a person's moving trace, and positions in compartment, for instance, a passenger is transferring from different compartment (Level 1), a passenger is falling down on the aisle (Level 1), a passenger have been into the toilet for a while (Level 1), even if the passenger's moving status, if a passenger is in hurry and running (Level 1), then he is possibly hit someone, so running will also possible show a slight degree of aggression.

Verbal behavior, key word of verbal expression can be used to express violence or not. Also the value of noise and voice, also indicate the aggression situation of the environment (Level 1).

Table 9 Expression reaction levels

Expressions	Increasing
Surprise	Very Surprise (Level 1)
Fear (Level 1)	Very Fear (Level 2)
Disgust (Level 1)	Very Disgust (Level 2)
Anger (Level 1)	Very Anger (Level 2)
Happy	Very Happy (Level 1)
Sad	Very Sad (Level 1)

Of course, the determination would not be only made by a single point; some indicators will be very useful. The facial expression is one of very helpful item to determine the situation. There are six basic expressions of human being, most passengers won't show any facial expression during the trip, so the facial expression can be regard as good indicator for judging the situation. Fear disgust and anger has a closer relation with aggressive behaviors, so initially, each of them is Level 1, for the rest of them only when the degree increased will achieve a further level. Such as if a passenger expression is angry (Level 1), and then the passenger will be a possible trouble maker, if very angry (Level 2), then much more aggressive mood. However, sometime even if the expression is happy, it also could lead to too much noise from passenger (Level 1-Level 2), so if the expression is happy we concern it as a positive value. If it is very happy (Level 1) then a slight aggressive atmosphere also needs to be concerned. We didn't give the expressions of surprise, happy and sad a level doesn't mean they are not useful, in many case, they are very good indicators, some situations can't be determined at the first place, we also need to relate them with the expression results, such as body languages are often used between friends. Sometimes it looks somewhat like aggression behaviors, they might be

having happy facial expressions, so facial expressions are helpful to detect whether these behaviors is for joke making. Simultaneously, it will reduce the error rate of situation determining.

As the final system will be a real-time automated detection system, but we will always need to determine the situation with related context. Except these salient things, some relationships are also need to be concerned, the previous situations and what happened in the history or happened in the same time will be very important indicators on determining aggressive situations since we can't just judge a situation always by a single frame. As we mentioned in Chapter 7, time taking of interaction between conductor and passengers, affect of human agents' position as well as the expression we motioned in previous paragraph, here is another example to show the important of the position relationship. They are also can be extracted as a script of abnormal moving while we consider this situation can be detected and tracked(Level 1).

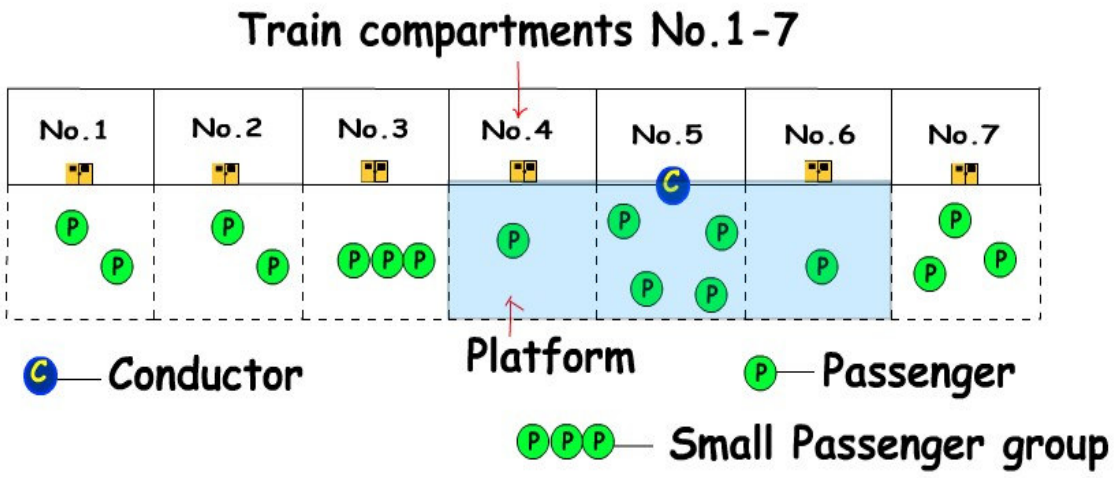


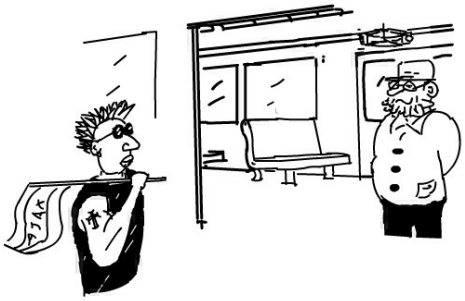
Figure 42 Train compartment and related waiting area.

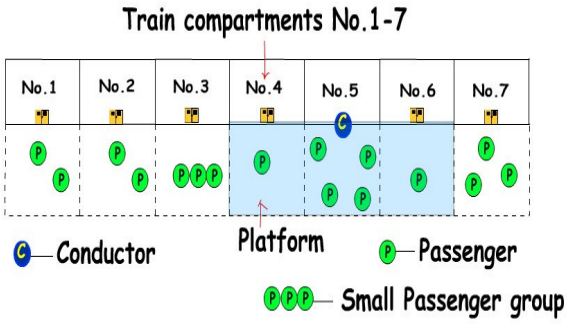
For each passenger there is a Waiting Area No. X (X), If Passenger gets on the train from Waiting Area No.X(X-1, X, X+1), then the entering position is normal. Otherwise Passenger will be marked and tracked as a suspect (Level 1). At this moment, conductor is standing in front of the No.5 compartment, every passenger can choose any door to get on the train, but we define if any waiting passenger in the blue area didn't enter the any door from No.4 to No.6; they will be marked as a suspected ticket evader. (Level 1) Because they don't choose the closer door to get in, at the same time, they are possibly afraid of being checked by the conductor. Both in the storyboard of "no ticket" and video recording of "no ticket boy", we have already mentioned this situation, the conductor and policeman will have very special impact on ticket evader, or hooligan's moving status, this is very typical script no matter it is in game or in movie; the relationship between these two opposite groups is always described, the features appeared in this section are not only a simple score to each features. The relationship can be described as "if then" rules while the different level of aggression can be possibly related to rule-based expert system, in the chapter 8.5,we will give a further description on these aspects on a real-time automated detection system.

8.3 Triggering a scene of actions

In this chapter, we use the story of "hooligan" to show how an aggression can be triggered with the scripts with the relative determine situations. Once you get into the world of train, you will be watched underneath of the automated detection system. The system will know how many people in the train currently; also all the objects and behaviors will be take after with this surveillance system. To each passenger, there are three situation checkers, one is the scenes checker, second is aggression checker, and the other is the time checker. The scenes checker will follow you to see which step are you current in. The aggression checker will check your aggression degree when you are in any step of the scripts of taking train, time checking will check whether the time taking is abnormal, however, the time taking can only be used for "ticket checking", average time taking will about 5 ~ 30 seconds, otherwise the ticket checking can be treated as a questionable event. (Level 1) So far we don't have enough data to summary the time taking for other standard event.

Position of C	Status of P
Initial position. Compartment (X)	Entering Position: Waiting Area (X) Moving status: Running Walking Expressions: Indicators (Status, Level) Belongings: General (Name) Unwanted (Name, Level (X)) Behaviors: Normal Reach aggression lever (X)





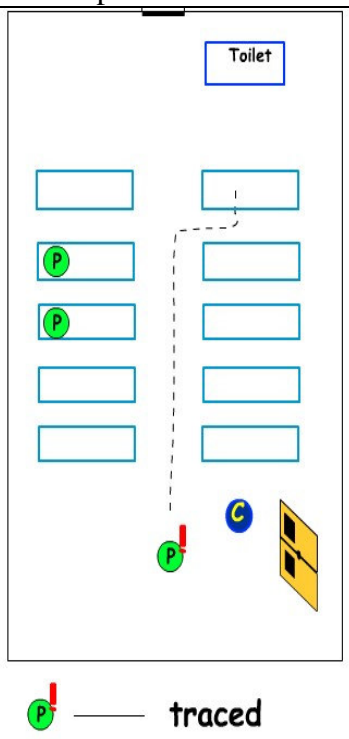
C Position is No.5

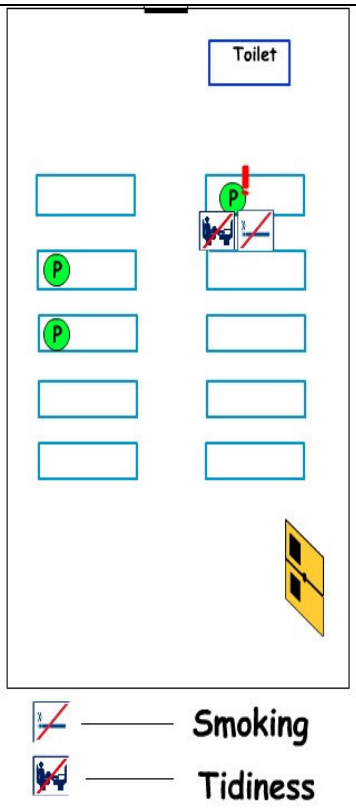
P=P1
Entering Position: No.5 Expressions: N/A
Behaviors: Normal Moving status: Walking
Belongings: Unwanted (Flag, Level (1)) (Tattoo, Level (1))

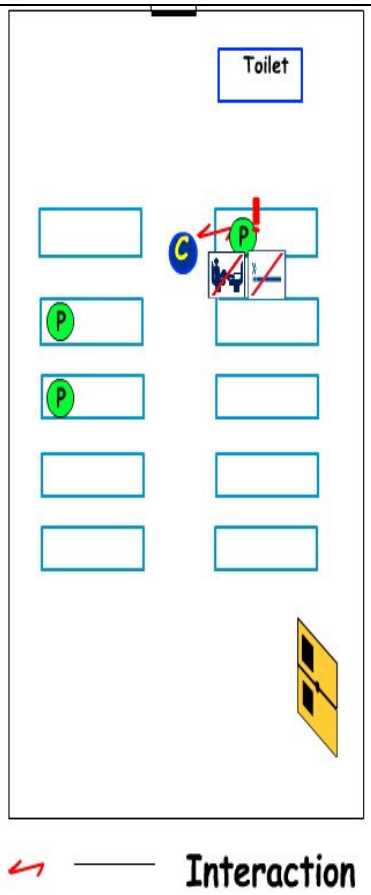
Figure 43 Entry condition

In the entry condition, P1 has already been marked and will be traced on the train because he has some strange attribute. Then we get to the first step of the script.

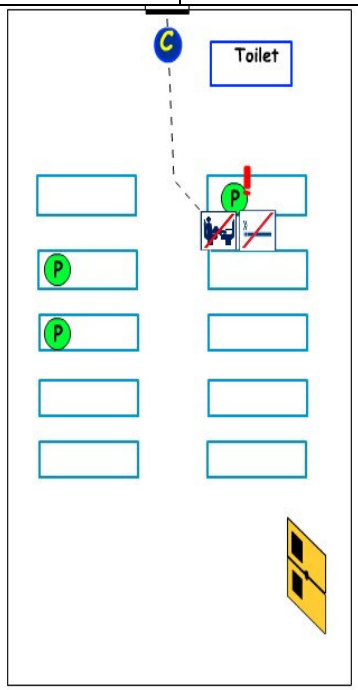
We start with the first step of "getting on the train". Now, the train has arrived at the station, the passengers are preparing for getting on the train. A train has several compartments; compare with the size of compartment, a relative area has been capsulated as the initial waiting area of passengers, the figure has shown the initial positions of conductor and passengers.

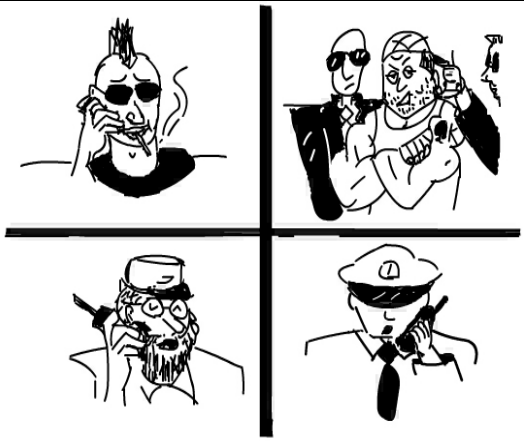
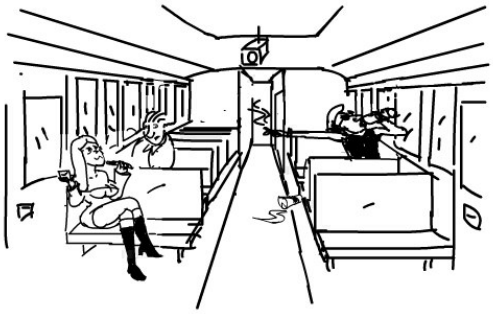
Scene 1 "getting on the train"	Plot for position status	P1 "getting on the train" with unwanted objects ☹
P waits till the last leaving P has got off. (Otherwise, Level 1) (house rule) P enters the train compartment. P finds a sitting position. P moves to that sitting position.		P1 waits till the last leaving P has got off. ☺ ↓ P1 enters the train compartment. ☺ ↓ P1 finds a sitting position. ☺ ↓ P1 moves to that sitting position. ☺ Expression –N/A belongings –unwanted

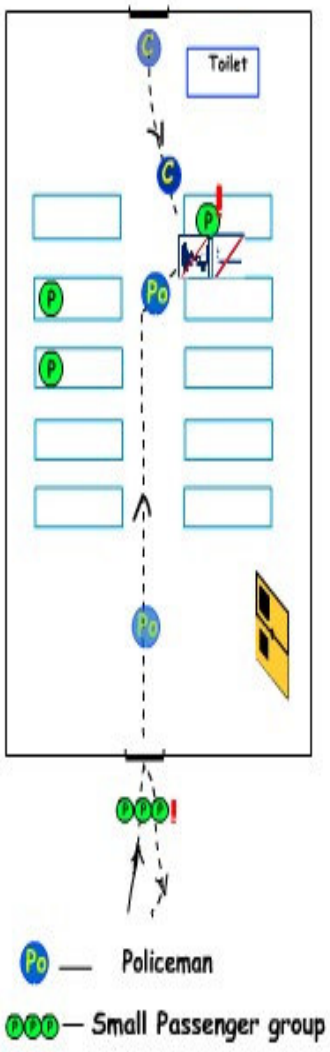
Scene 2 "sitting on a moving train" P sits down at the sitting position. P starts doing individual activities.		P1"sitting on a moving train" ☹ P1 sits down at the sitting position. ☺ Sitting position ensured e.g seat (179) Compartment (5) ↓ P1 starts doing individual activities. ☹ ↓ Expression –N/A feet on the bench (Level 2) Smoking (Level 2) Beer Can (Level 1) Beer Cans on the floor (Level 2) ↓ P1 (seat (179) Compartment (5)) have broken a couple of house rules (Level 2) ----Conductor informed
Related Visual scripts from storyboard and video recordings		
 To be continued	 To be continued	

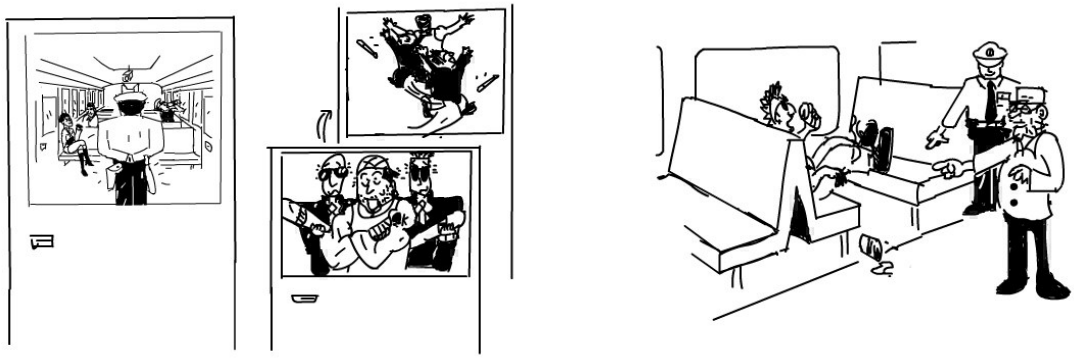
P interacts with C (Ticket checking) (Normal Conversation) (Normal Body language) ↓ (Conversation Level 1) (Body language Level 1) ↓ (Conversation Level 2) (Body language Level 2) ↓ (Fighting Level 3) (Quarreling Level3) ↓ (Violence Level 4)		P1 interacts with C ☹ C comes to P1 ↓ Ticket checking ☺ ↓ C persuades P1 with Normal Conversation and Normal Body language ↓ P1 doesn't want to obey with Conversation and Body language Level 1. P1 expression is angry. ↓
Related Visual scripts from storyboard and video recordings		
		

<table>
<tr>
<td> 
To be continue.</td>
<td> 
After this, interaction between C and P will end, passenger choose to leave.</td>
</tr>
<tr>
<td>P interacts with C

P starts doing individual activities.</td>
<td> 
</td>
<td>P1 interacts with C ☹

Conversation and Body language (Level 2)
P1 expression is very angry.
↓
quarreling (Level 3)
P1 expression is very angry.
↓
P1 (seat (179) Compartment (5)) is quarreling with C (Level 3)
----Police is informed
↓
P1 is calling.
C is calling.
↓
C is leaving</td>
</tr>
<tr>
<td colspan="3">Related Visual scripts from storyboard</td>
</tr>
<tr>
<td colspan="3"> 
 
To be continued</td>
</tr>
</table>

P starts doing individual activities. (Po 's position affects Ps) P interacts with Po		P1 starts doing individual activities. ☹ ↓ Expression –N/A feet on the bench (Level 2) Smoking (Level 2) Beer Can (Level 1) Beer Cans on the floor (Level 2) (Po is moving to compartment No. 5) {Ps is moving to compartment No. 5 ↓ Ps is moving back. (Level 1)} (C is moving to compartment No. 5) P1 interacts with Po ☹ Po comes to P1 ↓ Identity card checking ☺ ↓ Po asks P1 to stop with Normal Conversation and Normal Body language ↓ P1 doesn't want to obey with Conversation and Body language Level 1. P1 expression is angry. ↓ Po and C force P1 leave the train.

<table>
<tr><td colspan="3">Related Visual scripts from storyboard</td></tr>
<tr><td colspan="3"> 
To be continued</td></tr>
<tr><td>Scene 3“getting off the train”

P stands up from the sitting position.

P moves to the gate of train compartment.

P waits for the next station.

P leaves the train compartment.</td><td>  </td><td>P1 “getting off the train” ☹

P1 stands up from the sitting position.
↓
P1 moves to the gate of train compartment.
↓
P1 waits for the next station.
↓
P1 leaves the train compartment.</td></tr>
</table>

Figure 44 Triggering Scenes with “taking train”

By now we got a clear look on how script works with those causal relationships between existing events. From this sample, we can see that actions can result in state changes while states can enable actions, a scene can be triggered by a set of actions, at the same time, and a certain situation can also contain a lot of predefined actions. The actions in this sample are most written in verbs, in the next section, we will rewrite our script by Schank’s Conceptual Dependency (CD) theory.

8.4 Triggering "taking train" by primitive actions

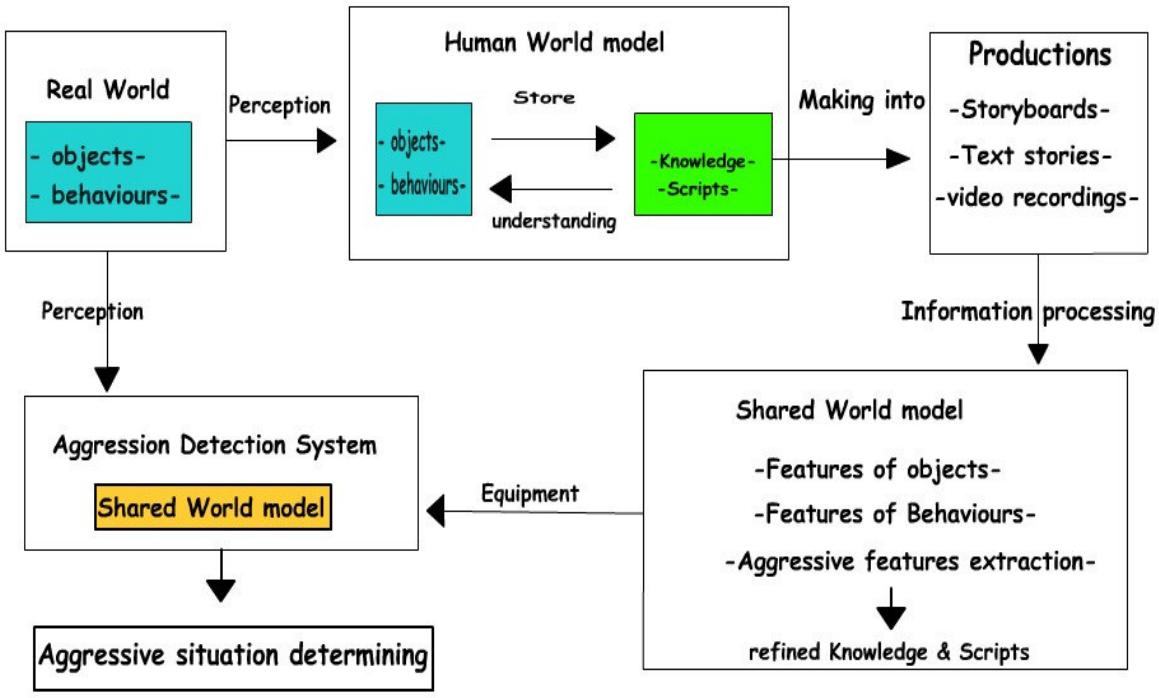


Fig 45 Architecture of an automated surveillance system

In the previous chapters, we had tried to find the relationship between pictures, related text as well as the video recordings, all the things we were doing is to find the detective feature and to extract refined knowledge and scripts for extracting a shared world model of train compartment. ***(Figure 45)*** By using this shared world model, the camera can work within a predefined the environment and has the same experience as people do. The final surveillance systems can use these refined knowledge and scripts to understand what it is seeing and able to make right decision.

In this section, we are going to rewrite the script of "taking train" with Conceptual Dependency theory (CD) which script is based on. Here we don't go into it in much detail, but it will be great if we can use primitive actions conception in CD (developed by R.Schank) to represent the scripts, those primitive actions are not the simple category for verbs, especially if sentences that have the same meaning are going to be represented in only one way. They can be treated as the elements of actions just like the elements in chemistry. As we mentioned before that the final automated detection system will equipped with rule-based inference engine, so the use of such primitives will severely reduces the inference problem, since the inference rules need only be written once for any actions rather than many times for each verb that references that action, in this case the inference comes from the actions rather than those input verbs. A simple introduction of CD has been listed in the Appendix B.

Table 10 Scripts: Taking train Track: From platform A to platform B

Props		Roles
Elementary	T-Valid Ticket , Identity card	C- Conductor P- Passenger Ps-Small group of passengers Po-Policeman Cs-Catering Service
General	Newspaper	
	Wallets	
	Cell phone	
	Suitcase	
	Bag	
	Food and drinks	
	baby carrier	
	Umbrella	
Unwanted	Strange attribute(Tattoo)	
	alcohol related (Beer Can)	
	Weapons (Gun Knife)	
	Huge belongings(Unfold bike, Ladder)	
	Cigarette	
Conductor & Police	Uniform Ticket Punch Weapons	
TC-Compartment	Seat Door Table Gate Rack Corridor Window Toilet	

Entry conditions
Position of C Status of P: Entering Position Moving status Expressions Belongings Behaviors

Results
Aggression happened. Aggression not happened. C is happy or unhappy. P is happy or unhappy. P gets to the destination. Ps are happy or unhappy. Po is called. P gets to the destination. Ps get to the destination.

Scene 1 "getting on the train"

(Train arrives at platform A)
P ***PTRANS*** P ***to*** platform A.
P ***ATTEND*** eyes ***to*** train
P ***DO*** (abnormal moving script) P ***MBUILD*** where ***to*** enter
P ***DO*** (Huge belongings script) P ***PTRANS*** P ***to*** gate
P ***DO*** (Getting on and off script) P ***PTRANS*** P into TC
P ***ATTEND*** eyes ***to*** seats.
P ***MBUILD*** where to sit.
P ***PTRANS*** P ***to*** seat.
P ***MOVE*** P ***to*** sitting position.

Scene 2 “sitting on a moving train”

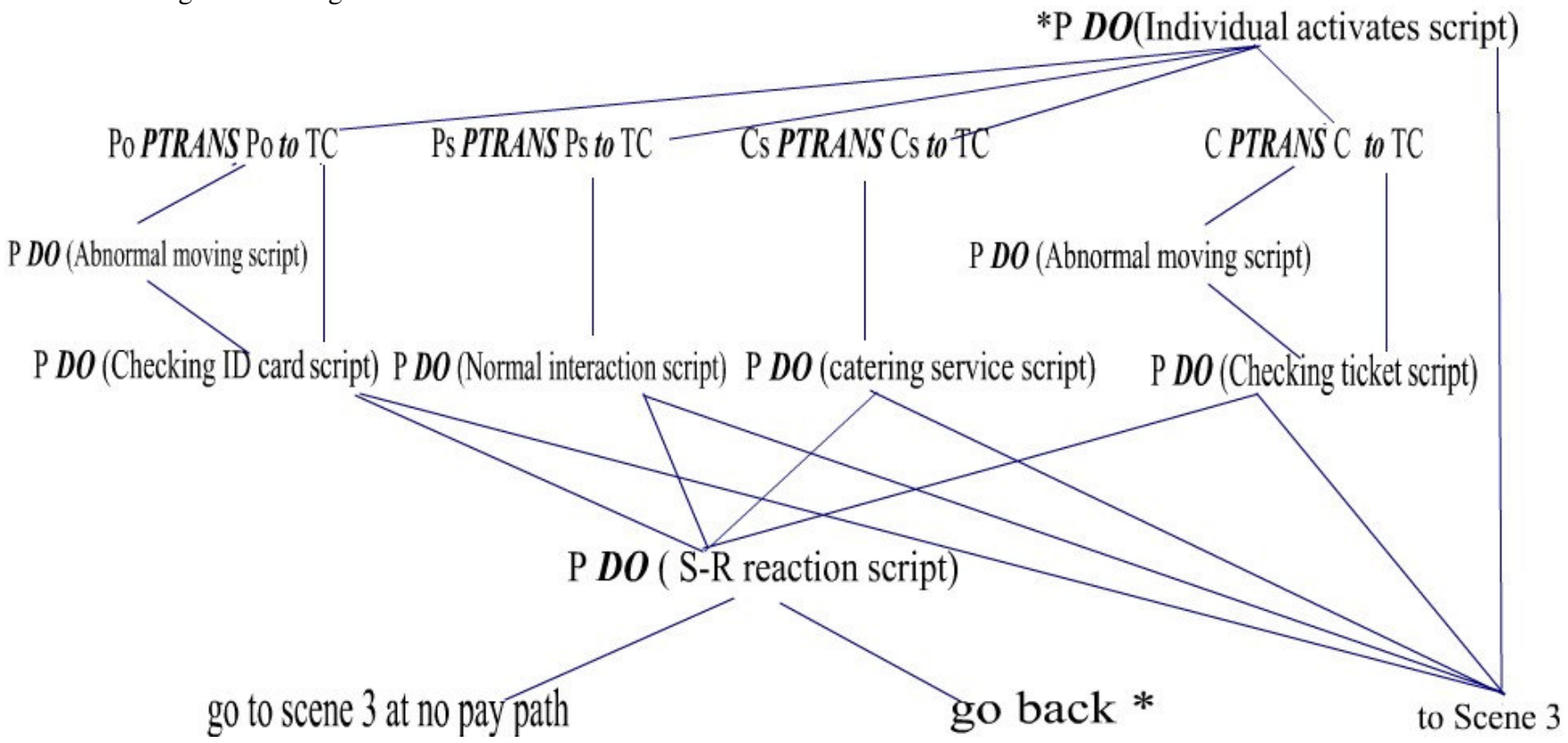


Figure 46 Scene 2 “ “sitting on a moving train”

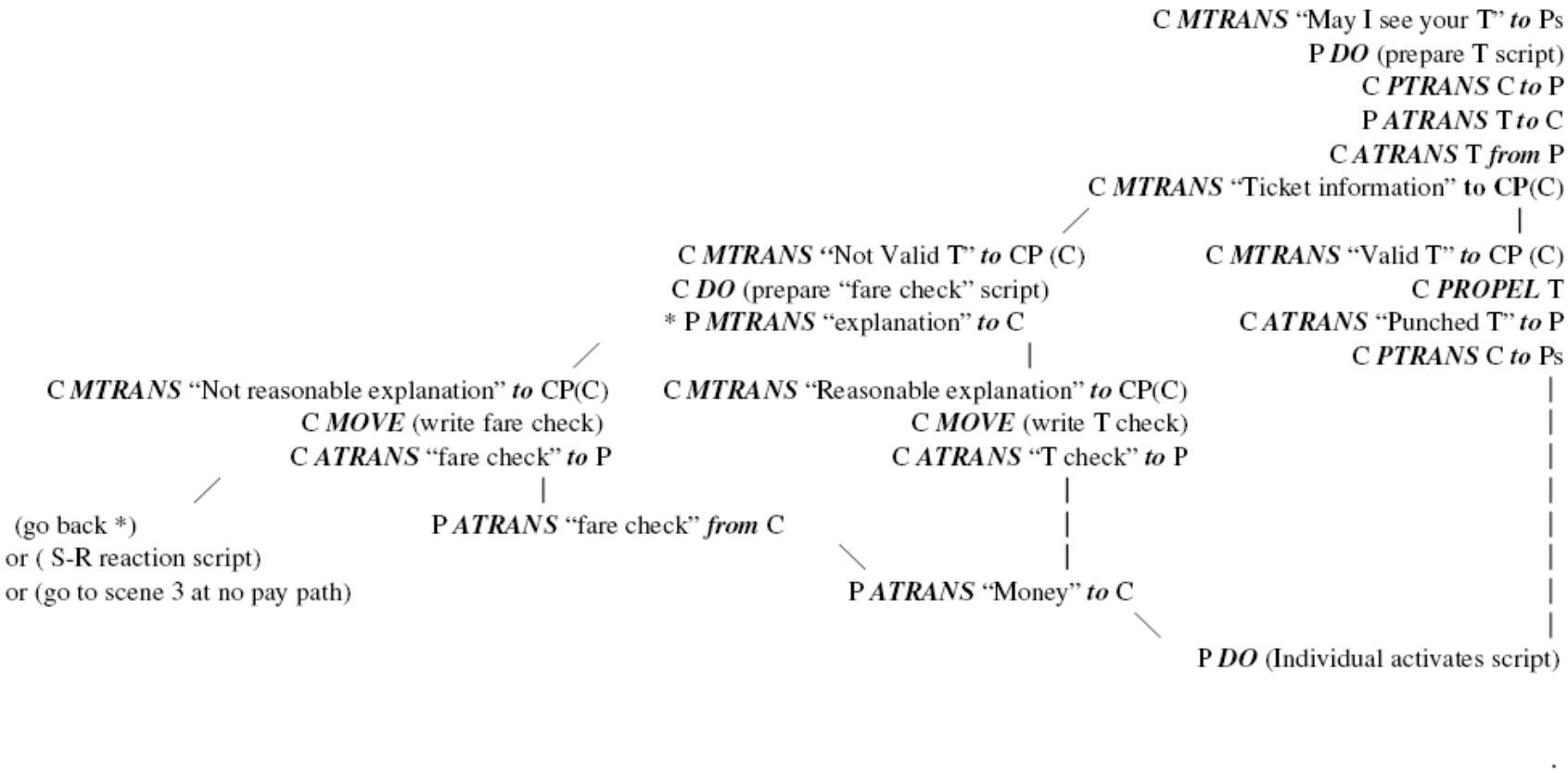


Figure 47 "Script of checking ticket"

Scene 3“getting off the train”
(Train stops at platform B)
P ***PTRANS*** P ***to*** gate.
P ***ATTEND*** eyes ***to*** platform B.
P ***PTRANS*** P ***to*** out of train compartment. (no pay path)

As we have seen that using the primitive actions to describe the script of “taking train”, this script is from the point of view of the passenger, the primitive actions are the core of each event in the chain of events being affected. The second scene “sitting on the train” is given with more optional detail, which also includes the most important scripts in our shared aggressive world model, the options on the right provides a direct coherent path through the scene , more possible scripts are listed on the left.

In scene 1 “getting on the train”, related special scripts to possible aggressions have been listed.

P ***DO*** (abnormal moving script) is the position relationship scripts we mentioned in previous chapters, that is, the position of conductor and policeman will possibly have a great impact on their opposite counterparties such as “ticket evader” “pickpocket”.

P ***DO*** (Huge belongings script) is the script with one of Dutch railway house rules that if passenger take huge belongings which can obstruct other passengers, an aggressive scene will also probably be triggered.

P ***DO*** (Getting on and off script) is the script is the script with one of Dutch railway house rules that if passenger doesn’t follow the correct boarding and leaving order, an aggressive scene will be triggered.

In scene 2 “getting on the train”, since this scene is very important so that this part of script is opened. Related special scripts to possible aggressions have been listed and “checking ticket script “has been made. (Figure 20)

P ***DO*** (individual activities script) can have a lot of possible actions, reading newspaper, have a sleep, singing, thieving, vandalism, or just sitting there, for instance, a simple actions of “reading newspaper” can be described as below,

(Newspaper on table)
P ***PTRANS*** newspaper ***to*** P
P ***ATTEND*** eyes ***to*** newspaper
P ***MTRANS*** news ***to*** LTM (P)
P ***ATRANS*** newspaper ***to*** table

After that, conductor might be show up and ask for tickets, this script have the highest possibility to happen (see figure 21), but other interactive situations will have similar relationships. One thing needs to be emphasized is aggression is a behavior against another that intentionally inflicts harm, the interaction between human-beings will be the

basic factor for triggering aggressive scene, anger arising or out of control will even push aggression developing into violence. So in each interaction script has an S-R reaction scripts to follow every possible aggression trace. The loop is setup to expect any interaction and events can finally go to normal status then further go to scene 3, shortcut to the no pay path is also built in case the aggression increasing greatly to a climate, related the reactions can be camera alarming or police has been called, in this case, the passenger needs to be driven out of our shared world model.

A script is a structure that prescribes a set of circumstances which could be expected to follow on from one another. It is similar to a thought sequence or a chain of situations which could be anticipated. A script is not only those certain key frames in predefined slots, but also the causal relations between these slots, in the next section, we will use "if –then" rules to describe those casual relations in a rule based system.

8.5 Aggression detection by rule based system

8.5.1 Introduction

The goal of the project "Multimodal aggression detection in trains" is to design a smart system for aggression detection in trains based on smart devices such as cameras with microphones. The input of such a system is sensor-suites which are able to sense the environment. We have to define a world model with objects and relations which are supposed to play a role in a context of aggression detection. After detection of relevant features from the environment and after a process of post-processing we have to interpret those features and come up with a diagnoses/conclusion what is going on in the world. The interpretation of features should be context sensitive. Our context is aggression is aggression detection in trains. And to model our context we define different scenes involving possible aggression in trains. These scenes are modeled and described by scenarios.

A common way to reason about sensed features from the environment is by using rule based systems. We consider rule based systems as a first step. Later on we will use a probabilistic approach (Bayesian Reasoning). There is a probabilistic approach in rule based systems by adding a certainty factor to every rule. But the main disadvantage of rule based systems is the lack of a model how to use successive rules. Next we realize that aggression detection is a process in time. There is an increase and decrease of aggression over time. Dynamic Bayesian networks is probably the most appropriate approach. But because of its simplicity and availability of data we use a rule based system as a first approach.

Our reasoning process is composed of a bottom-up and top down process. In the bottom-up process we sense features from the environment and they are supposed to trigger special scenarios. In the top down process we assume that some scenario is going on and look for verification. Both processes can be modeled in rule based systems by forward reasoning and backward reasoning models.

8.5.2 Rule based systems

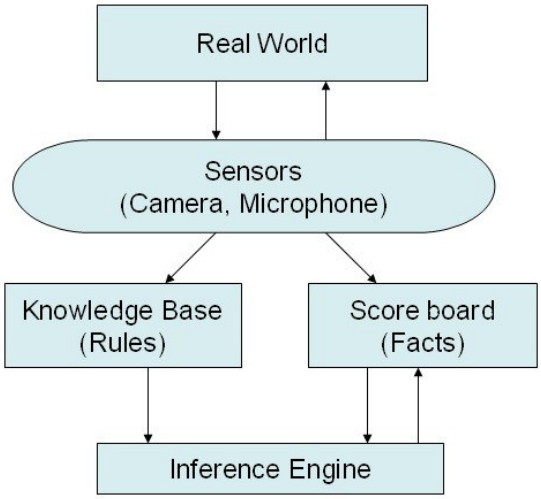


Figure 48 Components of aggression detection system

Model
In chapter 8.4, we introduced already our model, which can be summarized as follows ***(see Fig 48)*** we consider the following modules:

1. Feature detection
Our system is based on multimodal sensors such as cameras and microphones. We consider the following basic features local movement, moving objects, fast movement …

2. Script detection
We assume that our system has modeled some scripts, i.e. we have some scripts and their salient features. The activation level of a script is the weighted sum of detected features. The scripts with most detected features, or with the highest activation level is assumed to be going on. Our environment is supposed to be dynamic. So the activation level of scripts can change over time. So other scripts may be popping up as going on in the world

3. Script verification
In step 2 possible scripts popping up. The script with the highest activation level has a list of possible features. We can verify if most of the features are detected.

4. Scripts tracking in time
A script is a sequence of possible events in time. Not every event will appear and a script can be split up in different streams. Once a given script is detected we are able to predict and verify future events. If necessary we can switch from script as the most vigilant scripts at hand.

5. Alarming behavior

The goal of our system is aggression detection and once aggression is detected as a valid and trustful way the system is supposed to send and alert.

Comparing the storyboard, text stories and video recordings some features have been extracted which are basic features for our realistic feature detection. The final system, visual and audio fusion system, descriptive visual information is given a story by scripts, hearing about a specific situation will also mind impression of certain scripts. So the rules we are writing will also include an audio facts can trigger an aggressive situation. Related rules are given as below.

8.5.3 Basic features

- *local movement*

In quiet situation travelers are supposed to sit on their seats talking, reading, sleeping etc. In case of excitement we observe increasing movements as turning, moving faces, changing seat positions. We can consider this process as a Brownian movement of vibrating particles.
Rule: if Brownian movement passes some threshold then local crowd movement

- *moving objects*

Travelers can threw objects a train and travelers can move in a train. In both cases we can track moving objects
Rule if face tracker pass some threshold then moving person
Rule if object tracker pass some threshold then moving object

- *fast movement*

If fast movement is detected in trains then this is usual an indicator that unusual events are happen to be, such as running persons, fighting persons, agitated gesticulations.
Rule if fast movement tracker pass some threshold then irritation.

- *object recognition*

Some objects are true indicators of aggression such as knives, guns, baseball bats etc.
In the same way if faces are detected from persons on the black list. Well known T-shirts and colors of hooligans are alarming indicators.
Rule if the face of person A has been recognized or …. then alarming aggression

- *facial expression recognition*

If facial expression of fear, anger, and irritation are detected then this is an indicator of alarming aggression.
Rule if facial expression recognizer detects anger, fear … then alarming aggression

- *hard sounds*

If the music sound of a sound blaster or person start screaming or shouting then the onset of aggression van be detected.
Rule if sound energy passed some threshold the alarming situation

- *special words*

Some words as cursing are typical used in aggressive situations
Rule if asshole… Is detected then alarming irritation

8.5.4 Experimental validation

We recorded some video sequences with supposed aggressive behavior. We analyzed several clips if the supposed features are present and can be detected. We also mention the supposed script.

CLIP 4
This video is about a person who tries to enter a train on the moment other passengers are busy to leave the train.
Features:
-raising the speaking level of the voice
-fast movements
-cursing (i.e. Jezus,)

Clip 5
The same as CLIP4 but now outside the train.
Features
-raising voices
-dirty words (eikel (jerk), klootzak(asshole)
-fast movements
-big gestures

CLIP6, 7
Continuation of clips 4, 5. The door is closing and the man is unable to enter
Feature
-smash of the man on the door of train
-raising voice
-cursing

CLIPS 8
A woman with her child and children car plans to enter the train. Some youngsters hanging around at the opening of the door try to prevent that and are not willing to help.
Features
-body language of no interest
-facial expressions of helplessness, crying, dominance
-aggressive speech (ga eerst Nederlands leren (try to learn some Dutch), ken je dat zelf niet (are ’t you able to do this yourself))

CLIPS 9
Same situation as in CLIPS 8, but woman is outside the train, the youngsters too.
Features

-youngsters hanging around the entrance of the train
-raising voices
-aggressive sentences (wat mot je nou (what do you want)?)
-fast movements

CLIPS 10
A group of hooligans, probably drunken, plan to enter a train, disturbing other passengers
Features
-raising voices
-singing
-grouping
-fast movements
-big gestures
-throwing objects

CLIPS13
A man entering the train, disturbing passengers and sexual intimidation
Features
-cursing (Godsamme (damned))
-other people involved, gazing, comment
-raising voices
-typical expressions (wat nou(so what))
-fast movements
-big gestures

8.5.5 Advanced rule-based model

In the last section, we described rules, which generate some actions. The question is how do these rules work together or interact with each other? Our proposed system of aggression is supposed to be contect-senstive. So the generated action by a rule can be context dependent. In ***Figure 49*** we propose a possible architecture; ***Figure 50*** shows the reasoning scheme

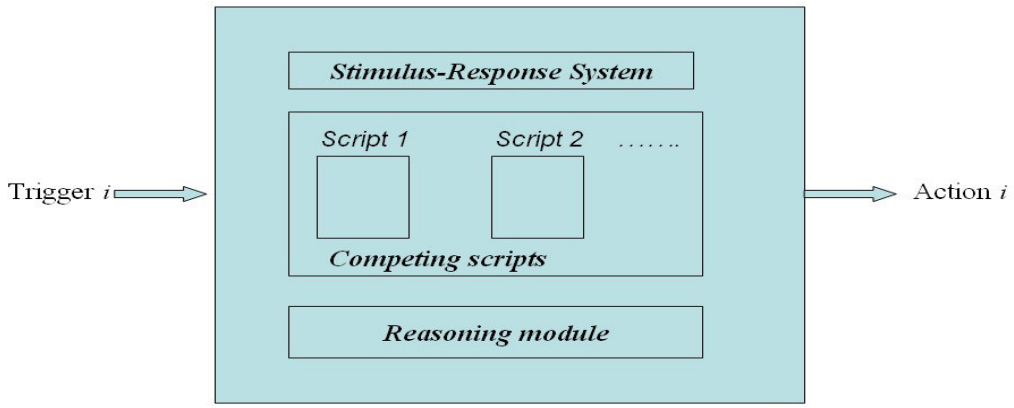


Figure 49 Architecture of rule-based aggression detection system

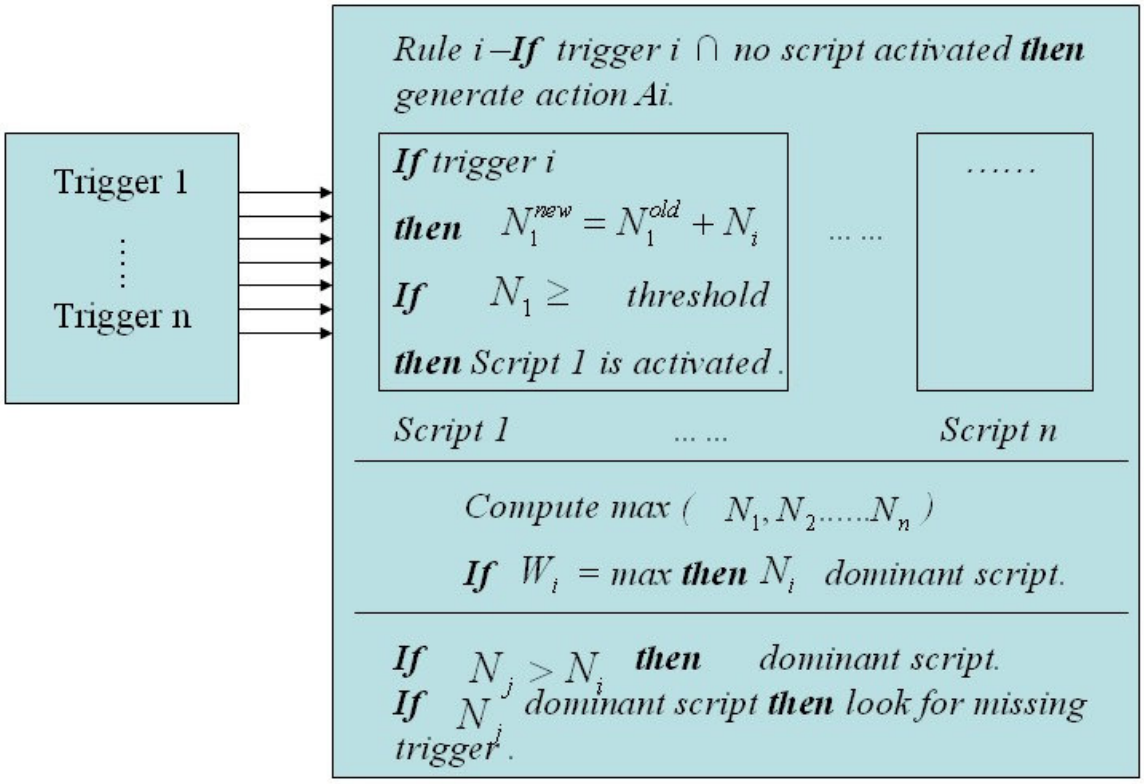


Figure 50 Reasoning scheme of rule-based system

8.6 Section WM description by icons

8.6.1 Introduction

The goal of the aggression project in trains is to develop a context sensitive system for aggression detection in trains. To enable the use of context knowledge we have to develop a world model. That is to say we have to describe all the objects with their characterizing features which play a role in the world of aggression detection in trains. Next we have to define all the relations between those objects. World model are usually described using XML or similar languages. But to use XML a background in Computer science is necessary. In our system also naive users are supposed to provide knowledge about ongoing actions in the world and we can not assume that they are able to use XML. For that reason we developed a special language based on Icons [reference S. Fitrianie, L. Rothkrantz]. Every object is represented by an icon and also features and relations between objects are described by icons. There is a direct relation between the graphical representation of the icons and the real objects and relations. So everybody is assumed to handle this icon language without much additional training.

We provide an observer with a handheld and an installed WM observation system by icons. An observer enters his observation into the system by pushing the appropriate

buttons. The buttons are supposed to trigger the right scripts. We defined 8 basic scripts on aggression detection in trains. At start when there not enough observations by icons available the observation s are ambiguous. This means the selected icons belong to more than one script. If we provide enough, highly selective icons then one script pops up as the most probable script triggered by the selected set of icons. After submitting additional icons it can happen that observers are reporting about different scripts. And after submission of enough, selective icons another scripts will pop up. It is even possible that competing scripts are popping up and the observer is requested to enter discriminative icons which are shown by the system. In ***Figure 51***, we give an example of such an interface on a handheld, using a Zaurus.

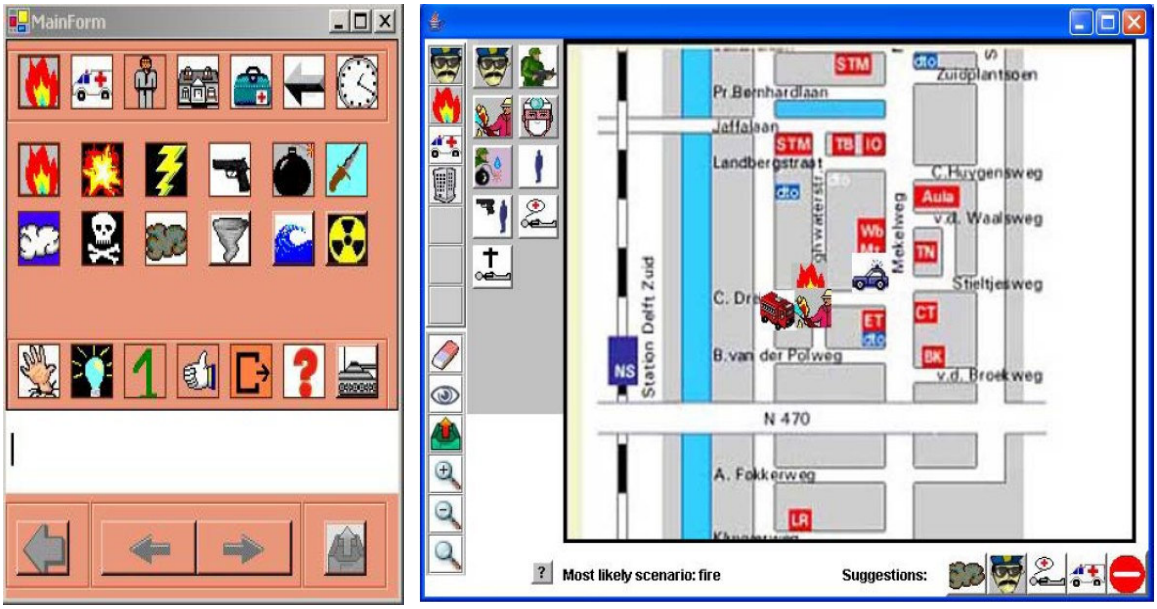


Figure 51 Icon based managing emergencies system

8.6.2 WM-icons

We design our own icons but used also icons freely available via World Wide Web. We consider the following categories

- *Features observed by sensors*

Soundwaves, explosions, shouting speaking,

Contours of faces, bodies backgrounds (no sharp contours of objects), color blood.

- Objects

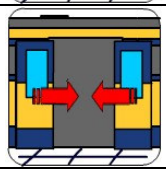
Hooligan, conductor ,face, facial expressions (emoticons), hands, feet, legs, police, travelers (male female), trains (doors, windows, chairs, corridors, light) beer cans, flags, tickets, SoundBlaster, mobiles, newspapers, books, laptop, suitcases, lockage, victims……

- Relations

Movements such as running persons, throwing objects, smashing, hitting, kicking……

For icon making, we further divide the conception of object into "Infrastructure" ***(Figure 52)***, "Human agents and roles" ***(Figure 53)***, "Props" ***(Figure 54)***, relations and features are combined together and regrouped as "Hand gestures and Behaviors" ***(Figure 55)***, "Facial expressions" ***(Figure 56)*** and "Events and situations" ***(Figure 57).*** The most basic icons have been listed as below:

Infrastructure

Icon name	Icon	Description
Train		All kinds of trains.
Logo		"NS" logo.
Class 1		Class 1 compartment
Class 2		Class 2 compartment
Opening		The gate of compartment is open or opening.
Closing		The gate of compartment is close or closing.

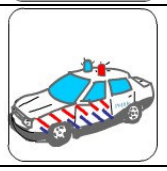
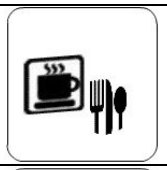
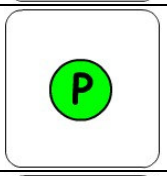
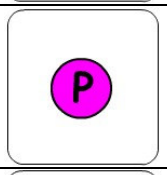
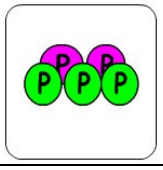
Compartment		Compartment consists of seats, windows, pathway, rack, floor, and table.
Toilet		Toilet in the train compartment.
Platform		Platform contains information board and clock.
Police car		Police car.

Figure 52 Icons of railway infrastructure

Human agents and roles

Catering service		A waiter and a carrier with foods and drinks.
Conductor		Train conductor.
Passenger(M)		Male passenger.
Passenger (F)		Female passenger.
Policeman		Dutch railway policeman.

Beggar		Beggar asks for money or food from the passengers.
Drunkard		Drunkards are often annoying passengers.
Pickpocket		They will steal passengers' belongings such as wallet and money.
Robber		They will rob passenger of personal belongings.
Soccer fans		They normally like to stay in small groups and make noise.
Hooligan		Single trouble maker.
Elder		Elders are vulnerable roles. Their movements will possible slower than normal passengers.
Child		Children are naughty, they perhaps make strange actions.
Mom and infant		They are vulnerable roles. Infant makes special voice.
Small group		Passengers stay together within a small group.

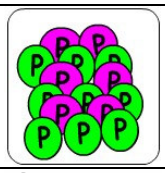
A lot of passengers		It also shows the status of crowded.
Noisy maker		These kinds of passengers always make other passengers get annoyed.

Figure 53 Icons of human agents and roles

Props

Huge belongings		Big luggage like long ladder and big cabinet are unacceptable to the train compartment.
SoundBlaster		Some passengers will take their handy speaker to listen music.
Laptop		A popular belonging of passengers.
Baby carrier		Baby carrier often appears together with adult passenger.
Unfold bike		This kind of bike normally has a big size which might obstruct other passengers.
Fold bike		This kind of bike needs to be put to the special parking place.
Suitcase		Suitcase is a representative of other acceptable luggage.

Book		Some passengers read books while traveling.
Newspaper		Reading newspaper is a popular behavior of passenger.
Dog		One sort of popular pet which can be seen on the train.
Wallet		Pickpocket and robbers' goal.
Money		Euro, cash, credit card……
Ticket		Train tickets.
Alcohol related props		Beer cans, wine bottles.
Burning cigarette		Smoking is not allowed on the Dutch train.
Gun		Dangerous weapon which is the props of robbers and policeman.
Knife		A dangerous prop.

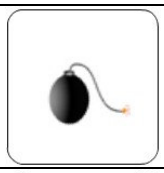
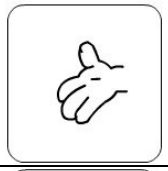
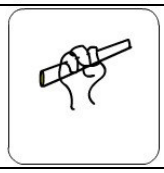
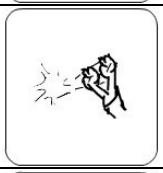
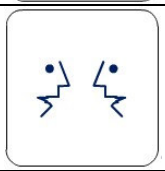
Bomb		Bomb indicates a dangerous scene of explosion.
Stick, club.		Hooligan's cheaper weapon.
Hammer		It can be very dangerous if it is used for making violence.

Figure 54 Icons of props

Hand gestures and Behaviors

Palm up		It is often related with the meaning of "asking for".
Pointing		This gesture is often related with showing direction, blaming, and surprising behaviors.
Voice down		Passenger often uses this gesture to express the meaning of "please turn down your voice".
Welcome		It shows the meaning of friendly and welcome.
Waving hands		It is often related to "releasing", "goodbye" gesture.
Holding		It is often related with props.

Stop		“Stop” gesture.
Warning		“Warning” gesture.
Knocking		“Knocking” gesture.
Fuck you		Dirty gestures.
Conversation		It is related with speaking, taking between roles.
Barking		The voice from dog.
Drinking		The action of drinking.
Sleeping		Some passengers will have a nap during the travel.
Singing		It is often related with fans, hooligan, and beggar.
Making phone call		Passenger uses their cell phones to make phone call, sometimes they will be too dedicated and annoying.

Reading		"Reading" will often be related to the props of books and newspaper.
Making up		Ladies often makes up during their travel.
Shaking head		"No" sign.
Stealing		Thief and pickpocket's behaviors.
Walking		Normal passenger's moving status.
Running		Fast moving.
Standing		It shows where the roles are standing at.
Sitting		Passenger is seated.
Falling down		Passengers can be knocked (hit) down or sometime heart attack happens.
Explanation gestures		Explanation gestures will accompany with the conversation.

Lying		It indicates the casualties.
Kicking		An aggressive action.
Feet on the bench		A bad behavior which is often played by hooligan.
Hitting		An aggressive action which is often related with trouble makers and victims, it can be a fist hit and also can be a body contact.
Drawing, writing		It indicates the behaviors related to drawing, painting and writing.
Giving, passing		The object is passing between two roles.
boarding		Passengers are getting on the train.
Leaving		Passengers are getting off the train.

Figure 55 Icons of Hand gestures and Behaviors

Facial expressions

Happy		One of the six basic expressions of human beings.

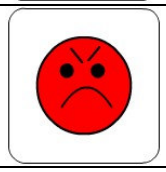
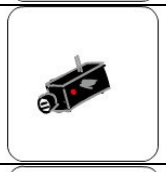
Surprised		One of the six basic expressions of human beings.
Fear		One of the six basic expressions of human beings.
Sad		One of the six basic expressions of human beings.
Disgust		One of the six basic expressions of human beings.
Angry		One of the six basic expressions of human beings.

Figure 56 Icons of facial expressions

Events and situations

Fighting		Full of aggressive body languages.
Tracking		The objects will be locked and traced.
Checking ticket		This is the most happened regulations on trains.
Too loud		It indicates a noisy scene.

Lighting		Lighting status is good.
Dark		Lighting equipments do not work or have been broken.
Emergency		If emergency, police needs to be called.
Alarming		Launching Alarm.
Arrest		Criminal gets arrested.
Bleeding		It indicates a strong violent scene.
Fleeing away		This situation indicates ticket evaders, hooligan and criminal have a behavior of keeping away from conductor or policeman.

Figure 57 Icons of events and situations

8.6.3 Observation by icons

In preceding chapters, we have made some observations of scripts with storyboards and video recordings by using semantic description. In this section we observe a couple of scripts by using icons we designed in 8.6.5. The pictures of storyboards are filled in the left column, the observed results will be described in the right column; scene information is described by "Infrastructure" icons at the first row, objects and relations are described by the format of "Human agents and roles"-"Hand gestures and Behaviors"- "Props"-"Human agents and roles"-"Facial expressions", "Events and saturations" will be shown in the last row, to discriminate the similar objects and roles, we number them with 1,2,3…… while the obvious information are also added at foot. We will use icon to

observe the scripts “Pickpocket” ***(Figure 58),*** “Shouting” ***(Figure 59),*** “Ladder Carrier” ***(Figure 60).*** You can also have a look at our digital storyboards.

Script of “Pickpocket”

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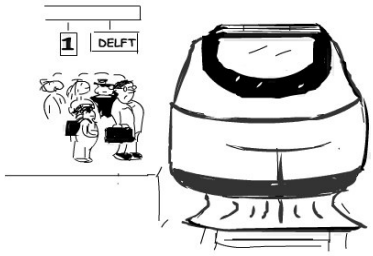
<td> 
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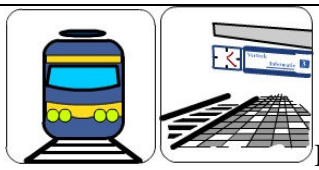
<td> 
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 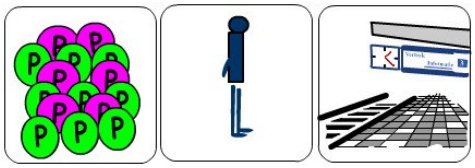 </td>
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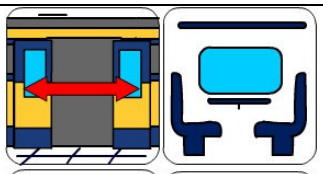
<td> 
 
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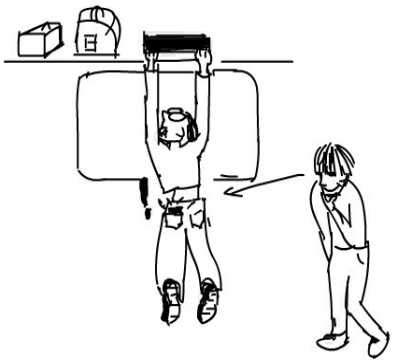
<td>  </td>
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 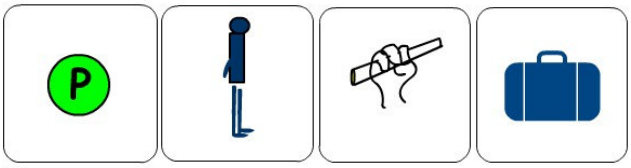
 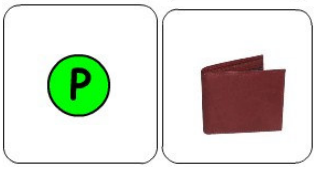
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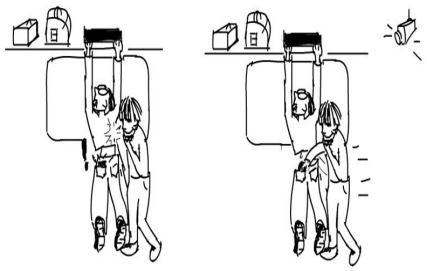

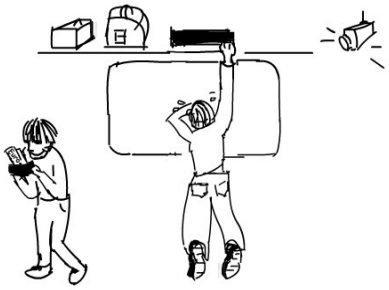

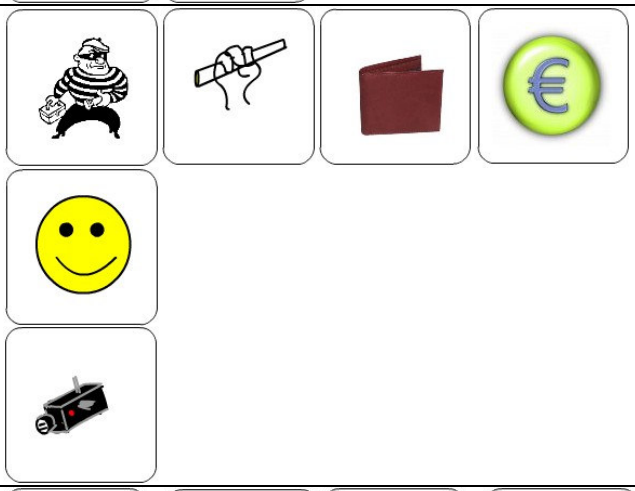


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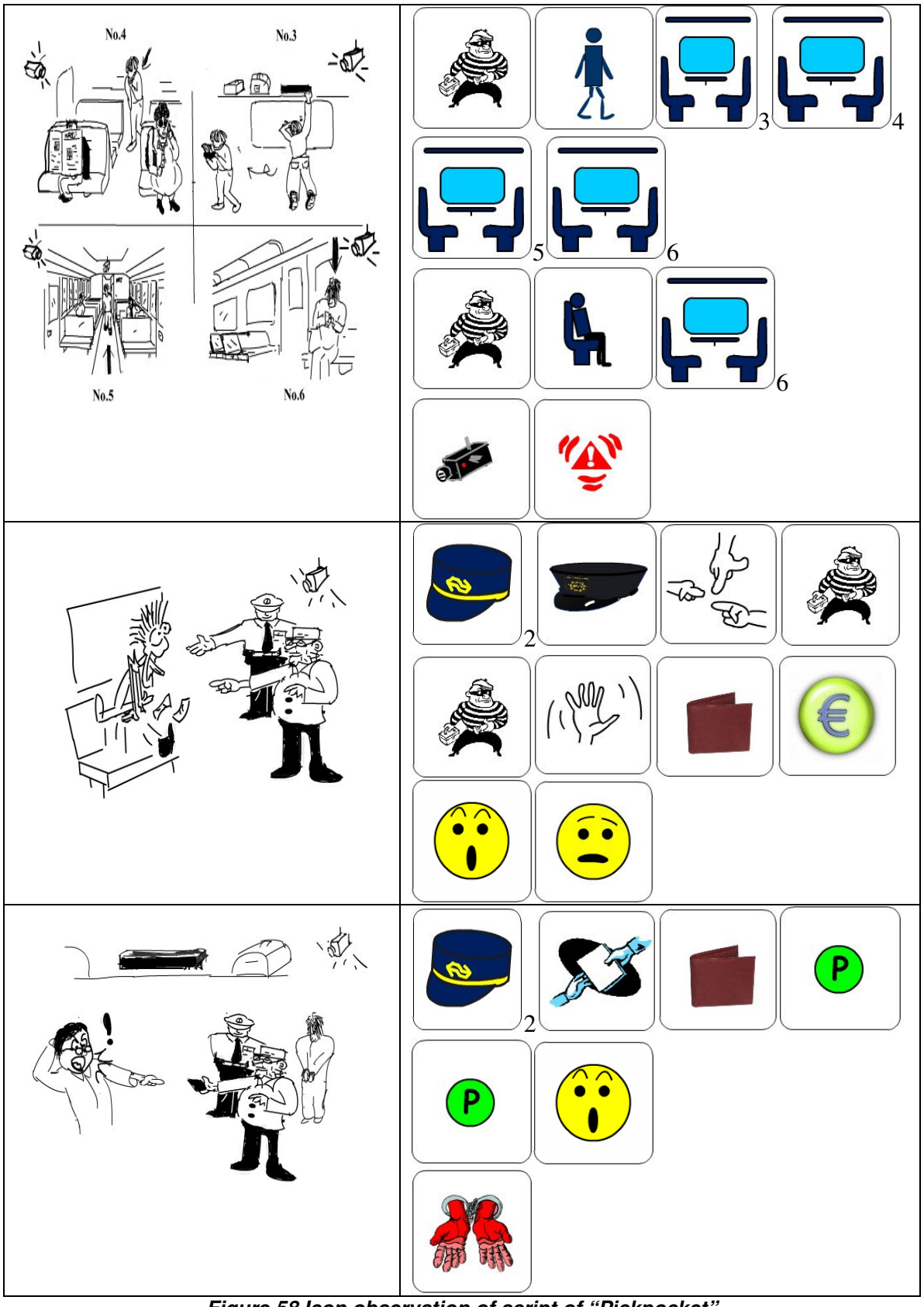
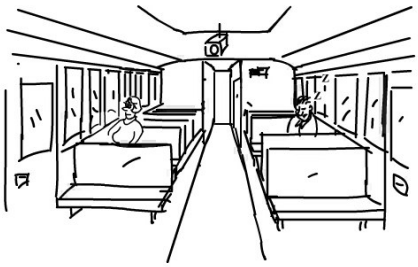
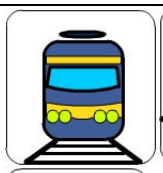
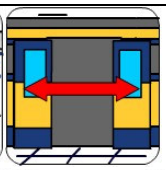
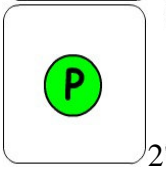
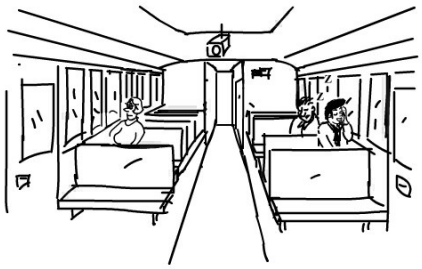
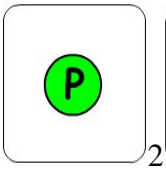
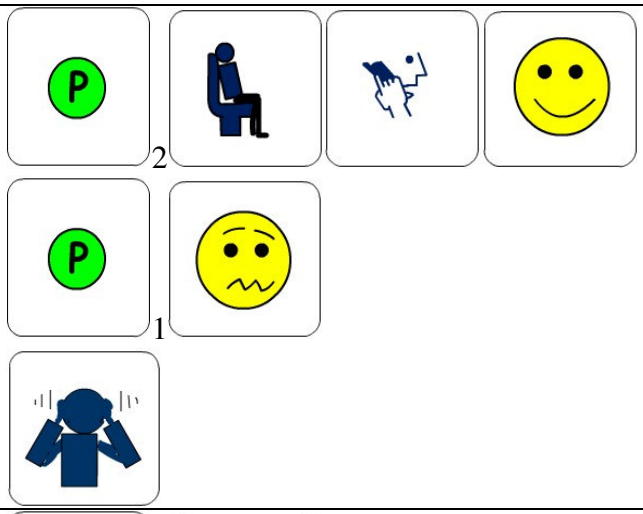
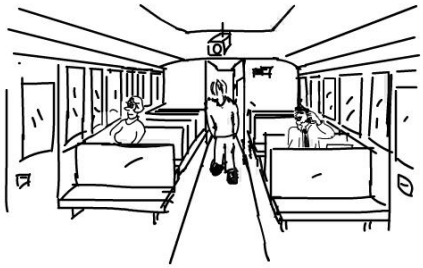
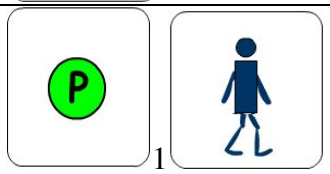
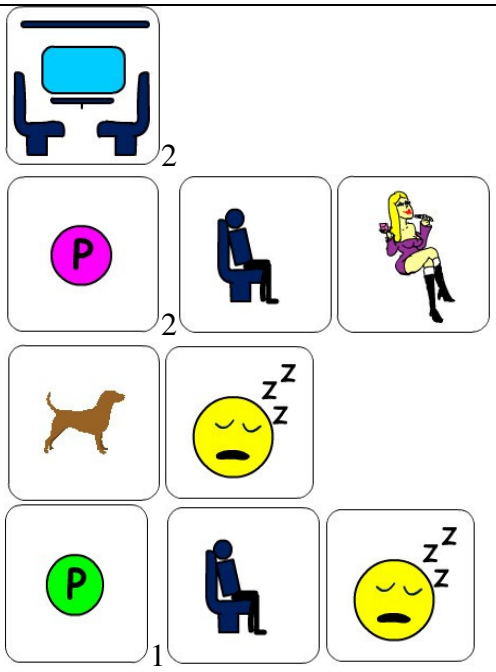
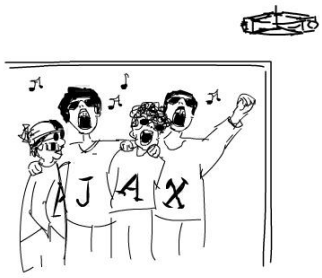
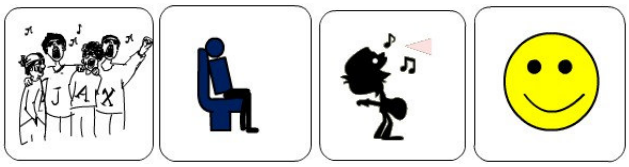
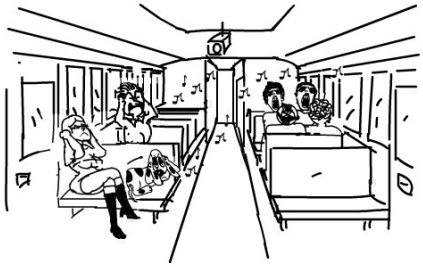
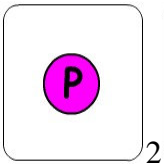
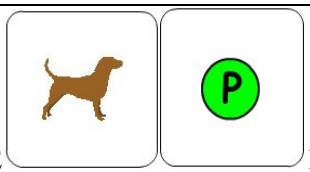


Figure 58 Icon observation of script of "Pickpocket"

Script of “Shouting”

	 1    1   1
	       2 
	 1    2

	  
	 2 
	 2  1  
	    

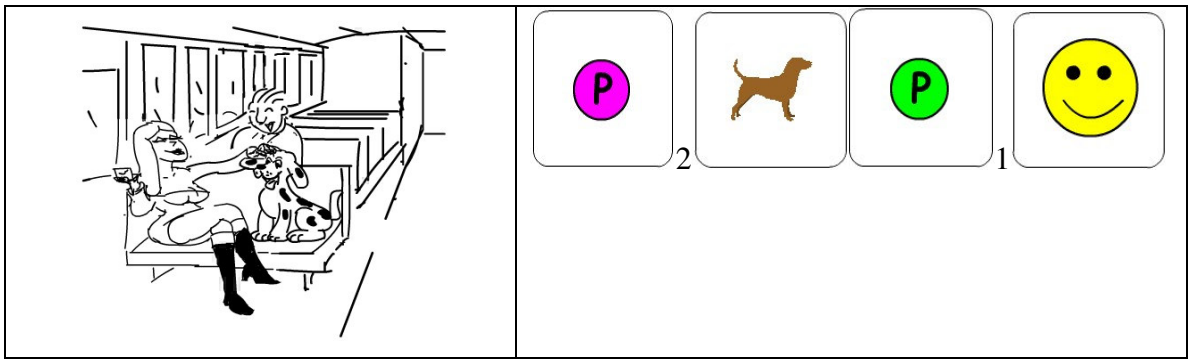
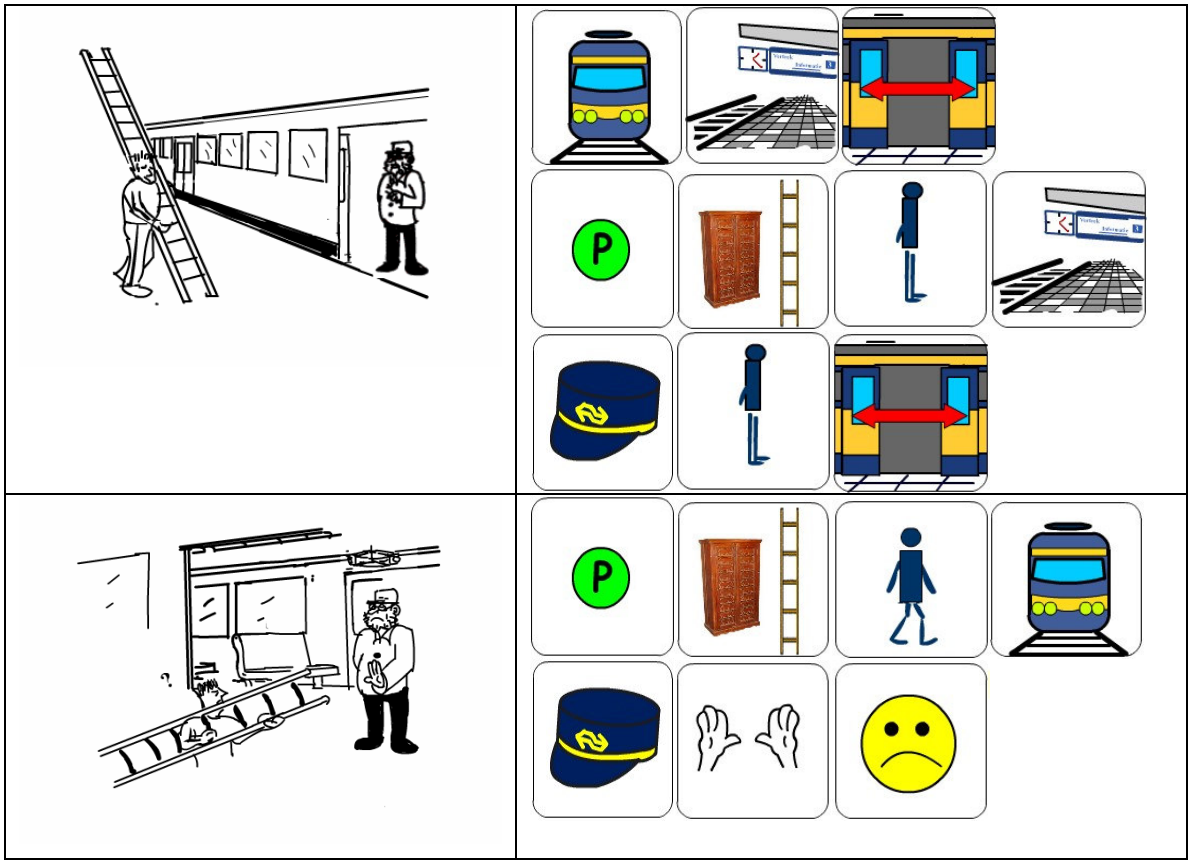
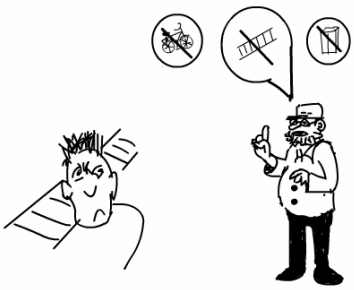
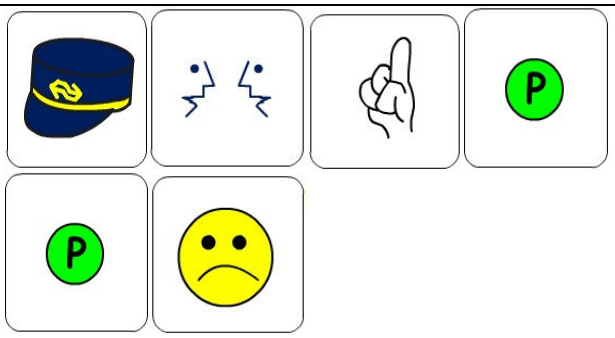


Figure 59 Icon observation of script of "Shouting"

"Ladder carrier"



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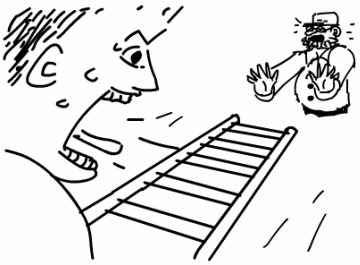

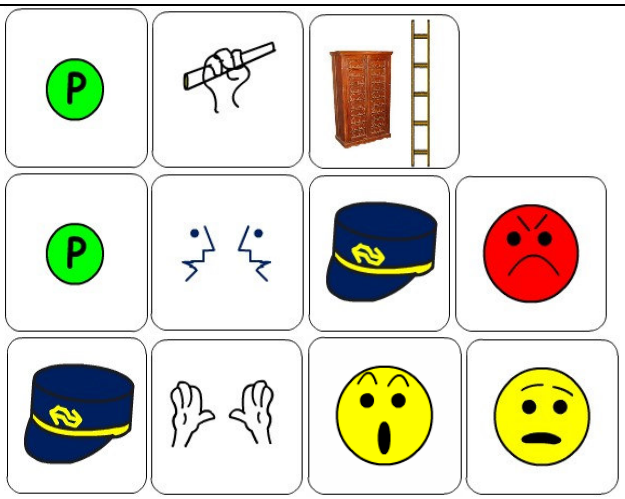
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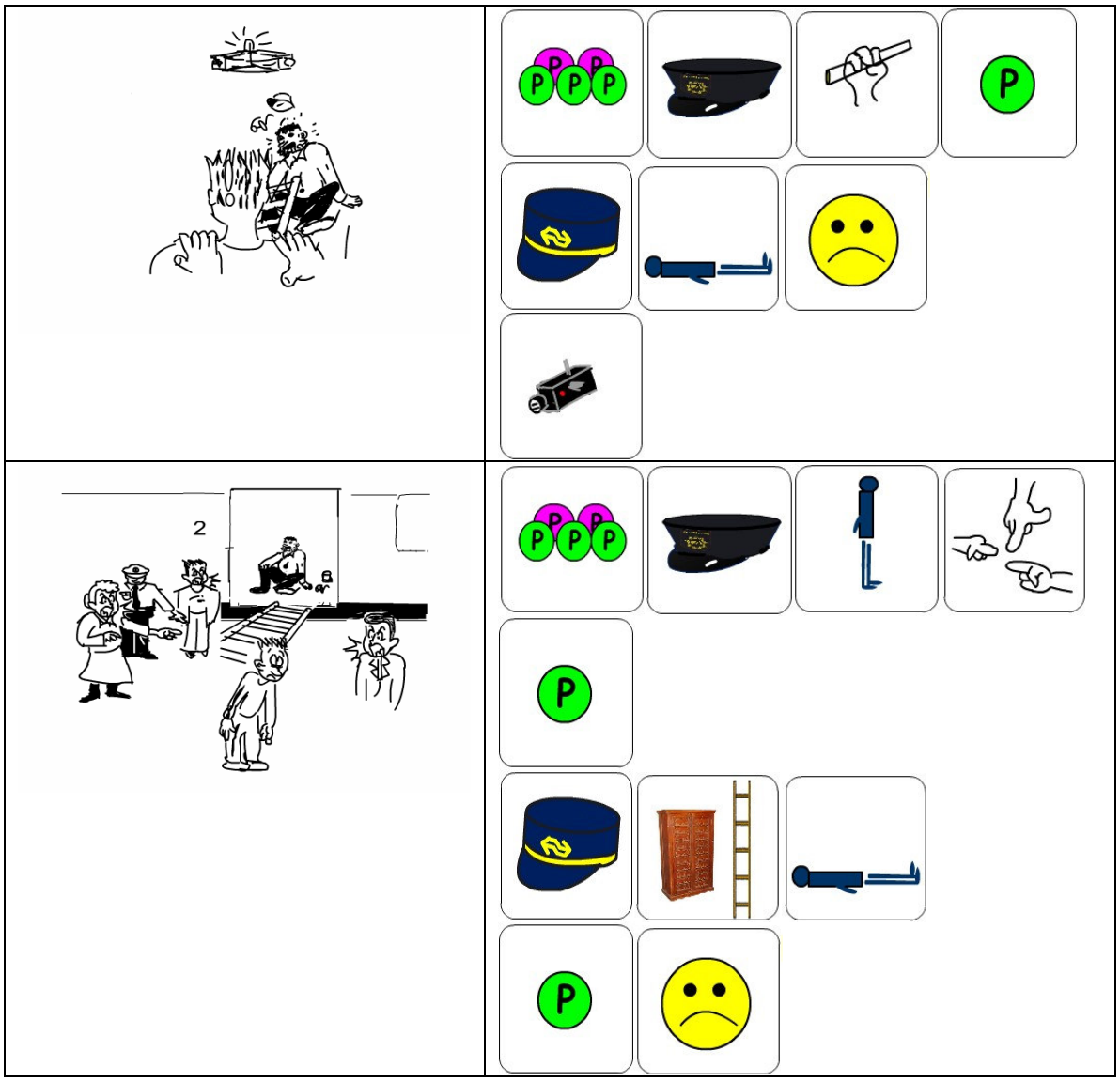


Figure 60 Icon observation of script of "Ladder carrier"

9. Conclusion and Recommendation

It's time to draw a conclusion and propose some recommendations for this thesis work. Combining with a mass of cognitive knowledge and analyzing work on aggressive scenes, a shared world model around train compartment has been described by a final script of "taking train" in the last chapter. In order to find this shared world model, we first start to tackle down the problem on how to explain human's perception process with the theory background of world model and script-based knowledge representation. For getting a more comprehensive understanding from individual world model, storyboards designing, text story experiment and video recording analysis have been made for extracting and refining the key conceptions in train world.

Storyboard can be a compact representation of the real world, not only on the data storage but also a favored modality for information conveying. It can be treated like a visual script. And it can make those written scripts much clear, comparing with making a real movie, creating a storyboard takes little time and energy and it will greatly reduce the amount of time spent shooting a scene. Except those advantages, envisioning design with storyboard is a good methodology in the early design stages; it makes scenarios more vivid and bright in a visualizing way.

Our storyboards are designed by following predefined storyboard model. After analyzing the final video recording, stimulus–response reaction has been proved to be a crucial factor on triggering an aggressive behavior. At the same time, we also find that the knowledge in common from individual world model can be well retrieved if we follow the structure of script.

During the storyboards designing, text story experiment and video recording analysis, we developed a cognitive model of perception and model modeling based on cognitive theory, comparing the analysis on the text story experiment and video recording. We find that a well designed storyboard could trigger a similar story from different people. So it fits well with Schank's theory of script and the script is the root of the shared world model, at the same time, scripts theory indicates why people will have such similar knowledge in their mind.

Because the shared world model also is knowledge-based, it contains all the possible conception of aggressive behaviors, that is say, on the one side, the script provides all the necessary slot and connectivity between these slots, all the objects and behavior pattern can be find a good match in the world model. On the other side, this world model can be updated as a knowledge database. In this thesis work, we can not collect all the aggressive features of human beings since human beings behavior are so uncertain. A broader sample collections are needed in the future and more refined features needs to be gradually added to the knowledge database. The key concepts we extracted from individual world models are useful for icon making for the final interface.

The final goal is to equip this shared world model on our final aggression detection system, the system can use it to interpret what it sees like human beings, also make reasonable reactions on guarding the train compartment. Dynamic Bayesian networks is probably the most appropriate approach. But because of its simplicity and availability of data we use a rule based system as a first approach. The extracted feature and refined knowledge in this shared world model can be described as a set of “if then” rules can be designed for system reasoning implement. A possible Rule-based expert system has been introduced in chapter 8.5.

Furthermore, this thesis work of storyboard-based world modeling is a single coherent interpretation build up from a collection of observations. The final system will have an ability to predict events since storyboards contain the coherent properties of scripts. Events tend to follow a predefined trail and occur in known runs or patterns. Different trails of scripts may be draw for different results. It can be also used to analyze and design similar situation determining system as long as they contain the standard events of situational scripts.

In the experiment of the text story collection, we also get some feedback and nice advice; storyboard also needs to be drawn with a good drawing skill, skilled drawing and high-level presenting tact can make storyboard more vivid and accurate to display the salient feature of the object and behaviors, when we collect features from the students, it is better to give more oriented questions on the information collection.

Reference

[1] R.Schank and R.Abelson, "Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures", Hillsdale, New Jersey, 1977

[2] N.Hayes, "Principles of Social Psychology", Hove (UK), Hillsdale(USA),1993

[3] L.Festinger, "*A theory of cognitive dissonance."* Stanford, 1957

[4] P.Klahr and D.Waterman, "Expert systems techniques, tools and applications", Addison-Wesley Longman Publishing Co., Inc. Boston, MA, USA, 1986

[5] C.Stott and S.Reicher, "Crowd action as intergroup process: Introducing the police perspective"; European Journal of Social Psychology Eur. J. Soc. Psychol. 28, 509±529 (1998)

[6] A.Mallon , "Storyboarding Multimedia", 1995.
http://ourworld.compuserve.com/homepages/adrian_mallon_multimedia/story.htm

[7] Iowa State University Extension, "Tips For Storyboarding", 2001
http://www.extension.iastate.edu/communities/tools/decisions/story.html

[8] Macromedia Flash MX tutorials
http://www.adobe.com/support/flash/documentation/fl_mx_tutorials.html

[9] Drawing for classical animation
http://www.karmatoons.com/drawing/drawing.htm

[10] Learn to Draw with Billy Bear
http://www.billybear4kids.com/Learn2Draw/Learn2Draw.html

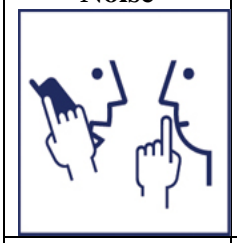
[11] Medialab Solutions BV (2004), Aquabrowser search engine.
http://www.medialab.nl/

[12] S. Fitrianie and L.J.M.Rothkrantz, "An Icon-Based Communication Tool on a PDA", TU Delft, the Netherlands, 2004

[13] P.Schooneman, "ISME – Icon based System for Managing Emergencies," Master Thesis, TU Delft, 2005

Appendix

Appendix A: House rules that apply on board of the train

Valid ticket 	You must have a valid ticket or pass on trains and platforms. From October 2005 a fine of 35 euro is added to the fare if you're traveling without a valid ticket.
Emergency	If there is an emergency, please stay calm. Inform NS staff and follow their instructions. Or call the railway police on 112.
Boarding and leaving the train	Please let passengers off the train first. Once the boarding signal has sounded do not get on or off the train. The doors will close and the train will depart.
Noise 	Please do not disturb other passengers. Please do not speak in a loud voice on your telephone and do not play loud music.
Bicycle 	Please make sure your (folding) bicycle does not obstruct other passengers. Folding bicycles may be carried free of charge, if they are completely folded. Other bicycles may only be carried during non-peak hours and at an extra charge. They should be parked at the indicated places.
Hand luggage 	Please make sure your hand luggage does not obstruct other passengers. It should be placed under your seat or in the luggage racks.

No smoking 	Smoking is not permitted on board trains. On platforms it is indicated where smoking is permitted.
Tidiness 	Please keep the train clean for other passengers. Please take your newspaper with you, use the litter bins and do not put your feet on the seats.

Appendix B: Conceptual Dependency (CD)

Conceptual Dependency originally developed to represent knowledge acquired from natural language input.

The goals of this theory are:

- To help in the drawing of inference from sentences.
- To be independent of the words used in the original input.
- That is to say: *For any 2 (or more) sentences that are identical in meaning there should be only one representation of that meaning.*

It has been used by many programs that portend to understand English (*MARGIE, SAM, PAM*). CD developed by Schank *et al.* as were the previous examples.

CD provides:

- a structure into which nodes representing information can be placed
- a specific set of primitives
- at a given level of granularity.

Sentences are represented as a series of diagrams depicting actions using both abstract and real physical situations.

- The agent and the objects are represented
- The actions are built up from a set of primitive acts which can be modified by tense.

Examples of Primitive Acts are:

ATRANS

-- Transfer of an abstract relationship such as possession, ownership or control. *e.g. give*. take

PTRANS

-- Transfer of the physical location of an object. *e.g. go*.

PROPEL

-- Application of a physical force to an object. *e.g. push*.

MTRANS

-- Transfer of mental information. *e.g. tell*.
We partition memory into two pieces, the CP (conscious processor where something is thought of), and the LTM (long term memory where things are stored).

MBUILD

-- Construct new information from old. *e.g. decide*.

SPEAK

-- Utter a sound. *e.g. say*, *play music, purr.*

ATTEND

-- Focus a sense on a stimulus. *e.g. listen, watch*.

MOVE

-- Movement of a body part by owner. *e.g. punch, kick*.

GRASP

-- Actor grasping an object. *e.g. clutch*, grab.

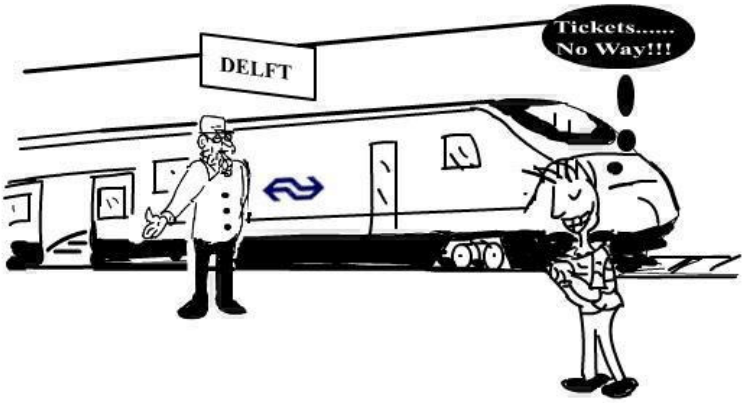
INGEST

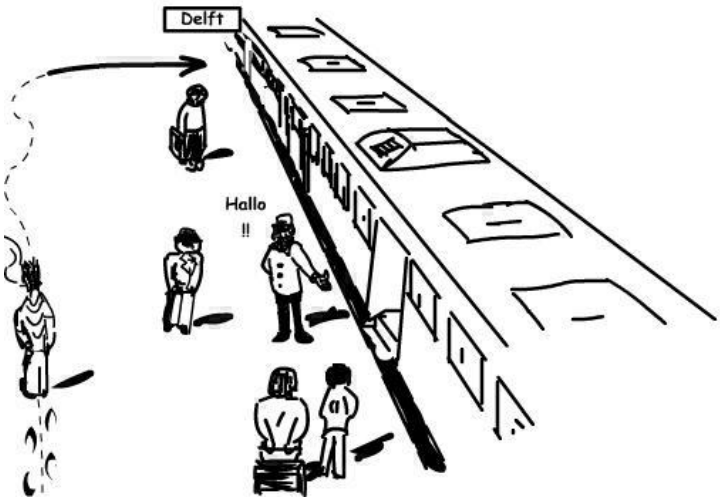
-- Actor ingesting an object. *e.g. eat*.

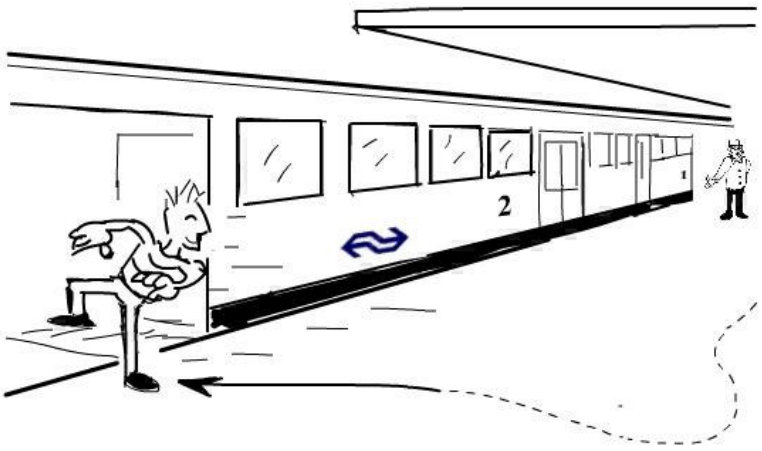
EXPEL

-- Actor getting rid of an object from body. *e.g. sweat, cry*

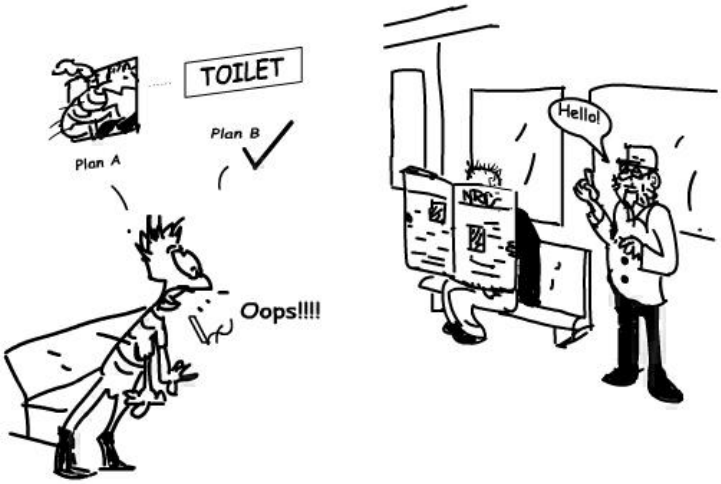
Appendix C: Storyboards and observed results

Storyboard #1 "No ticket"	Objects
 1. A train has arrived Delft at station, the train conductor is standing in front of the train, welcome his passengers' boarding. Passenger A, who is experienced ticket evader, after seeing the conductor, he begins thinking of how to take his risky trip.	-Train -Platform -Information board of "Delft" - "NS" logo -Conductor -Passenger A -Track -Gate
	Relations
	-Train is ***stopped*** -Passenger is ***walking*** -Gates are ***opened*** -Conductor ***shows "Welcome boarding" gesture.*** -Passenger A is ***thinking***
	Features
	-Passenger A shows a ***strange expression.*** - Text balloon "Tickets No way!"
Text Stories T1: A youth wants to get on the train without ticket; even he saw the train staff. T2: At Delft station, there is a guy who would not buy a ticket. T3: One guy is thinking of taking the train without paying for the ticket. T4: A young man who did not want to buy tickets was waiting for the train. T5: A man is going to get to the train, but his didn't buy the ticket. T6: A passenger decides not to buy train ticket. T7: A passenger wants to take the train from Delft station. T8 (Text balloon): Passenger A: Stupid people buy the tickets to get on the train. Let me buy the tickets. No way! T9 (Text balloon): Guy: Buy the ticket……no way! T10 (Text balloon): Black passenger: tickets? No way!	**Observed Objects**
	A young man-O6 Conductor – O5 Train-O1 Delft-O3
	Observed Relations
	Thinking—R5 Get on—R6
	Observed Features
	"Tickets…No way!"-F2

Storyboard #1 “No ticket”	Objects
 2. All the passengers are preparing to get on the train from nearest gate, but it seems Passenger A won’t like to get on the train as soon as possible. **Text Stories** T1: He passed by the train conductor and passengers and chooses to get on from the middle part of the train. T2: So he didn’t go to the near door where the conductor is standing by. But go to the further door to get into the train. T3: He thought the conductor didn’t know it. T4: He was looking for a compartment in which had no teller. T5: He sees the ticket conductor and goes another way to be onboard in order to get rid of the ticket conductor. T6: He passes the conductor and tries to get on the train from the next compartment. T7: He tries to find the proper door to get in the train. T8 (Text balloon): Conductor: Hello, tickets please. T9 (Text balloon): The guy is moving forward to dodge the conductor‘s sight. T10 (Text balloon): Black passenger: I must keep away with the steward	-Train -Platform -Information board of “Delft” -Conductor -Passenger A -Other passengers -Luggage
	Relations
	-Gates are ***opened*** -Conductor ***shows “Welcome boarding” gesture.*** -Other passengers ***are getting on*** the train
	Features
	-Passenger A passes by crowd and ***keeps away from the conductor.***
	Observed Objects
	The young man-O6 Conductor-O5 passengers-O11 Door of compartment-O12
	Observed Relations
	Moving forward-R2 Looking for –R48 Standing -R23
	Observed Features
	Keep away from -F3

Storyboard #1 “No ticket”	Objects
 3. When Passenger A walks several compartments away from the conductor, then he suddenly gets into the train. **Text Stories** T1: The guy quickly moves to the compartment without any attention. T2: He is so happy that the conductor didn’t see him. T3: He gets on the train. T4: He hided from the teller and went onto the train without noticing by the teller. T5: He finds a door which is far way from the ticket conductor and get onboard. T6: He gets on the train without ticket. T7: He goes into the train. T8 (Text balloon): Passenger A: Somebody is checking the tickets. Get on the train from another door. T9 (Text balloon): Guy: hehe, you can’t find me. (he gets onto the train far away from the conductor) T10 (Text balloon): Black passenger: yeah! He didn’t see me.	-Train -Platform -Conductor -Passenger A - “NS” logo - Class 2 Relations -Conductor ***stands far***. -Some gates are ***closed*** -Passenger ***shows*** a ***happy expression.*** --Passenger A ***looks back*** to conductor when he ***gets into*** the train. Features -Passenger A ***quickly moves*** into the train compartment. **Observed Objects** The young man-O6 Conductor-O5 Door of compartment-O12 Train-O1 **Observed Relations** Get on－R6 Standing far away from - R7 Happy-R9 **Observed Features** Keep away from -F3 Quickly move-F4

Storyboard #1 "No ticket"	Objects
 4. After boarding, all the passengers are seated, each passenger is doing individual actions, sleeping, reading newspaper……Passenger A pretends as calm as he can, but camera makes him feel unsafe. **Text Stories** T1: Other people spent the short time to have a sleep or reading newspaper. Expect the guy which feels uncomfortable and looks around hoping to arrive to the destination as soon as possible. T2: He was seen by the camera. T3: The man is sitting there and pretending there is nothing wrong. T4: He set down in a compartment with only a few passengers and nobody noticed him. T5: The man is sitting on the chair looking embarrass, this scene is captured by the camera in the compartment. T6: He is nervous on the train. T7: The camera found the person who did not buy the ticket. T8 (Text balloon): Passenger A: Ja, succeed! En….The train is leaving now. T9 (Text balloon): The camera is working. T10 (Text balloon): Black passenger: how does a camera know if I have a ticket, haha.	-Train compartment -Cameras -Seats -Passenger A -Other passengers -Newspaper -Gate -Rack -Corridor -Windows **Relations** -Cameras are ***looking around.*** -All the passengers are ***sitting on*** the chairs. -Other passenger, one is ***sleeping***, the other is ***reading newspaper.*** ***-Train is moving.*** **Features** -Passenger A ***shows*** a ***doubtful expression, looking up at*** the camera. **Observed Objects** The young man-O6 Other passengers-O13 Newspaper-O15 Camera –O14 Chair- O32 Compartment-O16 **Observed Relations** Reading -R15 Sitting on –R13 Looking around- R12 Sleeping- R14 **Observed Features** showing uncomfortable looking, nervous embarrass-F1

Storyboard #1 “No ticket”	Objects
 5 But the quietude doesn’t last for long, “all tickets, please.” train conductor comes up in the compartment, Passenger A looks very nervous and a couple of ideals come into his mind, then he decides to hide himself in the toilet. **Text Stories** T1: After a short period, the conductor starts to check the tickets, the youth suddenly gets up from the chair and two plans bear in his brain, one is getting out the train from the window, the other one is stay in the toilet in order to avoid the checking. T2: When the conductor comes to check tickets, he tries to go to the toilet. T3: When he starts to light a cigarette, the conductor came to this compartment and started to check everybody’s ticket. T4: The teller came into the carriage, and the young man was anxious and tried to find a way to escape from the ticket checking. T5: Suddenly, the ticket conductor appears, the man intend to go to the toilet to avoid the ticket conductor. T6: When the conductor comes, he tries to escape the checking. T7: He finds that the conductor is checking the tickets. T8 (Text balloon): Conductor: Dear passengers, your tickets please. Passenger A: Oh, my god, somebody will check the tickets. What shall I do? Get off the train or go to the toilet? T9 (Text balloon): Conductor: all tickets, please!	-Train compartment -Seats -Passenger A -Other passengers -Newspaper -Gate -Corridor -Conductor -Windows
	Relations
	-Conductor ***shows up*** and ***asks for tickets.*** - One passenger is ***reading newspaper.***
	Aggressive aspects
	- Passenger A ***suddenly stands up*** from the seat. -Passenger A is ***surprised*** with his ***mouth wide open.***
	Observed Objects
	The young man-O6 Chair- O32 Compartment-O16 Cigarette-O30 Ticket-O8 Toilet-O21 Conductor-O5
	Observed Relations
	Appear, come to -R16 Checking ticket -R19 Thinking—R5 Go to - R21
	Observed Features
	Suddenly stand up from seat-F5 Surprised-F6

<table>
<tr><td>The guy gets nervous when the conductor comes. A plan comes to his mind.
T10 (Text balloon):
Black passenger: damn shit! He is so fast! What am I gonna do? Get out of the window or hide in the toilet?</td><td></td></tr>
<tr><td>Storyboard #1 “No ticket”</td><td>Objects</td></tr>
<tr><td rowspan="11"> 
6 When the conductor starts checking tickets, passenger A leaves his seat immediately.

Text Stories
T1: Without any more consideration, the man runs away immediately when the conductor start checking other passenger’s tickets.
T2: He tries to flee.
T3: This guy gets nervous.
T4: He slid away when the teller was checking somebody’s ticket.
T5: When the ticket conductor is approaching, he runs away.
T6: He runs to the toilet before the conductor comes to him.
T7: The conductor continues checking the tickets.
T8 (Text balloon):
Passenger A: I need to leave this compartment soon.
T9 (Text balloon): The guy stands up immediately.
T10 (Text balloon): Steward: ticket please!
Black passenger: toilet is better!</td><td>-Train compartment
-Cameras
-Seats
-Passenger A
-Other passengers
-Newspaper
-Gate
-Rack
-Corridor
-Ticket
-Windows
-Conductor</td></tr>
<tr><td>Relations</td></tr>
<tr><td>-Conductor is checking tickets with other passengers
-the passenger is still sleeping.</td></tr>
<tr><td>Features</td></tr>
<tr><td>-Passenger A is leaving from his seat quickly, cold sweating.</td></tr>
<tr><td>Observed Objects</td></tr>
<tr><td>The young man-O6
Compartment-O16
Conductor-O5</td></tr>
<tr><td>Observed Relations</td></tr>
<tr><td>Checking ticket-R19
Leaves his seat-R20</td></tr>
<tr><td>Observed Features</td></tr>
<tr><td>Run away,flee-F3
Run-F4</td></tr>
</table>

Storyboard #1 “No ticket”	Objects
 7 Passenger A is moving fast to the toilet. **Text Stories** T1: The guy decides to hide himself in the toilet which he thinks it would be a perfect way to avoid punishment. T2: And he did it. T3: He decided to run away. T4: He ran to the far end of the compartment. T5: He runs through the compartment. T6: He runs to the toilet. T7: He goes into the toilet.T8 (Text balloon): Passenger A: Be quiet. Pretend to go to the toilet. T9 (Text balloon): Turn around to the toilet. T10 (Text balloon): Black passenger: be cool, be cool! He doesn’t know	-Train compartment -Cameras -Seats -Passenger A -Other passengers -Door -Rack -Corridor -Ticket -Windows Relations -The passenger is still ***sleeping.*** Another passenger is ***looking outside*** of window. Features -Passenger A ***Fast moving*** in the train compartment. **Observed Objects** The young man-O6 Toilet-O21 Compartment-O16 **Observed Relations** Runs through-R31 Go to –R21 **Observed Features** Run-F4
Storyboard #1 “No ticket”	Objects

8 Passenger A locks himself in the toilet; he believes that the busy conductor doesn't notice his special move at all and the toilet is a very good shelter.

Text Stories

T1: The guy closed the toilet door and felt he was cute enough seems everything gets on very well with his plan. Since not so many people are in the compartment. The conductor quickly finished his work.
T2: He closed the door of toilet.
T3: He hides himself in a toilet.
T4: He hided into the toilet to escape from the ticket checking.
T5: Then hides himself in a toilet.
T6: He hides himself in the toilet.
T7: The conductor comes near the toilet.
T8 (Text balloon):
Passenger A: Haha, nobody found me.
T9 (Text balloon):
Guy: is the checking finished? (The guy murmur to himself)
T10 (Text balloon):
Black passenger: it is safe here.

-Train compartment
-Cameras
-Seats
-Passenger A
-Other passengers
-Rack
-Corridor
-Ticket
-Windows
-Conductor
-Toilet
-Door of toilet

Relations

-Conductor is ***checking tickets*** with other passengers
-Passenger A ***enters the toilet.***

Features

- Passenger A shows a ***strange smile***

Observed Objects

The young man-O6
Toilet-O21
The door of toilet- O22

Observed Relations

Enter-R21
Close-R8

Observed Features

It is safe here, hide, nobody found me
-F1

Storyboard #1 "No ticket"

Objects

9 Been a while, the door is being knocked; passenger A is still in the toilet and he doesn't know that the conductor will stand right there in front of him.

Text Stories

T1: As a professional train conductor, the old man thought there must be someone hides in the toilet to avoid being checked and he knocked the door to let the people out.
T2: The conductor knocks the door.
T3: The conductor finds out this strange behavior and asks the guy be out of the toilet.
T4: Unfortunately, the teller knocked at the door of the toilet and told him to come out.
T5: The ticket conductor knocks the door of the toilet.
T6: The conductor checks the toilet.
T7: The conductor knocks the door of the toilet.
T8 (Text balloon):
Conductor: Somebody in the toilet?? Your ticket please!
T9 (Text balloon):
At this moment the door is being knocked.
Conductor: open the door, please.
T10 (Text balloon):
Steward: are you finished. I want use the toilet!

-Train compartment
-Cameras
-Seats
-Other passengers
-Rack
-Corridor
-Windows
-Conductor
-Toilet
- The door of toilet

Relations

- Conductor is ***standing at*** the door of toilet.

Features

- Conductor is ***knocking*** at the door of toilet

Observed Objects

Conductor-O5
Toilet-O21
The door of toilet- O22

Observed Relations

Enter-R21
Close-R8

Observed Features

Knocking-F13

Storyboard #1 "No ticket" | Objects

10 Passenger A thought the danger was already past, that is bad luck, the conductor asks for the tickets when he comes out of the toilet. He can only play innocent and gives a lot of excuses.

Text Stories

T1: The conductor asks him to show the ticket, but he can not show the ticket because he didn't buy it.
T2: He comes out but he doesn't have a ticket.
T3: The guy pretends to be innocent.
T4: He came out reluctantly without ticket.
T5: He has to open the door and face the ticket conductor.
T6: The passenger comes out without ticket.
T7: The conductor asks for ticket. He says 'you have already checked it'.
T8 (Text balloon):
Passenger A: Ah, I don't have the ticket.
T9 (Text balloon):
Conductor: please show me your ticket.
Guy: I didn't buy it
T10 (Text balloon):
Steward: oh, do you have a ticket?

-Train compartment
-Cameras
-Seats
-Other passengers
-Rack
-Corridor
-Windows
-Conductor
-Toilet
- The door of toilet

Relations

-Conductor is ***asking for*** tickets.
- They ***start*** a ***conversation.***

Aggressive aspects

- Passenger A ***spreads his hands, showing innocent.***

Observed Objects

Conductor-O5
The young man-O6

Observed Relations

Ask for ticket-R17
Conversation-R24

Observed Features

Explaining, innocent –F7

Storyboard #1 "No ticket"	Objects

11 Passenger A is not willing to pay any money for the tickets; he is getting angry and more aggressive both on words and actions. He is not aware of the coming of the policeman.

Text Stories

T1: A policeman is been informed by the camera when they starts shouting.
T2: The guy tries to fight with conductor.
T3: He starts yelling at the conductor.
T4: He shouted at the teller and tried to refuse to pay the ticket and penalty.
T5: He argues with the ticket conductor for the ticket. This scene is captured by the camera in the compartment, and then the policeman comes.
T6: While the passenger is arguing, the policeman comes.
T7: The camera records the process.
T8 (Text balloon):
Passenger A: What do you want to do? Let me buy the ticket. No way!
T9 (Text balloon):
The guy is getting angry.
T10 (Text balloon):
Black passenger: (I must evade as soon as possible), hey, what is it over there?

-Train compartment
-Cameras
-Seats
-Other passengers
-Rack
-Corridor
-Windows
-Conductor
-Toilet
- The door of toilet
-Policeman

Relations

-Policeman ***appears***
-Conductor is ***under attack.***

Features

- Passenger A is ***making aggressive pose.***
- Passenger A has an ***angry*** looking.
- Passenger A is ***speaking fiercely.***

Observed Objects

Policeman-O23
The young man-O6
Conductor-O5

Observed Relations

Show up- R16

Observed Features

Shouting -F36
Speaking Fiercely-F10
Want to fight-F8
Angry –F9

Storyboard #1 “No ticket”

Objects

12 Policeman finally arrests Passenger A, and he feels regret for that.

Text Stories

T1: The policeman comes and arrests this guy without ticket, and the conductor is very happy with that.
T2: A policeman comes and arrests him.
T3: The conductor calls the police, This guy gets caught.
T4: The police came in time and arrested that young man.
T5: The man without the ticket is then taken by the policeman.
T6: The policeman gets the passenger for punishment.
T7: The policeman catches him.
T8 (Text balloon):
Policeman: Sorry! You are under arrest!
T9 (Text balloon):
The policeman comes and takes him away.
T10 (Text balloon):
Black passenger: shit! Police!

-Train compartment
-Cameras
-Seats
-Rack
-Corridor
-Windows
-Conductor
-Toilet
- The door of toilet
-Policeman
- Baton
-Gun

Relations

-Policeman and conductor are all very ***happy.***
-Conductor ***shows "good-bye" gesture.***

Features

-Passenger A is ***crying.***
-Policeman is ***collaring*** the passenger A.
-Policeman is ***holding*** a Baton ***at hand.***
-***Arrest***

Observed Objects

Policeman-O23
The young man
-O6
Conductor-O5

Observed Relations

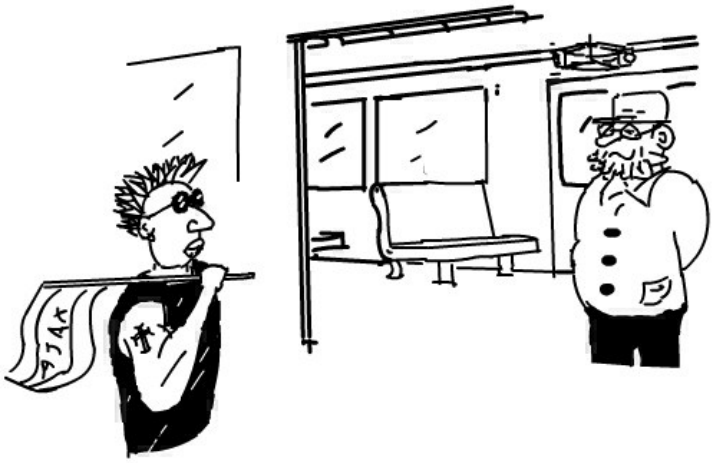
Happy-R9

Observed Features

Arrest -F17

Storyboard #2 "Hooligan"

Objects

<table>
<tr>
<td>


1. An Ajax fan is going to enter the train compartment while the train conductor is standing at the entrance.

Text Stories
T1: One day a young man in black on aboard.
T2: An Ajax fan gets into the train, and the train conductor stands there.
T3: A hooligan is about to get on the train.
T4: A guy with mohican style hair is heading to a train, where a train attendant is standing at the door. The guy is most probably a fan of Ajax, since he holds a flag of Ajax in his hand.
T5: A man with black clothes and a pair of black glasses is going to get on the train while a ticket conductor is standing at the door of the train.
T6: A passenger gets on the train. His hair style and the tattoo show that he is not an easy going.
T7: The man called bank goes to home with a flag after watching a football match.
T8 (Text balloon): Hooligan: En…??? Train attendant!
T9 (Text balloon): Conductor: Hey
Passenger: …
T10 (Text balloon):
STEWARD: hello!
PUNK MAN: (said: fat ugly old man with a contemptuous glance)
</td>
<td>
-Compartment
-Conductor
-Passenger A
- Ajax Flag
- Tattoo
- Camera
- Mohican style

Relations
-Passenger A is going to get on the train
- Conductor is standing at the gate of the compartment
-Camera is looking around
Features
- Passenger A is accessorized with Flag & Tattoo
-Conductor shows an unhappy expression

Observed Objects
A young man-O6
Conductor-O5
Gate of train compartment- O12
Train compartment-O16
Camera –O14
Flag-O28
Tattoo-O27
Mohican style-O29
Hooligan-O26
Observed Relations
Standing at –R23
Getting on the train-R6
Looking around-R12
Observed Features
Showing an unhappy expression- F19
</td>
</tr>
<tr>
<td>Storyboard #2 “Hooligan”</td>
<td>Objects</td>
</tr>
</table>

2. The soccer fan starts to smoke and drink beer, and his feet are on the opposite bench.

Text Stories

T1: He starts drink beer in the train.
T2: He sits on the seat, drinks beer and puts his feet on the other side of the seat. Obviously, he is not so polite.
T3: The hooligan is drinking beer and his behavior is very bad.
T4: Obviously, this guy is too self-centered. He takes up a whole seat in the train and drinks lots cans of beer, while smoking. Is it Heineken? Oh, my god…
T5: When the train is on the way, the man starts smoking and drinking. He drops the empty can on to the floor of the car. He looks really happy.
T6: The passenger puts his feet on the opposite seat. He does not only drink on the train, but also smokes and throws the empty cans on the ground.
T7: Bank feels very tired and not good because of his national team losing the match, so he smokes and drinks some beers on the train.
T8 (Text balloon): Smoking, drinking, nice, and so comfortable!
T9 (Text balloon): Passenger: ~LA~LA~LA (sing a song).
T10 (Text balloon): PUNK MAN: (I should get some relaxation before the match)

-Compartment
- Bench
- Beer Can
- Passenger A
- Cigarette
-Windows

Relations

-Passenger A is ***sitting on*** the seat.
-Beer cans ***is on*** the table.

Features

-Beer can is ***lying on*** the ***floor.***
-Passenger A ***throws*** beer cans.
- Passenger A's ***feet*** are ***on the opposite bench.***
- Passenger A is ***smoking***

Observed Objects

A young man-O6
Beer Can-O31
Seat-R32
Cigarette-O30
Hooligan-O26

Observed Relations

Sitting on –R13
Drinking –R29
Happy-R9

Observed Features

Smoking –F23
Feet the on the opposite bench- F22
Drop, Throwing –F21
Lying on-F20

Storyboard #2 "Hooligan"

Objects

3. The conductor warns him that his behavior is not allowed on the train.

Text Stories
T1: The conductor told him that is not allowed on the train to drink and smoke.
T2: The conductor sees this and persuades him not do so.
T3: The conductor came up and asked him to stop this behavior.
T4: At this moment, the train attendant comes to him to have some warned. It is not allowed to smoke in public, especially in the train. What's more, the trash is also not allowed to throw to everywhere.
T5: Suddenly the ticket conductor come by, he told the man smoking is not allowed in the no-smoking car.
T6: The conductor warns the passenger.
T7: Some one else says to him that it is not polite to smoke on the train.
T8 (Text balloon):
Conductor: It is not allowed to smoke and litter up in the train. Please pay attention to your behavior in the public.
T9 (Text balloon): Conductor: Please pick up those rubbishes and stop smoking.
Passenger: Bug off. It's none of your business.
T10 (Text balloon):
STEWARD: sir! It is not allowed to put the foot on the bench and please throw the garbage into the trash can!
PUNK MAN: get out off me, asshole!

-Compartment
- Bench
- Beer Can
- Passenger A
- Cigarette
-Windows
-Conductor

Relations

-Passenger A is ***sitting on*** the seat.
-Conductor is ***standing at*** the seat of Passenger A.

Features

-Beer can is ***lying on*** the ***floor***
-Passenger A ***throws*** beer cans.
-Passenger A's ***feet*** are ***on the opposite bench.***
-Passenger A is ***smoking***
-Conductor ***shows a warning gesture.***

Observed Objects

Conductor-O5
The young man-O6
Seat-R32

Observed Relations

Conversation –R24

Observed Features

Warning –F24

Storyboard #2 "Hooligan"

Objects

4. However, the hooligan gives him a dirty answer.

Text Stories
T1: He refuses to observe the rules.
T2: But this guy is very rude; he shows an impolite body language.
T3: But the hooligan didn't follow the conductor's order, and he just said "fuck you".
T4: Needless to say, the guy could hear nothing of what the train attendant has said just now. Instead, he gestures "fuck you" to defy the train attendant.
T5: But the man seems angry and gives the ticket conductor a middle finger.
T6: The passenger shows disrespect.
T7: Bank is very angry with that and say "fuck you"
T8 (Text balloon):
Hooligan: Fuck you!
T9 (Text balloon): Passenger: fuck you! (A dirty hand-pose)
T10 (Text balloon):
PUNK MAN: fuck your ass!

- Passenger A
- Cigarette

Relations

-Passenger A is ***sitting on*** the bench.

Features

-Passenger A ***shows a dirty gesture.***
- Passenger A is ***smoking***

Observed Objects

The young man-O6
Hooligan-O26

Observed Relations

Conversation –R24

Observed Features

Showing a dirty gesture-F25

Storyboard #2 "Hooligan"

Objects

5. Both sides are calling for help.

Text Stories

T1: He also has some colleague to refuse these rules, the conductor calls the police.

T2: The guy starts calling his fans team, so the conductor calls the policeman.

T3: They are preparing for a fight; the hooligan is calling to his friends. So does the conductor.

T4: Both the Mohican style hair guy and the train attendant are making the phone calls. The guy is calling his boss, while the train attendant is calling the police.

T5: After the man calls for his boss and his friends, while the ticket conductor telephones the policeman.

T6: The passenger calls his fellows, and in the meanwhile the conductor calls the police.

T7: Bank does not care about other people's advice. Someone calls the police

T8 (Text balloon): Hooligan: Come on, my friends; help me beat up a geezer. I am on the train.
Conductor: Come on, train policeman, some passenger make me trouble.

T9 (Text balloon): Passenger: Hello, here is a annoying conductor, I am here at No.6 (Passenger starts calling to his big brother)
Big brother: got it, we will be there in a second.
Conductor: A drunkard has broken amount of rules, really bad behavior.(Call to the policeman)
Policeman: just wait for my go.

T10 ((Text balloon): STEWARD: I am sorry, sir! If you keep doing this, I gonna call the police.

- Cell phone
- Policeman
- Passenger A
- Cigarette
- Tattoo
-Conductor
-A small group of passengers

Relations

-Passenger A is ***calling*** to A small group of passengers
-Conductor is ***calling*** to Policeman

Features

-Passenger A is ***smoking***
- The passenger with the tattoo "♠K" is a high level hooligan.
-***Calling to the police***

Observed Objects

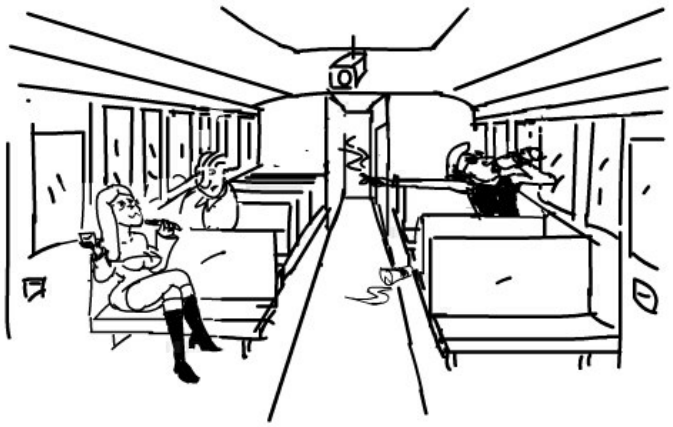
Conductor-O5
The young man-O6
Cell phone-O33
A small group of passengers –O34
Hooligan-O26
Policeman-O23

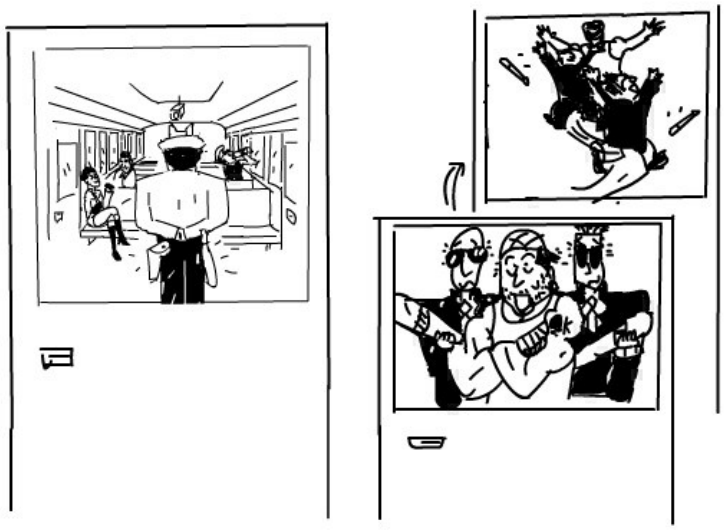
Observed Relations

Conversation –R24

Observed Features

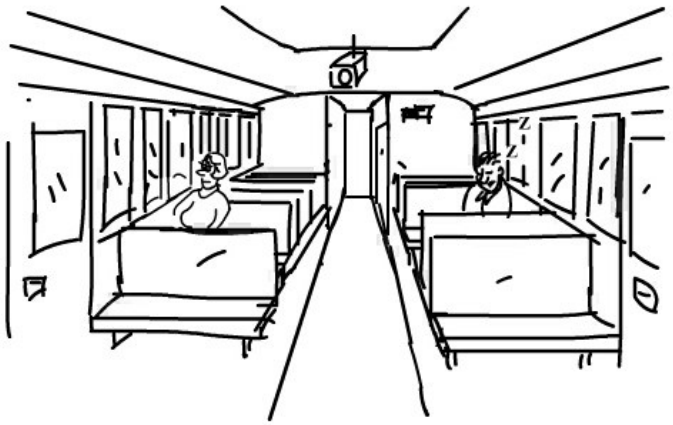
Call the police-F35

PUNK MAN: go ahead! Let's see who will be punished. STEWARD: (call the police) PUNK MAN: (call his punk friend)	
Storyboard #2 "Hooligan"	**Objects**
 6. Other passengers are suffering from his bad behavior. **Text Stories** T1: The behavior of the young man is quite annoying to the other passengers. T2: The guy is still drinking the beer; some passengers are sitting around him, a guy and a young lady. T3: Three hooligans are sitting together. ☺ T4: There are few people in this carriage and obviously, the rest people are doing their own business, letting the Mohican style hair guy alone. But a video camera on the top of the carriage taped all the behavior what the guy had done. T5: The man is till smoking and drinking in the car, but other passengers feel terrible. At the same time, the camera install on the ceiling of the car captures all the figures which show what happened in the car. T6: The passenger continues drinking and smoking. T7: Bank continues to make big noise before police come. T8 (Text balloon): Hooligan: Oh, threat me? Shit! T9 (Text balloon): Passenger: "LALALALA" (Still singing, drinking, smoking) Other passenger: I don't like him…… T10 (Text balloon): PUNK MAN: get a smoke and still enjoy his life like in his home	-Compartment - Beer Can - Passenger A - Cigarette - Other passengers - Camera - Corridor -Windows - Seats **Relations** -Passengers are ***sitting on*** the seats. -Passenger A is ***drinking.*** **Features** - Beer can ***is on*** the floor - Passenger A is ***smoking*** - Other passengers' facial expressions are ***miserable.*** **Observed Objects** Other Passengers –O13 The young man-O6 Cell phone-O33 Hooligan-O26 Camera- O14 Compartment-O16 **Observed Relations** Sitting near –R37 **Observed Features** Annoying-F29 Showing unhappy-F19

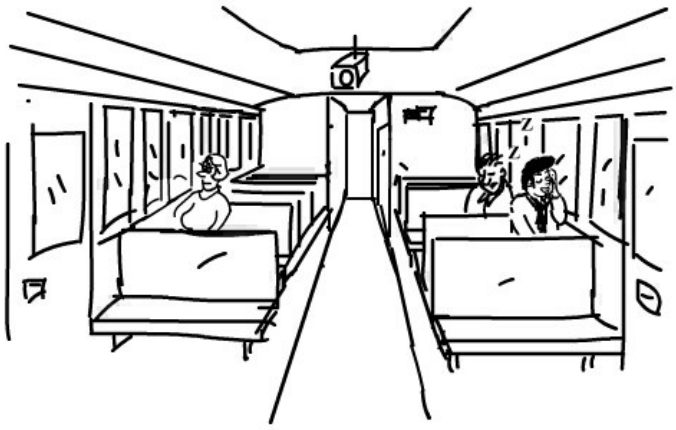
Storyboard #2 “Hooligan”	**Objects**
 7. When hooligans saw that policeman had got to that compartment, they flee at once. **Text Stories** T1: The policeman comes. T2: And the policeman comes, and then the fans run away. T3: The hooligan gets surprise when they see the policeman. T4: Few minutes later, the police and the boss of the guy with hired roughneck appear in the same time in the same carriage. But when the boss and the hired roughneck see the police, they run away. T5: The policeman come, and the boss of the man run away. T6: When the policeman comes, the fellows run away. T7:The police is coming and thinking that maybe bank is a big man T8 (Text balloon): Hooligan B: Ah, boss, look, the policeman is coming. Hooligan Leader: let’s leave the train, don’t make any trouble. T9 (Text balloon): Policeman comes and Passenger‘s brothers are all coming to the compartment. But the brothers choose to flee away. T10 ((Text balloon): Hooligans: Policeman is coming! Punk man’s friends evade all-around after seeing the police.	- Policeman - Passenger A - Door of compartment corridor - Other passengers - A small group of passengers - Clubs
	Relations
	-Policeman ***shows up*** in the compartment. -Policeman comes ***quicker than*** hooligan group -The small group is ***moving in the compartment.***
	Features
	-The small group of hooligans ***flees away*** at once. -The small group of hooligans ***shows surprised expressions*** - Hooligans are ***holding some clubs at hands.*** - Hooligans ***throw*** the clubs to the floor.
	Observed Objects
	Policeman –O13 The young man-O6 A small group of passengers –O34 Hooligan-O26 Compartment-O16
	Observed Relations
	Showing up , appear –R16
	Observed Features
	Keeping away from the police-F3 Fast moving-F4 (Flee)

Storyboard #2 “Hooligan”	**Objects**
 8. Now the hooligan has no idea what he should do. **Text Stories** T1: The conductor and the policeman are standing before the guy. T2: The conductor shows the policeman the young person who’s impolite just now. T3: The policeman together with the conductor told the hooligan to stop drinking beer. But the hooligan still didn’t stop his behavior. T4: The train attendant shows the police where the guy is, while the guy is still drinking by himself. T5: The ticket conductor forces the man to pick up the empty can with the help of the policeman. T6: The passenger was rebuked for his rude behavior, T7: When the policeman arrives bank is still drinking. T8 (Text balloon): Conductor and Policeman: You, because your bad behavior in public, please leave the train. T9 (Text balloon): Conductor: It’s him (he point to the passenger.) Policeman: You have badly broken the rules; we are going to cancel you right for being here if you continue to do so. Passenger still makes trouble. T10 (Text balloon): STEWARD: It’s him. PUNK MAN: wordless with largely splayed mouth.	-Compartment - Bench - Beer Can - Passenger A - Cigarette -Windows -Conductor -Policeman
	Relations
	-Passenger A is ***sitting on*** the seat. -Conductor is ***standing at*** the seat of Passenger A. -Policeman is ***standing at*** the seat of Passenger A.
	Aggressive aspects
	-Beer can is ***lying on*** the ***floor*** -Passenger A ***throws*** beer cans. -Passenger A’s ***feet*** are ***on*** the ***opposite bench.*** -Passenger A is ***smoking*** -Conductor and Policeman ***show blaming gesture.*** -Hooligan is ***surprised*** with wide open mouth
	Observed Objects
	Policeman –O13 Conductor-O5 The young man-O6 Hooligan-O26 Compartment-O16
	Observed Relations
	Standing at –R23
	Observed Features
	Warning, point to –F24 Surprise- F6

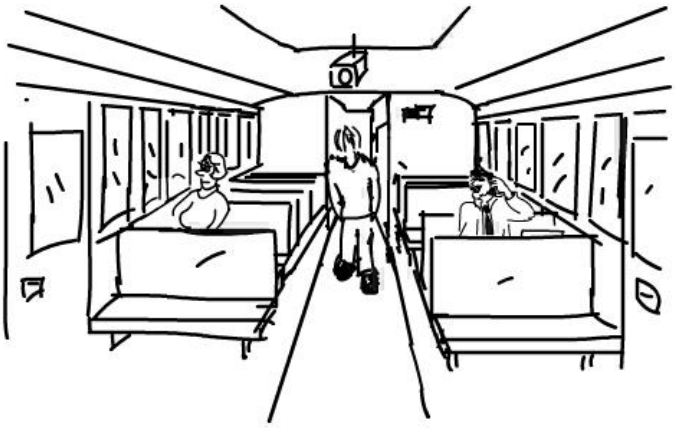
Storyboard #2 “Hooligan”	**Objects**
 9. Kick off. **Text Stories** T1: The policeman helps the conductor to kick off the man in black. T2: The policeman kicks the guy out of the train and the conductor is very happy. T3: The conductor and policeman decided to kick this guy out of the train. T4: At the end, with the help of the police, the train attendant kicks the guy off the train. What a happy end it is. T5: Finally, the man is thrown out of the car due to his bad behavior. T6: …and be kicked out by the police and the conductor. T7: The police throws bank out of the train and other peoples are very happy. T8 (Text balloon): It is not allowing any bad man in the train to influence other passengers. T9 (Text balloon): Policeman kicks that passenger out of the train. T10 (Text balloon): Policeman: Get out off our clean train!	- Policeman - Passenger A - Compartment -Conductor - Gate of compartment **Relations** -Policeman and conductor are very ***happy.*** -Conductor ***shows “good-bye” gesture.*** **Aggressive aspects** - Policeman is ***kicking*** passenger A’s ass. **Observed Objects** Policeman –O13 Conductor-O5 The young man-O6 Hooligan-O26 Compartment- O16 **Observed Relations** Showing a happy expression–R9 **Observed Features** Kicking-F26 Thowing-F21

Storyboard #3 “Shouting”	**Objects**
 1. A tied passenger (Passenger A) is sleeping during the trip wile another passenger (Passenger B) is looking outside of window. **Text Stories** T1: One day a man is sleeping on a quiet train. T2: It’s a quiet compartment and only two people are sitting there. T3: Almost an empty train, only two passengers on it. T4: Only two people were in a carriage of a train and it was so quiet that one man was having a nap. T5: There are two passengers in the car. The car is very quite. T6: A passenger is sleeping in the train, and the other is having a rest. T7: Two persons are sitting in the compartment. One of them is sleeping T8 (Text balloon): Somebody is sleeping in the train. Oh, his snore is so loud! T9 (Text balloon): Passenger A and B is enjoying their trip. T10 (Text balloon): Silent carriage, passenger is enjoying the quiet environment!	-Compartment -Seats -Passenger A -Passenger B -Camera -Windows -Corridor **Relations** -Passengers are ***sitting on*** the seats. -Passenger A is ***sleeping*** -Passenger B is ***looking outside*** of window **Features** ***-A quiet compartment*** **Observed Objects** A passenger-O6 A man -O6 Compartment- O16 **Observed Relations** Sleeping-R14 Quiet Comparment-R32 **Observed Features**

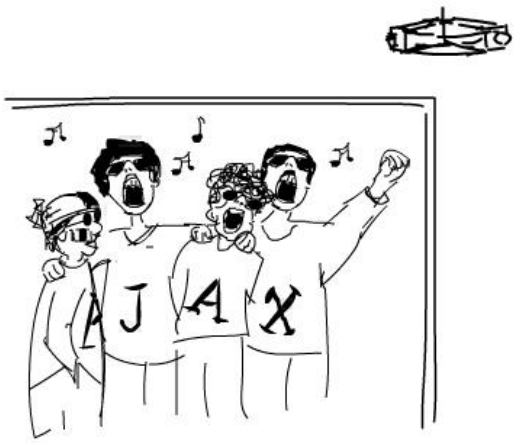
Storyboard #3 “Shouting”	**Objects**
 2. A businessman enters this compartment and camera scans his expression and emotion. **Text Stories** T1: Another gentleman gets on aboard. T2: A man comes and sees the camera over there. T3: A young gentleman get on the train, the camera is flashing. T4: At one station, a gentle man got into the train, while the speaker was broadcasting something. ☺ T5: A gentleman is going to on board. The alarm rings. (Is it an alarm? I don’t know what it is. I think you’d better make is clearer in the future.) T6: A passenger gets on. T7: Somebody looks up and finds a camera. T8 (Text balloon): Oh, the train is so empty, nice. T9 (Text balloon): Passenger C gets on the train. T10 (Text balloon): Civilian: Nice camera, huh. But can you hear me!	-Camera -Gate of Train compartment -Suitcase -Passenger C
	Relations
	-The gate is ***open.*** -Passenger C ***shows*** a ***happy expression.*** -Passenger C is ***getting on*** the train.
	Features
	-The camera is ***looking around.*** - Passenger C is ***looking*** up ***at*** the camera curiously.
	Observed Objects
	A gentle man -O6 Camera-O14
	Observed Relations
	Getting on the train – R6 Looking at the camera-R10 Looking around-R12
	Observed Features

Storyboard #3 “Shouting”	**Objects**
 3. The businessman starts to make a call. **Text Stories** T1: He sits in front of that sleeping man, he starts to make noise. T2: And he sits down, and he is doing something strange. T3: After this gentleman seated, he starts to chat with his friends with his cell phone. T4: It was still so quiet in this carriage that everyone just did their own business. T5: Although there is one more passenger than before, the car is still quiet, since the there passengers are all very quiet. T6: The passenger talks on his phone. T7: This person also sits down. T8 (Text balloon): Oh, who’s snore. It is so big! T9 (Text balloon): Passenger C: Hello, It’s me….How are you doing? (He starts making phone call). T10 (Text balloon): Ringing Civilian: hello, oh honey!.....	-Compartment -Seats -Passenger A -Passenger B -Camera -Windows -Corridor -Passenger C -Cell phone
	Relations
	-Passengers are ***sitting on*** the seats. -Passenger C is ***making phone call.*** -Passenger A is ***sleeping*** -Passenger B is ***looking outside*** of window.
	Features
	-***A normal compartment***
	Observed Objects
	Sleeping guy –O6 A gentleman -O6 Cell phone-O33
	Observed Relations
	Making a call –R25 Normal compartment-R34 Ringing-R33
	Observed Features

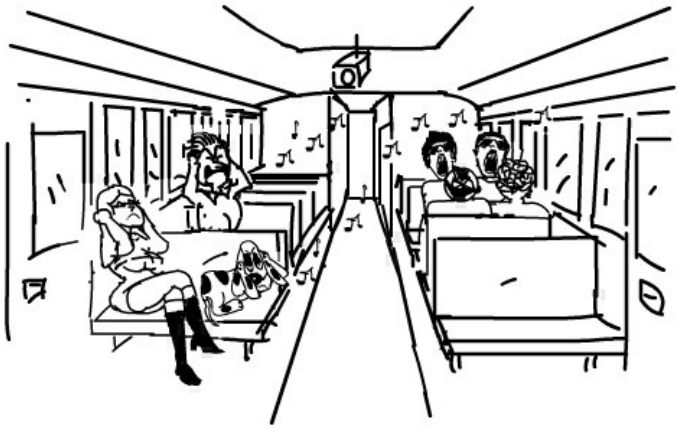
Storyboard #3 “Shouting”	**Objects**
 4. The businessman's voice interrupts the passenger's sleeping. Passenger A wants to ask him to stop but he is failed. **Text Stories** T1: So the sleeping man is waked up by him. T2: So the other person is looking at him. T3: He is chatting so loud, the passenger sitting behind him starts feel annoyed. T4: But sometime later, the gentleman started to make some noise and the guy behind him wanted to stop him. T5: The gentleman is sitting on the chair with his suitcase on his left side on the same chair. A boy is sitting behind him. T6: The conversation over phones wakes up the sleeping passenger. T7: A child wants to steal a packet of a man ☺ T8 (Text balloon): Oh, I will make some sound to wake him! T9 (Text balloon): Passenger A to Passenger C: Would you please turn down your voice? (Passenger C speaks loudly.) T10 (Text balloon): Civilian: let me sing a lovely song for you! :” I love so much…….”	-Suitcase -Passenger C -Seat -Passenger A -Cell phone -Windows
	Relations
	-Passenger C is ***making a phone call.*** -Suitcase is ***lying on*** the bench. -Passenger C is ***devoted in*** his talking. -Passenger A is ***awake.***
	Features
	-Passenger A is ***annoyed.*** -Passenger A ***shows an down expression*** -Passenger C’s ***voice is too loud.*** **-**Passenger C ***is annoying.***
	Observed Objects
	Sleeping guy –O6 A gentleman -O6 Suitcase - O18
	Observed Relations
	Sitting near – R37
	Observed Features
	Voice is too loud –F28 Annoying –F29 Showing an un happy expression- F19

Storyboard #3 “Shouting”	**Objects**
 5. The tied passenger leaves for another quiet place. **Text Stories** T1: He decides to leave to another compartment. T2: The guy is leaving. T3: So the passenger left this compartment and went to another one. T4: After sometime, people come and go. And the carriage was still having few people in it. T5: The boy sitting behind the gentleman leaves the car and moves to the end of the car. (This picture is quite strange! What do you want to tell us? Also page 4?) T6: The one, who was sleeping, walks to another carriage. T7: Another person comes up to the compartment. T8 (Text balloon): Haha, he is awaked by me and leaves. ☺ T9 (Text balloon): Passenger B can’t bear it any more and leave that compartment. T10 (Text balloon): The guy behind him is going to throw up! And leave to another carriage. ☺	-Compartment -Seats -Passenger A -Passenger B -Camera -Windows -Corridor -Passenger C -Cell phone
	Relations
	-Passenger C is ***devoted in*** his talking. -Passenger B is ***looking outside*** of window
	Features
	-Passenger A is ***leaving from*** his ***seat.***
	Observed Objects
	The sleeping man -O6 Compartment- O16
	Observed Relations
	Moving in the compartment- R31 Leaving from one’s seat- R20 Walking –R2
	Observed Features

Storyboard #3 “Shouting”	**Objects**
 6. Later on, he enters another quiet compartment and continues his sleep. **Text Stories** T1: He falls asleep again. T2: There is a sexy lady and the other man sitting in another train compartment. T3: Some passengers are sitting there. T4: Later, a modern lady with a dog got into the carriage, while a man just sat behind the lady. T5: In another car there is a young man and a lady with modern dressing. A dog is lying on the same chair. T6: The passenger continues his sleep in another quiet carriage, where a dog is sleeping next to its owner. T7: A pretty lady, a gentle man and a dog are sleeping. T8 (Text balloon): Heng, I go to another carriage to sleep. T9 (Text balloon): Passenger D and her dog are sitting at another compartment. T10 (Text balloon): Silent carriage, passengers are enjoying the quiet environment! A dog is sleeping quietly aside a fashion lady.	-Compartment -Seats -Camera -Windows -Corridor -Passenger A -Passenger D -Dog
	Relations
	-Passenger A is ***sleeping*** -A ***quiet compartment***
	Features
	-Passenger D is a ***lovely girl*** and she is ***making up.*** -The dog is ***sleeping***
	Observed Objects
	The sleeping man -O6 Lady –O6 Compartment- O16 Dog – O39
	Observed Relations
	Sleeping – R14 Sitting near –R37 Quiet compartment- R32
	Observed Features
	Lying on -F20

Storyboard #3 “Shouting”	**Objects**
 7. However, it was only a short silence. Several soccer fans enter the compartment singing. **Text Stories** T1: Unfortunately, a group of soccer fan comes, singing. T2: Then a couple of Ajax fans get into the train, singing. T3: A couple of young guys come into the train and singing Ajax. T4: Suddenly, a group of Ajax fans stepped into the train, singing loudly. T5: The four boy get on board with singing themselves.. T6: A small chorus gets on the train. T7: A group of students sing songs. T8 (Text balloon): We are the best glee club of the world. T9 (Text balloon): A group of soccer fans get on the train, singing. T10 (Text balloon): Football fan aboard, obviously, their team win the match	-Camera -Gate of compartment -A small group of passengers **Relations** -A small group of passengers are ***Ajax fans.*** -A small group of passengers is ***getting on*** the train. **Features** -Camera is ***looking around.*** -Soccer fans are ***happily singing.*** **Observed Objects** A small group of passengers – O34 **Observed Relations** Singing–R36 Getting on the train- R6 **Observed Features** Voice is too loud –F28

Storyboard #3 “Shouting”	**Objects**
 8. Their voice spreads quickly. **Text Stories** T1: The compartment is full of noise make by the soccer fan. T2: They are singing loudly. T3: They keep singing, so loud. T4: This group of people still kept singing while paid no attention to the people sitting beside them. T5: In the car the four boys are still singing happily and loudly. T6: The chorus is singing in the quiet carriage. T7: They continue singing T8 (Text balloon): Let’s sing our favorite song. T9 (Text balloon): Oh ley oh ley(Song of Ajax) (They are singing the song of Ajax) T10 (Text balloon): Football fan: singing” we are the champion, we are the champion! We will rock you, baby!”	-Compartment -Seats -Camera -Windows -Corridor -Passenger A -Passenger D -Dog -A small group of passengers
	Relations
	--Passenger A is ***sleeping*** -Passenger D is a lovely girl and she is ***making up.*** -The dog is ***sleeping*** -The small group is ***sitting near*** with Passenger A and Passenger D.
	Features
	-Soccer fans are happily singing. - Their voice is ***spreading all over*** the compartment.
	Observed Objects
	Compartment- O16 A small group of passengers – O34
	Observed Relations
	Showing a happy expression -R9 Singing – R36 Sitting near – R37
	Observed Features
	Voice is too loud –F28 Noisy compartment- F50

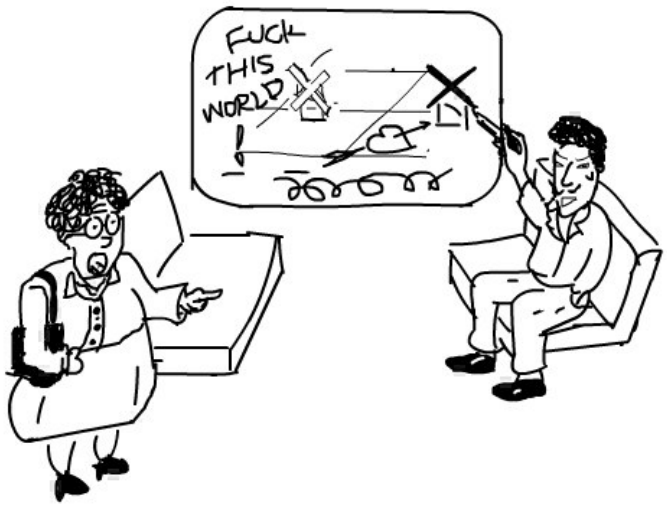
Storyboard #3 “Shouting”	**Objects**
 9. The passengers can't bear them any more. **Text Stories** T1: The people can’t tolerate them anymore. T2: Their voice is so loud that the lady is not happy with that. T3: The young lady and the man get annoyed and so the dog. T4: Obviously, the noise broke up the quietness and the rest people could not stand it any longer. T5: The singing annoys the left passengers. It seems that they feel terrible. T6: Other passengers are disturbed by the song. T7: The lady and gentle man can not suffer the sound. T8 (Text balloon): Oh, it is too noisy! T9 (Text balloon): Passenger A D to Fans: That’s too loud, guys! T10 (Text balloon): Passengers put their hand on their ear. The dog gets up.	-Compartment -Seats -Camera -Windows -Corridor -Passenger A -Passenger D -Dog -A small group of passengers
	Relations
	-The small group is ***sitting near*** with Passenger A and Passenger D.
	Features
	- Passenger D and Passenger A show ***very miserable expressions*** and ***seal their ear.*** - Soccer fans are ***singing*** their voice is ***annoying***
	Observed Objects
	A small group of passengers – O34 The sleeping man -O6 Lady –O6 Compartment- O16 Dog – O39
	Observed Relations
	Observed Features
	Showing a unhappy expression–F19 Sealing one’s ear –F30 Annoying- F29 Noisy compartment -F50

Storyboard #3 “Shouting”	**Objects**
 10. The Ajax fans are shocked by the dog. **Text Stories** T1: Surprisingly, a small dog comes and shouts at those soccer fans. T2: Her dog starts to bark to the Ajax fans. T3: The dog starts barking at those guys. T4: At this time, the dog started to bark and the Ajax fans were annoyed of the barking. T5: The girl’s dog bays to the four boys to make them stop singing. T6: The dog tells the chorus how are the dogs treated when they are too noise. T7: They fight. The dog shouts to the students. T8 (Text balloon): “Wowo” (You are too noisy!). Dog??? T9 (Text balloon): The dog is barking to those fans, the compartment suddenly get a quiet moment. T10 (Text balloon): After breaking lose the ties on its mouth, it barks at the football fan ☺	-A small group of passengers -Dog **Relations** - Soccer fans ***stop singing*** **Features** -The dog is ***barking*** at those fans. -Fans feel ***scared and surprised.*** **Observed Objects** A small group of passengers – O34 Dog – O39 **Observed Relations** Stop singing- R38 **Observed Features** Barking – F30

Storyboard #3 “Shouting”	**Objects**
 11. The compartment gets the quietness back. **Text Stories** T1: The other passengers are quite pleased with that dog. T2: And that young lady is very happy with her dog. T3: And the lady gives this dog praise. T4: Finally, the carriage recovered from the noise and resumed to peaceful and quiet again. T5: It works! The dog is praised by the girl. T6: The dog seems to be more educated than the chorus. T7: The lady is pride of this. T8 (Text balloon): Oh, my nice dog, my baby, well done! T9 (Text balloon): Passenger D: Well done, beila. T10 (Text balloon): Fashion lady: good boy!	-Passenger A -Passenger D -Dog -Compartment -Seats -Windows -Corridor **Relations** - Passengers are ***sitting on*** the bench, dog is ***sitting besides*** Passenger D. **Features** -Passenger A and Passenger D are ***smiling.*** - Passenger D ***lays*** her ***hand on*** the dog **Observed Objects** The sleeping man -O6 Lady –O6 Dog – O39 **Observed Relations** Showing a happy expression–R9 Normal compartment-R32 **Observed Features**

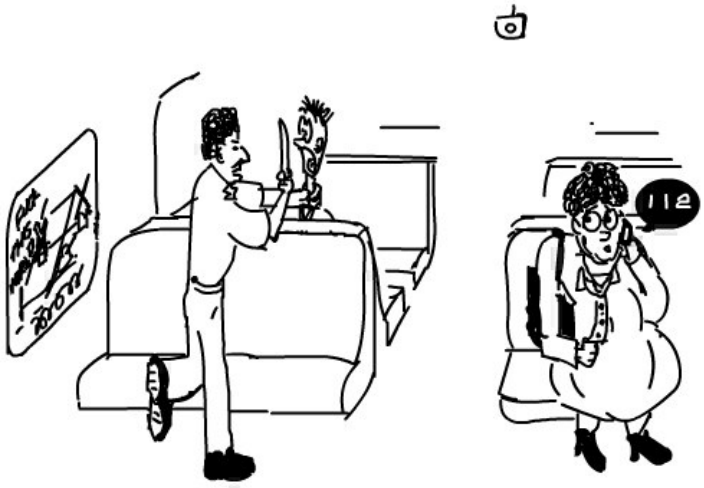
Storyboard #4 “Vandalism”	**Objects**
 1. Passenger A sees a girl is drawing the scene outside of window, then he talks to himself “why not I also make one like that?” **Text Stories** T1: One day a young man saw a painter on the train. T2: A girl is drawing something, and a man also thinks about that. T3: A fair lady is painting the land view on the paper, and a jerk came up to the lady and saw what this lady was drawing. T4: One day on the train, a hairy guy was passing by in a carriage while seeing a lady painting the view sight outside. T5: When train runs smoothly on the way, a lady (or a girl) is drawing nice picture of the scene out of the window. T6: A passenger sees a lady drawing the windmill outside, and he has some idea in his mind. T7: Bank is very boring during these days because he has not finished his master thesis, one day he goes out by train. He saw one lady is painting. ☺ T8 (Text balloon): Somebody is drawing?! T9 (Text balloon): Passenger A: Nice drawing. (After seeing the painting of that girl.) T10 (Text balloon): Doodle painter: come on, man! What are you drawing is nothing. I am the best painter in the world!	-A girl -Passenger A -Compartment -Seats -Windows -Corridor **Relations** -The girl is ***sitting on*** her seat. -Passenger A is ***passing by (moving)*** and thinking. **Features** -The girl is ***drawing*** -The man is ***thinking*** **Observed Objects** A girl –O6 A man -O6 **Observed Relations** Think–R5 Moving, pass by – R31 **Observed Features** Drawing – F32

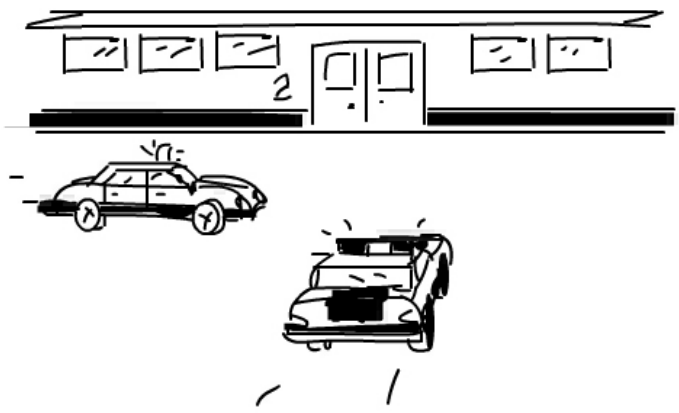
Storyboard #4 “Vandalism”	**Objects**
 2. He really appreciates with his panting on the window. **Text Stories** T1: Then he draws some offensive pictures on the window of the train. T2: So the man is drawing on the glass of window. T3: The lady’s drawing awake the jerk’s intuition and he starts to draw some garbage on the window of the train and also writes down some dirty words. T4: “What a good thought” the guy thought. And he started to doodle on the train window. T5: After seeing this, a young man who pass by the lady, intends to make a drawing too. T6: The passenger scrawls over the window. T7: He makes a picture which can shows what he is thinking. In the picture he makes windmills and he wants to make a girl friend in Holland but he failed. So he write “fuck this world” ☺ T8 (Text balloon): En, nice picture should be drawn on the window. Wa, nice. T9 (Text balloon): Passenger A: How about my drawing? Not bad ….Hey (He is showing off his graffiti on the window) T10 (Text balloon): Doodle painter: let me show you how to draw.	-Passenger A -Compartment -Seats -Window **Relations** -Passenger A is ***sitting on*** the bench. **Features** -Passenger A is ***drawing*** on the window ***-Dirty words.*** **Observed Objects** Windows- O20 A man -O6 **Observed Relations** Be on–R27 **Observed Features** Drawing-F32 Dirty Words- F33

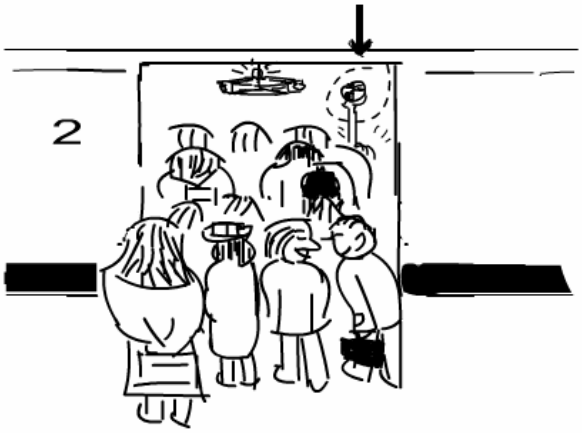
Storyboard #4 “Vandalism”	**Objects**
 3. An old woman is surprised by the window drawing then starts blaming him, but he feels nothing at all. **Text Stories** T1: An old woman told this young man it is not allowed. T2: An old lady tries to stop him. T3: An old lady told this young man stop drawing on the window because it is not allowed. T4: At this moment, an old lady passed by and saw the hairy man’s behavior. “Stop it, young man, what are you doing” said the old lady. But the man did not pay attention to her. T5: Then the man starts drawing on the window with a lot of dirty words. T6: A lady warns the graffiti. T7: One Dutch lady sees the picture. She is very surprise for that. She thinks it is not polite to make this picture in Holland. ☺ T8 (Text balloon): You can’t paint on the windows of the train. Shit, fuck. T9 (Text balloon): Passenger B: How dare you do it on the train…….? That is not allowed. Passenger A: It’s none of your business, isn’t it? T10 (Text balloon): Lady: hey, lad, it is not allowed to scratch on the train window. Doodle painter: come on, lady! It is art. Art is everywhere! ☺	-Passenger A -Compartment -Seats -Window -Old lady -Suitcase **Relations** -Passenger A is ***sitting on*** the bench. -An old lady is ***passing by (moving).*** -They ***start a conversation*** **Features** -Passenger A is ***drawing*** on the window - ***Dirty words.*** - An old lady ***shows*** a ***blaming*** him. - An old lady ***shows*** a ***surprising expression*** **Observed Objects** A man -O6 An old lady- O6 **Observed Relations** Conversation–R24 **Observed Features** Showing a warning gesture-F24 Surprised –F6

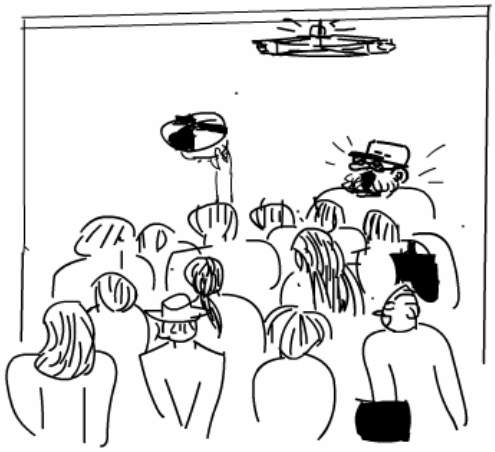
Storyboard #4 “Vandalism”	**Objects**
 4. A young guy says just same as the old lady, the Passenger A begins to lose patience. **Text Stories** T1: The guy sitting behind him also said so. T2: Another young man also points out that he is not right. T3: The other guy also said the jerk should stop his behavior. T4: In the same time, the guy sitting behind the hairy man found it and had a fight with the hairy man. T5: A madam comes by and gives the man a lecture, but no use. T6: The passenger is angry at another condemnation. T7: Another guy say to bank “if you make this kind of photos you must go out of Holland” ☺ T8 (Text balloon): What that lady said is right. You can’t paint on the windows of the train. T9 (Text balloon): Passenger C: It is not right to do so, you will get punished. Passenger A: Believe or not, I will give you a lesson if you don’t stop talking. T10 (Text balloon): Justical man: I will call 112 Doodle painter: come on man, if you call the police, I gonna kill you!	-Passenger A -Compartment -Seats -Window -A young guy -Knife
	Relations
	-Passenger A and the young guy ***start a conversation***
	Features
	-Passenger A is showing a ***very angry expression.*** - A young guy is ***surprised*** - A young guy is showing ***blaming*** gesture. -Passenger A is ***holding a knife.***
	Observed Objects
	A man -O6 A young guy -O6 Knife- O41
	Observed Relations
	Sitting behind–R37 Conversation – R24 Holding sth in hand- R50
	Observed Features
	Warning ,blaming gesture- F24

Storyboard #4 “Vandalism”	**Objects**
 5. The hooligan is indeed on fire. **Text Stories** T1: The young man frightened by the guy‘s knife. T2: This man is rude and he takes out a knife on his hand. T3: But the jerk got mad; he wants to kill the guy with his knife. T4: The hairy man was angry and threatened the guy with a knife in his hand. ”Shut up or I will kill you” said the hairy man. T5: After a boy sitting behind the man told the man that is it not allowed to draw on the windows. T6: The passenger menaces with a knife. T7: Bank takes out of a knife and say to that guy ”shut up your mouth” T8 (Text balloon): Shut up! Otherwise, I will kill you. T9 (Text balloon): Passenger C: What a weirdo! Passenger A: You can try to say it again. (Passenger A takes a knife out and threatens the Passenger C) T10 (Text balloon): Doodle painter: Damn it. Do you see this knife	-Passenger A -Compartment -Seats -Window -A young guy -Knife
	Relations
	-Passenger A is ***kneeing on*** the chair.
	Features
	- Passenger A is ***collaring*** the young guy -Passenger A is ***showing a very angry expression.*** - A young guy shows a ***scared and frightened expression*** -Passenger A is ***holding a knife.*** - The young guy is ***under attack.***
	Observed Objects
	A man -O6 A young guy -O6 Knife- O41
	Observed Relations
	Conversation – R24 Holding sth in hand- R50
	Observed Features
	Warning ,blaming gesture- F24 Collaring – F12

Storyboard #4 “Vandalism”	**Objects**
 6. At this moment, the old lady calls the police "112". **Text Stories** T1: The other people keep quiet because they are frightened by the knife. T2: Then the old lady is calling the policeman. T3: The old lady saw this situation and she decided to call the policeman. T4: At this moment, the old lady called the police immediately. And for sure, the video camera on the top caught everything what happened just now. T5: But the man is angry and uses a knife to scare the boy. The madam calls 112 immediately. T6: A lady calls the police for help. T7: Other guys think that he should call the police; otherwise there will be a fight. T8 (Text balloon): Hello, policeman, there is somebody threat one passenger in the train using a knife. T9 (Text balloon): Passenger C: Help!!!!!! Passenger B looks at this, dial the railway police “112”. T10 (Text balloon): lady: 112,112, there is some problem	-Passenger A -Compartment -Seats -Window -A young guy -Knife -Cell phone -An old lady -Suitcase
	Relations
	-Passenger A is kneeing on the chair. -Passenger A and the young guy are talking.
	Features
	-An old lady is ***calling. “112”.*** -Passenger A is ***holding a knife.*** - Passenger A is ***collaring*** the young guy
	Observed Objects
	A man -O6 A young guy -O6 An old lady-O6 Knife- O41
	Observed Relations
	Making a phone call–R28
	Observed Features
	Call the police – F35

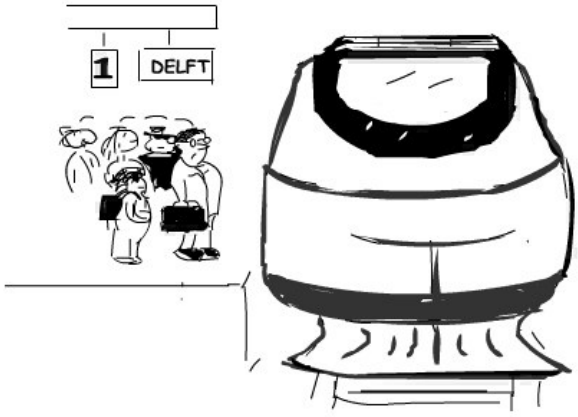
Storyboard #4 “Vandalism”	**Objects**
 7. The police are waiting for him at the next station. **Text Stories** T1: The policeman finally arrived at the train. T2: So the police come. T3: Two police car came. T4: Several minutes later, when the train stopped in one station, the police was coming. T5: The policemen come and the boy is safe. T6: The policemen come and wait at the station. T7: The police is coming T8 (Text balloon): The police man is coming within a short time. When you in such a case, please call the police! T9 (Text balloon): Police comes to that compartment. T10 (Text balloon): Police is coming	-Train -Platform -Police cars
	Relations
	-Train is ***arriving at*** the next station - Police cars are ***arriving at*** the next station.
	Features
	-Police Cars
	Observed Objects
	Police car –O42 Train-O1
	Observed Relations
	Arriving–R49
	Observed Features

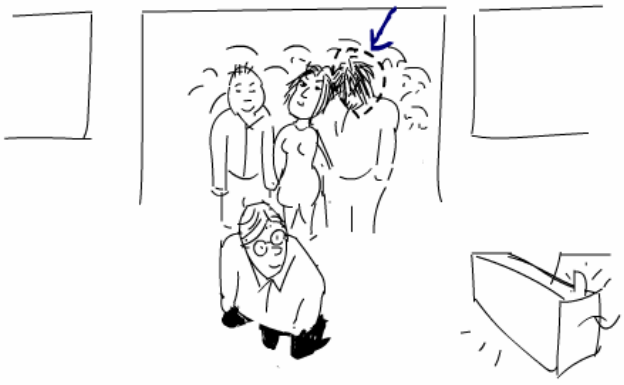
Storyboard #5 “Get on and off”	**Objects**
 1. The train arrives at the station, passengers start to get onboard, nobody is aware of that the last passenger hasn't got off yet, even she begins yielding. **Text Stories** T1: Many people try to get on the train. T2: There are a lot of people are waiting for getting on the train. T3: Crowds want to get on the train. T4: One day, the train was so crowed. Someone was waving a hat and wanted to make a notice, but nobody paid attention. T5: When a lot of passengers are moving into the car, someone intend to get out of the car with his raising hat. T6: The train stops and passengers are boarding. Something happens in the train. (Don’t know what exactly.) T7: Lots of people are watching a film T8 (Text balloon): Passenger A: Stupid people buy the tickets to get on the train. Let me buy the tickets. No way! T9 (Text balloon): A train arrived at the station, people starts rushing to the compartment. T10 (Text balloon): Suddenly, a hat is in the air	-Gate of the compartment - A hat - A lot of Passengers -Camera
	Relations
	-Camera is ***looking around.*** -The crowd is ***getting on*** the train.
	Features
	-A hat is ***being hung in the air.***
	Observed Objects
	Passengers –O11 Hat –O43
	Observed Relations
	Getting on the train–R6
	Observed Features
	Holding sth in the air- R41

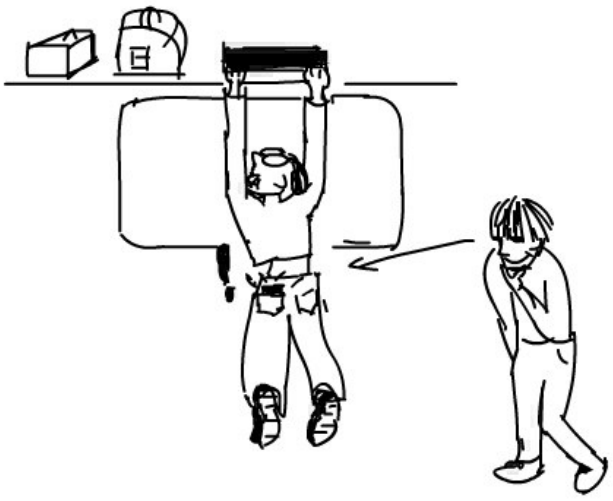
Storyboard #5 “Get on and off”	**Objects**
 2. The conductor comes up to help. **Text Stories** T1: But there is still a young girl wants to get off the train since there are many people try to get in, she can’t get off immediately. T2: Somebody is holding something with his hand. T3: Because this little girl is so little, no one can see her from behind. T4: At this time, the train attendant noticed that and spoke loudly to make everybody’s attention. T5: The alarm rings and the ticket conductor come by, but the door of the car is still crowded. T6: The conductor comes. T7: Bank shout out at that time T8 (Text balloon): So many people. Crowd! T9 (Text balloon): There is a people wants to get off but he/she is blocked by the crowd. T10 (Text balloon): STEWARD: listen, everybody! There is little girl wants to take off the train. Please let her go first!	-Gate of the compartment - A hat - A lot of Passengers -Camera -Conductor **Relations** -Camera is ***looking around.*** -The crowd is ***getting on*** the train. -Conductor ***shows up.*** **Features** -A hat is being ***hung in the air.*** -Conductor is ***shouting*** **Observed Objects** Passengers –O11 Conductor – O5 Hat –O43 Camera-O14 **Observed Relations** Getting on the train- R6 **Observed Features** Crowded – F38 Noisy – F50 Alarming - F46

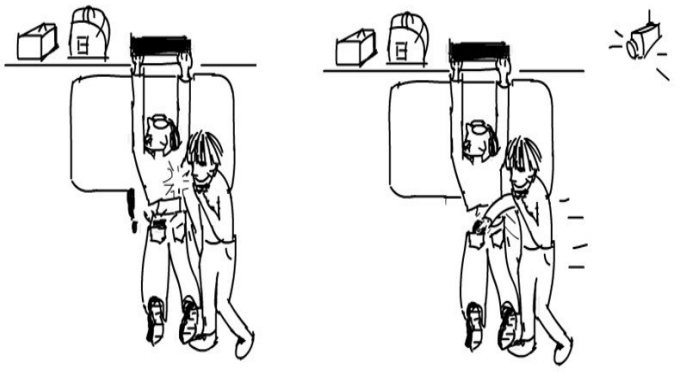
Storyboard #5 “Get on and off”	**Objects**
 3. The passengers now know that there is a very little girl. **Text Stories** T1: The conductor told the public that they should keep a way for the girl. T2: Then the conductor sees that hand, and tries to stop him. T3: The conductor shows everybody that girl wants to get off. The conductor holds the crowd and said let the little girl first take off. T4: After sometime, a little girl holds the hat with unhappy face. T5: The ticket conductor asks passengers to let to girl get off the car first. T6: It is something has to do with a girl. T7: The manager of the cinema finds bank out T8 (Text balloon): Please get on the train in sequence. Slowly, one by one. Don’t crowd! Take care of children! T9 (Text balloon): The conductor sees the situation and tries to help her. T10 (Text balloon): We are sorry! We didn’t see this lovely girl.	-Gate of the compartment - A hat - A lot of Passengers -Camera -Conductor -A little girl **Relations** -Camera is ***looking around.*** -The crowd is ***getting on*** the train. -Conductor is ***holding*** little girl’s hand. **Features** - A girl wants to ***get off.*** - The girl shows an ***unhappy expression.*** **Observed Objects** Passengers –O11 Conductor – O5 A little girl –O6 **Observed Relations** Getting on the train- R6 Getting off the train- R42 **Observed Features** yelling – F36 Unhappy face- F19

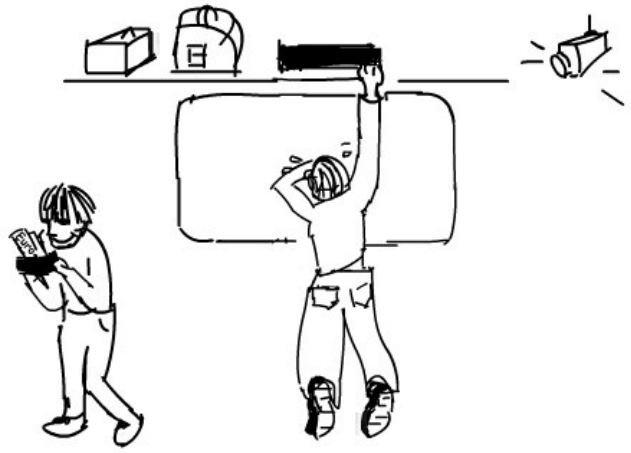
Storyboard #5 “Get on and off”	**Objects**
 4. The conductor makes a way for the little girl. **Text Stories** T1: Later she successfully leaves the train. T2: The camera can see the thing if you lift something very high. ☺ T3: Now everybody get informed that they make one way and let the little girl get off the train. T4: Finally, the girl with the hat on head separated the crowed people into two ordered lines. With the help of the girl, the train attendant finally kept the people in queue to get into the train. T5: The girl gets of the car happily. T6: … T7: The manager of the cinema finds bank out T8 (Text balloon): Please stop! Let this child get off the train first! T9 (Text balloon): Conductor asks the other passengers to make a way for this little passenger successfully. T10 (Text balloon): Black passenger: tickets? No way!	-Gate of the compartment - A lot of Passengers -Camera -Conductor -A little girl
	Relations
	- Camera is ***looking around.*** -Conductor ***shows “good-bye” gesture.*** - A girl is ***getting off*** from the crowd. - The girl ***shows*** a ***happy expression.***
	Features
	-The crowd ***stops boarding.*** -The crowd ***makes a way*** for the little girl.
	Observed Objects
	Passengers –O11 Conductor – O5 A little girl –O6
	Observed Relations
	Showing a happy expression–R9 Getting off the train – R42
	Observed Features
	Crowd Particle Movement – F37

Storyboard #6 “Pickpocket”	**Objects**
	-Information board “Platform 1” of “Delft” -Train -A lot of Passengers - Track
	Relations
	- Passengers are ***standing at*** platform and ***waiting for*** the train. - Train is ***arriving.***
	Features
	-Crowded platform
1. It is rush hour in an early morning; people are waiting for the train at Delft station.	**Observed Objects**
	Passengers –O11 Platform –O2 Train -O1 Information board- O3
Text Stories T1: All the passengers waited for the train’s coming at Delft Station. T2: People are waiting for the train’s coming at Delft station. T3: Passengers are waiting for getting on the train. T4: A train stopped at the station of Delft. T5: A lot of passengers are waiting for getting on to the train the Delft central station platform No.1. T6: A train is leaving from Delft station. ☺ T7: Many passengers are waiting for the train in Delft. T8 (Text balloon): The train is coming. So many people are waiting the train in the platform. T9 (Text balloon): Train is coming to the Delft Station. T10 (Text balloon): Train coming at delft station	**Observed Relations**
	Standing at – R23
	Observed Features
	Many passengers, Crowded – F38

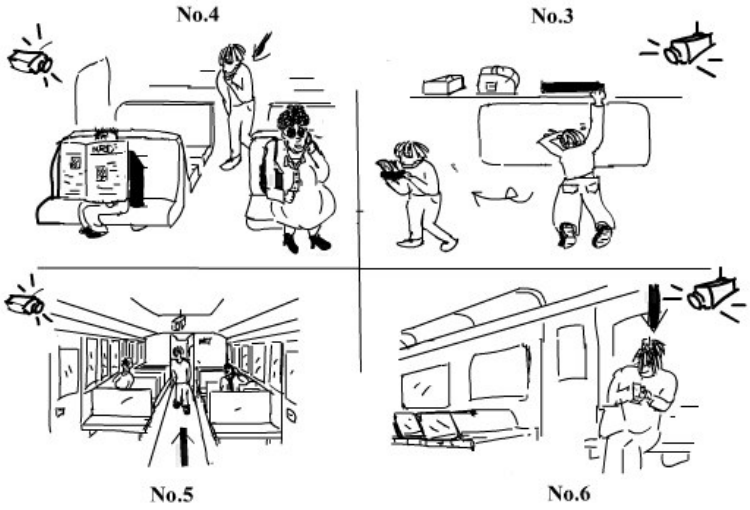
Storyboard #6 “Pickpocket”	**Objects**
 2. People enter the train, camera scans people's facial expressions, and one of the passengers looks strange. **Text Stories** T1: A guy looks like a thief followed with mass and came into the train. T2: People begin to get in, but there is guy looks strange. T3: I don’t understand. ☺ T4: A lot of people were getting into the train; one of them was walking with head down. T5: When the passengers are going into the car, the camera facing the door recognizes a thief. T6: A special passenger boards on the train. T7: A person falls to sleep. T8 (Text balloon): Some peeper is peering a young lady. ☺ T9 (Text balloon): Crowd get onto the train, a thief comes along with the group. T10 (Text balloon): A thief doing his work on a lady, when the door it getting closed	-Compartment -Gate of the compartment - Crowd -Camera
	Relations
	- Passengers are ***getting on*** the train. -One passenger is ***looking up at*** the camera.
	Features
	-One passenger looks ***weird.*** -***Crowded*** compartment. - One passenger is ***lower his head*** to the floor.
	Observed Objects
	A man -O6 Passengers - O11
	Observed Relations
	Getting on the train – R6
	Observed Features
	Crowded – F38 Thief – F48 Head down pose – F39

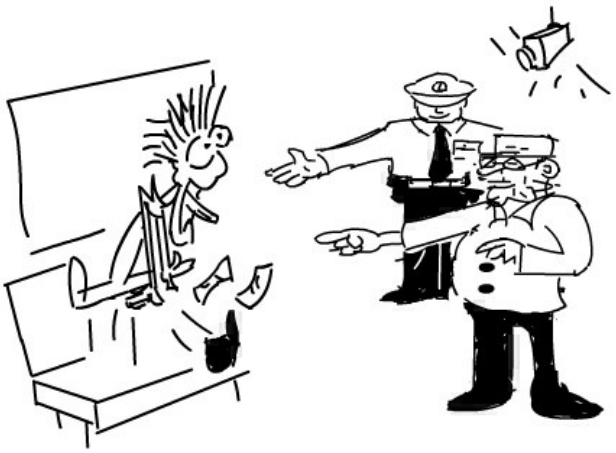
Storyboard #6 “Pickpocket”	**Objects**
 3 Passenger A is trying to put his luggage onto the rack while a pickpocket is passing by, and he is interested with unprotected wallet. **Text Stories** T1: The guy stirring at one person who is taking his suitcase on the shelf. While his wallet is left on the back pocket of his trousers. T2: He sees the other people’s pockets. T3: A thief sees that one passenger’s wallet is not fully protected. T4: One of the passengers was tidying up his package, while the man who walking with head down just now was staring at the wallet. T5: A man is putting his suitcase onto the shelf. The thief feels that it is good chance to steal the man’s wallet. T6: He is a thief and gets his target. T7: A thief wants to steal his pocket. T8 (Text balloon): Oh, somebody is getting his bag. Oh, I find his purse. T9 (Text balloon): Thief: god blesses me. (A good chance for him to steal a un protected wallet) T10 (Text balloon): The thief sees the purse on the back pocket of a man who is putting baggage on the rack.	-Rack -luggage -A thief -Passenger A -Wallet -Window **Relations** -Passenger A is ***putting*** his ***luggage onto the rack.*** -Another passenger is ***passing by.*** **Features** -The Wallet of Passenger A is ***exposed.*** -A thief is ***peering (looking) at*** passenger A’s wallet. **Observed Objects** A thief -O50 A passenger -O6 Suitcase -O18 Wallet – O40 Rack – O17 **Observed Relations** Putting the luggage on the rack –R43 Looking at , see – R10 Walking – R2 Moving –R31 **Observed Features**

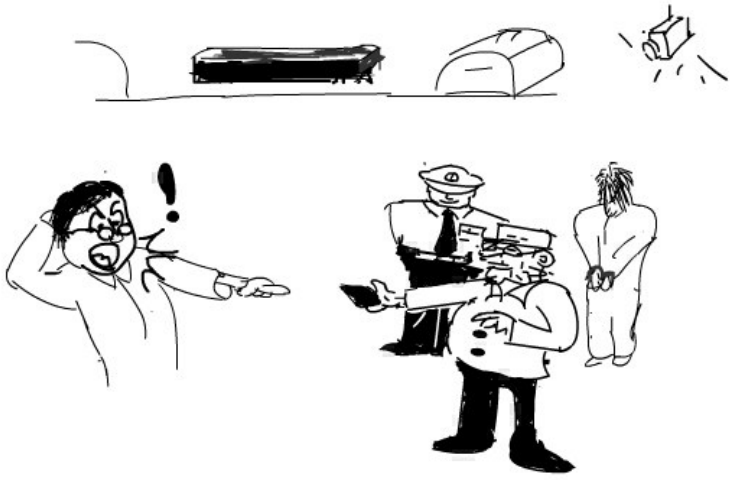
Storyboard #6 “Pickpocket”	**Objects**
 4 Stealing. **Text Stories** T1: The thief first hits the target passenger, and then suddenly takes away his wallet. T2: Then he steals the wallet while the person is putting his luggage. T3: Then he decided to take some action, he slowly close to that passenger and takes his wallet out of his pocket. T4: The thief successfully stole the wallet from the passenger. T5: The man is focus on putting his suitcase and hasn’t seen the thief. Then his wallet is stolen. T6: He steals a wallet. T7: The camera turns to him, the thief. T8 (Text balloon): Walk off with it! T9 (Text balloon): The thief is stealing the wallet, but the camera notices that. T10 (Text balloon): Thief: Haha, got it	-Rack -luggage -A thief -Passenger A -Wallet -Window -Camera
	Relations
	-The Wallet of Passenger A is ***exposed.*** -Passenger A is ***putting his luggage to the rack.*** -Another passenger is ***passing by.*** -Camera is ***looking around.***
	Features
	-- A thief first pretends to ***hit*** the man with no conscious. **-** A thief is ***stealing.***
	Observed Objects
	A thief -O50 A passenger -O6 Wallet – O40
	Observed Relations
	Putting the luggage on the rack –R43
	Observed Features
	hitting-F40 Stealing -F41 Hooligan – F47

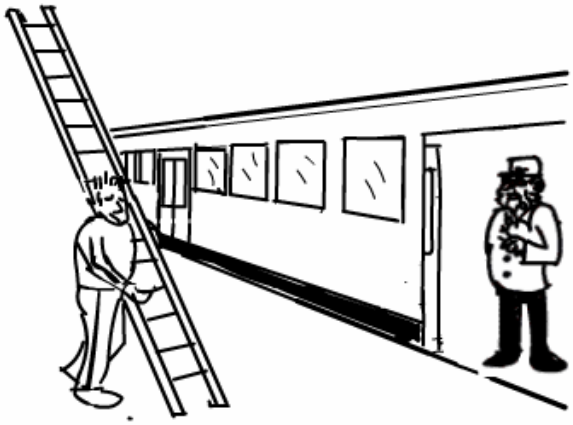
Storyboard #6 “Pickpocket”	**Objects**
 5 The thief gets the wallet and seems very happy, but the Passenger A didn’t know that. **Text Stories** T1: The thief is happy with the cash in the wallet. T2: He gets the wallet. T3: The passenger didn’t notice it, and he’s still trying to put his luggage on the shelf. T4: The passenger was still tidying up this package and didn’t realize his wallet was stolen by the thief. T5: The thief takes out of the money and looks quite happy. The whole procedure is captured by the cameras in the car. T6: He takes a look at the cash. T7: The thief gets what he wants. T8 (Text balloon): So much money. T9 (Text balloon): Theif: A piece of cake. (It‘s really easy to get the wallet) T10 (Text balloon): Thief: Woo! A lot of money,	-Rack -luggage -A thief -Passenger A -Wallet -Window -Camera -Money **Relations** -Passenger A ***finishes tidying up*** his luggage. -Passenger A is ***sweeping sweat.*** **Features** -Passenger A didn’t notice the wallet has gone. -Thief is ***very happy.*** -Thief is ***checking*** the money inside the wallet. **Observed Objects** A thief -O50 A passenger -O6 Wallet – O40 Camera – O14 Money – O45 **Observed Relations** Putting the luggage on the rack –R43 Look at money – R10 **Observed Features** Thief – F48

Storyboard #6 “Pickpocket”	**Objects**
 6. Smart camera launches the alarm and the train staff has been informed. **Text Stories** T1: The colleague finds this event on the computer screen. The policeman is noticed T2: But the people works with the camera sees this, and then he tells to the conductor and policeman. T3: The camera recorded these actions and transmits the image to the central control station. And conductor calls policeman. T4: The surveillance controller saw the thief on the screen and called the police. T5: The guard informs the ticket conductor and policeman on the train. T6: The thievery is reported to the conductor and the police. T7: Police catch the photo of the thief. T8 (Text balloon): Police and train attendant, some thief is on the train. He stolen one passenger’s purse. T9 (Text balloon): After conductor seeing the all the process, he calls the police. T10 (Text balloon): In the control room, everything is recorded. The controller calls the police and the steward.	-Operator in the Control Center - Policeman -Conductor - Surveillance screen -Handie-talkie **Relations** -The operator is sending message to the conductor and policeman. -Conductor and Policeman are receiving the message. - The Screen is showing the thief being tracked. **Features** -Operator is ***speaking*** and ***pushing a button.*** **Observed Objects** Controller –O5 Conductor-O5 Policeman-O23 PC Screen – O51 **Observed Relations** Making phone call – R28 **Observed Features** Alarming – F46

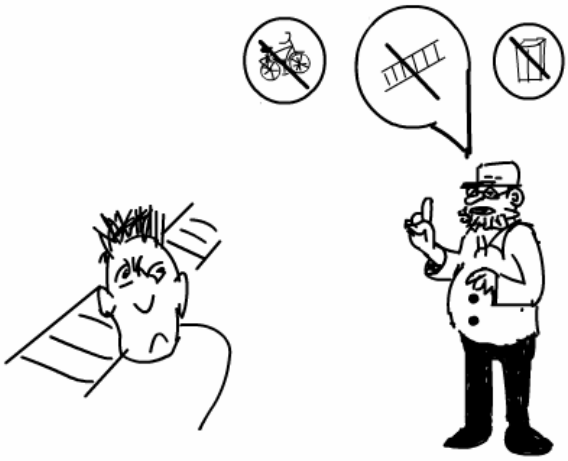
Storyboard #6 “Pickpocket”	**Objects**
 7. The suspect has been tracked stealthily throughout the train. **Text Stories** T1: With help of the cameras at different compartment, the thief is traced. T2: Everything the thief has done is recorded by the camera and the person is being watched. T3: The policeman takes a look at this man’s image and starts to search this man throughout the train. T4: The record showed what the thief did and where he was at that moment. T5: He told also inform the exact position of the thief. T6: The thief walks to another carriage. T7: The whole pictures are shown again. T8 (Text balloon): The monitor is always watching on you on the train. ☺ T9 (Text balloon): The colleague of conductor: Now the thief is moving to No .6 (The camera is tracking that thief) T10 (Text balloon): The thief count the money happily just under the camera. ☺	-A thief -Camera -Compartments -Other passengers -Windows -Seats -Corridor -Gate **Relations** -The camera is keep tracking the object and transferring the instant images to the surveillance system **Features** -The thief is ***moving through*** the different compartments. **Observed Objects** Thief –O50 Camera -O14 Compartment- O16 **Observed Relations** Moving – R31 Walking – R2 Looking at – R10 **Observed Features**

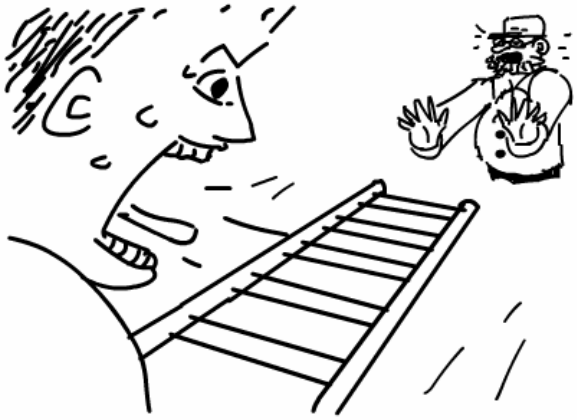
Storyboard #6 “Pickpocket”	**Objects**
 8. The thief is surprised when he was been found by the policeman and conductor.	-A thief -Camera -Conductor -Policeman -Wallet -Bench -Window
	Relations
	-The policeman and conductor are ***standing*** before him. - Wallet is ***falling down.*** - Policeman and conductor are ***pointing to*** the guy. -Camera is ***looking around.***
	Features
	-The thief is ***surprised.*** - The thief is ***jumping*** off the bench.
Text Stories T1: Finally, the thief is been found sited at one of the compartment after he passed several compartments. T2: The thief is surprised. T3: Finally, the policeman found that the thief just seated on one chair. T4: Polices found the thief very soon and arrested him. T5: Finally, the ticket conductor and the policeman capture the thief. T6: The conductor and the police find the thief. T7: The thief is found by the police. T8 (Text balloon): You are the thief. You are under arrest! T9 (Text balloon): Policeman: now, you are arrested! Thief: how comes? T10 (Text balloon): The thief shocked largely when he see the police	**Observed Objects**
	Thief –O50 Policeman –O23 Conductor- O5 Chair – O32 Wallet – O44
	Observed Relations
	Sitting on – R13
	Observed Features
	Arresting – F17 Surprised – F6

Storyboard #6 “Pickpocket”	**Objects**
 9. Passenger A is shocked when he saw the wallet returning by the conductor. **Text Stories** T1: Then the policeman comes and arrested the thief; they returned the wallet to the passenger. T2: The wallet has been found and returns to the owner. T3: The thief got caught by the policeman. By then the passenger just finds out that his wallet has been stolen. T4: Polices return the lost wallet to the owner. T5: The wallet is then returned. T6: The wallet is return to the owner. T7: The police return the pocket to its loser. T8 (Text balloon): Dear passenger, you purse is stolen just now. We have got the thief. And this is yours. Be careful! T9 (Text balloon): Policeman: here is your wallet, sir! Passenger: Ah….Thanks a lot, I am even not aware of that. T10 (Text balloon): Steward: Here is your purse. Be careful on the train	-A thief -Camera -Conductor -Policeman -Wallet -Rack -luggage -Passenger A **Relations** -Conductor is ***giving*** the wallet to the owner. - The thief is ***arrested*** by policeman -Luggage ***is on*** the rack. **Features** - Passenger A is ***surprised.*** **Observed Objects** Thief –O50 Policeman –O23 Conductor- O5 A passenger – O6 Wallet – O44 **Observed Relations** Passing, giving –R46 **Observed Features**

Storyboard #7 “Ladder carrier”	**Objects**
 1. A guy wants to get into the train with a long ladder. **Text Stories** T1: A man with a ladder he wants to get on the train. T2: A person is carrying a ladder and he is trying to get into the train. T3: A man who is carrying a ladder wants to get on the train. T4: A guy with a long ladder was heading to a train, where a train attendant was standing by. T5: A man with a ladder is going to get on the train. T6: A passenger comes with a ladder. T7: bank wants to take a ladder onto the train. T8 (Text balloon): I need to take a ladder onto the train. T9 (Text balloon): A passenger with a ladder wants to get on the train. T10 (Text balloon): Porter: stupid car! I must take this ladder home by train	-Platform -Train -Gate -Conductor -Passenger A -Ladder **Relations** -Conductor is ***standing at*** the gate of the train. -A passenger is going to ***get on*** the train. **Features** - A passenger with ***a long ladder.*** **Observed Objects** Conductor-O5 A man -O6 Ladder –O47 **Observed Relations** Getting on the train- R6 Holding sth in hand- R50 **Observed Features**

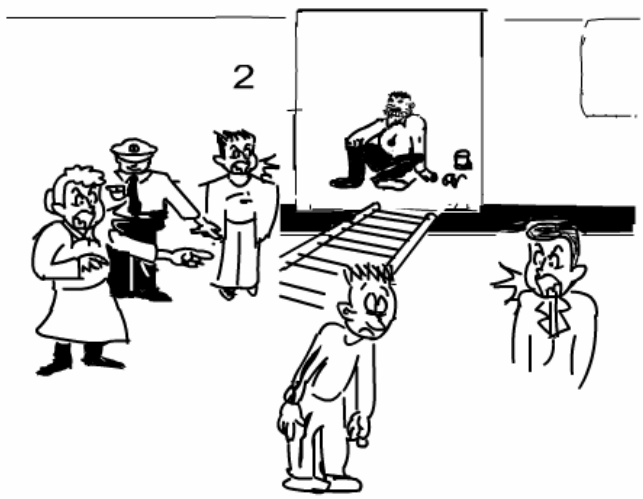
Storyboard #7 “Ladder carrier”	**Objects**
 2. The conductor says it is not allowed. **Text Stories** T1: But conductor refuses him to get on aboard. T2: But the conductor stops him. T3: But conductor said NO. T4: Obviously, the train attendant did not want this guy to be in the train. T5: But the ticket conductor does not allow him to get on board. T6: The conductor tells his that the ladder can not go into the train. T7: But the client of the train does not allow this action. T8 (Text balloon): Sorry, you can’t take the ladder onto the train. T9 (Text balloon): Conductor: Hello, sir, it is not allowed to get on the train if you have it with you. Passenger A: Why? I have paid for the ticket. T10 (Text balloon): STEWARD: sir, it is not allowed to take the ladder with you on board.	-Gate of the train compartment -Conductor -Passenger A -A long ladder -Camera **Relations** -Passenger A wants to ***get on*** the train with the long ladder. **Features** -Conductor ***shows “stop” gesture.*** **Observed Objects** Conductor-O5 A man -O6 Ladder –O47 **Observed Relations** Getting on the train – R6 **Observed Features** Stop ,“NO” gesture – F44

Storyboard #7 “Ladder carrier”	**Objects**
 3. The guy is not happy with conductor’s explanation.	-Conductor -Passenger A -A long ladder
	Relations
	-Conductor is ***explaining*** -They ***start a conversation***
	Features
	-Passenger A seems ***disagree with that.*** **-**Passenger A is ***showing unhappy expression.***
	Observed Objects
Text Stories T1: The conductor told him that is not allowed to get on aboard with ladder, bike and large furniture. T2: He said that Bike, Ladder…is not allowed boarding to the train. T3: Then he explains some rules to this young man. T4: The train attendant announced to the man that no ladder, no cabinet and no bicycle were allowed to the train. T5: The ticket tells him that the ladder, bicycle and very big bag are not allowed to take on to the train. T6: The conductor explains to the passenger what are forbidden for the train. T7: The client of the train explains the reason. T8 (Text balloon): Bicycle, ladder and big cabinet are not allowed to be taken onto the train. T9 (Text balloon): Conductor: According to our rules, Bike, Ladder and the other big furniture are not allowed to take on the train. T10 (Text balloon): Porter: why? STEWARD: it is the rule! Not only ladder, but also other dangerous baggage	Conductor-O5 A man -O6 Ladder –O47 Unfolded Bike –O52
	Observed Relations
	Getting on the train – R6 Conversation – R24
	Observed Features
	Explaining gestures – F7 Disagree expression – F45

Storyboard #7 “Ladder carrier”	**Objects**
 4. The guy is getting angry, and tries to force-land. **Text Stories** T1: He started to get angry with the conductor and shouted at the conductor. But the conductor still insists on refusing him. T2: The man is very angry and he is shouting to the conductor. T3: The young man feels these rules are unacceptable. T4: The man with ladder seemed to be angry and yelled at the train attendant. He wanted to rush to the train, but the train attendant warned him not to do that. T5: The man is angry and rushes to the ticket conductor. T6: The passenger was angry at the conductor, T7: Bank thinks it is not fair. T8 (Text balloon): Keep away! Leave the door! T9 (Text balloon): Passenger A: Why is that? I must take right now, how can I do? Conductor: No, you can’t. T10 (Text balloon): Porter: out off my way, I must take it with me.	-Conductor -Passenger A -Ladder
	Relations
	-Passenger A is trying to ***get on*** the train.
	Features
	-Passenger A is ***angry***. -Conversation in ***yelling.*** -Conductor tries to ***stop*** Passenger A. -Passenger A is ***rushing*** at the conductor.
	Observed Objects
	Conductor-O5 The man -O6 Ladder –O47
	Observed Relations
	Getting on the train – R6
	Observed Features
	Rushing, fast moving – F4 Yelling – F36 Angry expression – F9 Speaking fiercely – F10

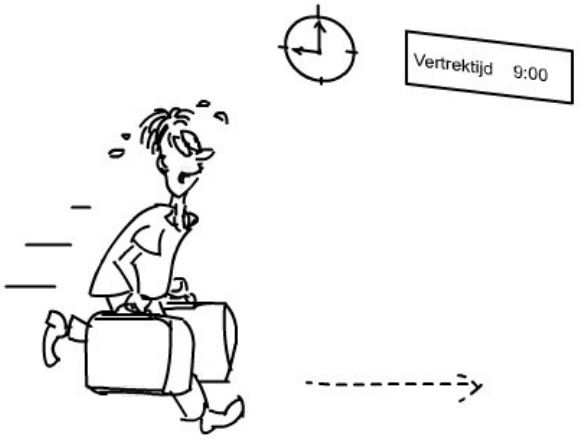
Storyboard #7 “Ladder carrier”	**Objects**
 5. The guy knocks the conductor down. **Text Stories** T1: Surprisingly, he starts to hit the conductor with his ladder. T2: And the conductor is knocked down. T3: He starts to attack the conductor with his ladder. T4: The man pushed down the train attendant with the ladder and still yelled at him. T5: The man uses the ladder to knock the ticket conductor down on the floor. At the same time the alarm rings. T6: … and knocks over the conductor. T7: Bank pushes down the client of the train. T8 (Text balloon): No, no, you can’t…. T9 (Text balloon): Passenger A: go away, I must take it. Conductor: No…. Passenger A use the ladder knocks the conductor. T10 (Text balloon): Porter hits the steward with ladder	-Camera -Conductor -Passenger A -Ladder
	Relations
	Features
	-Passenger A ***hits*** the conductor ***down.*** -Passenger A is ***angry.*** -Conductor is ***sitting on*** the floor. -Conversation in ***yelling.*** -Camera is ***alarming.***
	Observed Objects
	Conductor-O5 The man -O6 Ladder –O47
	Observed Relations
	Observed Features
	Knocked down , hitting down – F40 Lying on – F20

Storyboard #7 “Ladder carrier”	**Objects**
 6. At this moment, some people comes and holds him back. **Text Stories** T1: The conductor is badly injured; T2: But everything is recorded by the camera and someone is trying to stop him. T3: The conductor is falling down and gets hurt on his chest. T4: When the man with ladder wanted to walk across the train attendant, someone stopped him. T5: The man is shocked by the alarm. T6: Somebody stops the passenger. T7: The client called the police T8 (Text balloon): Oh, my god. The ladder runs me down. T9 (Text balloon): Passenger A attempts to beat the conductor, however, other passenger hold him back. T10 (Text balloon): Just when the porter thinks his violence is effectual and wants to get on the train, a hand draws him from behind.	-Camera -Conductor -Passenger A -Ladder -Hands -Shoulder
	Relations
	Features
	-Passenger A ***hits*** the conductor ***down.*** -Passenger A is ***angry.*** -Conductor is ***sitting on*** the floor. -Conversation in ***yelling.*** -Camera is ***alarming.*** -Someone’s ***hands*** are ***on*** the guy’s shoulder.
	Observed Objects
	Conductor-O5 The man -O6 Ladder –O47 Camera – O14
	Observed Relations
	Lay one’s hand on – R39
	Observed Features
	Alarming – F46

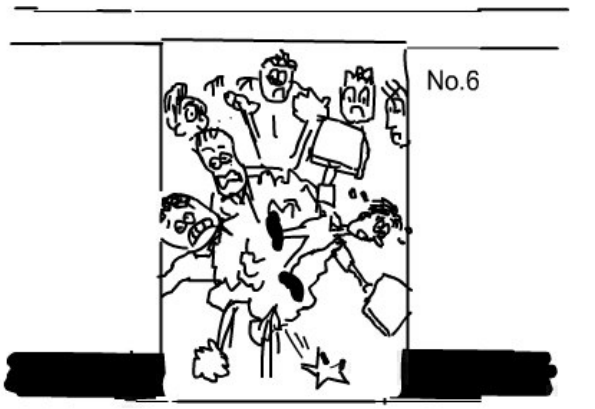
Storyboard #7 “Ladder carrier”	**Objects**
 7. Everybody think that the guy is blameful. Passenger A’s head is down, depressed. **Text Stories** T1: Policeman comes and blames his behavior. T2: Finally, everyone is blaming him. T3: A policeman came up together with some other passenger are blaming on him. T4: The people around seeing what happened just now were all blaming the guy and the guy with ladder felt so embarrassed. T5: The other passengers and policeman criticize this man that his behavior is wrong. T6: The passenger is rebuked by the public. T7: The police arrive. Lots of people think bank should not do this. T8 (Text balloon): The man was dropped into the public. “Bad young man, no polite….” T9 (Text balloon): All the passenger are blaming on him. T10 (Text balloon): Police man and other people put down the porter.	-Conductor -Passenger A -Ladder -Passengers -Policeman **Relations** - All the people are ***blaming*** him on his behavior. **Features** -Passenger A ***heads down*** and ***depressed expression.*** -Conductor is ***lying on*** the floor. **Observed Objects** Conductor-O5 The man -O6 Policeman – O23 Other passengers – O11 **Observed Relations** Conversation – R24 **Observed Features** Showing a depressing expression–R9 Warning ,blaming gestures – F24

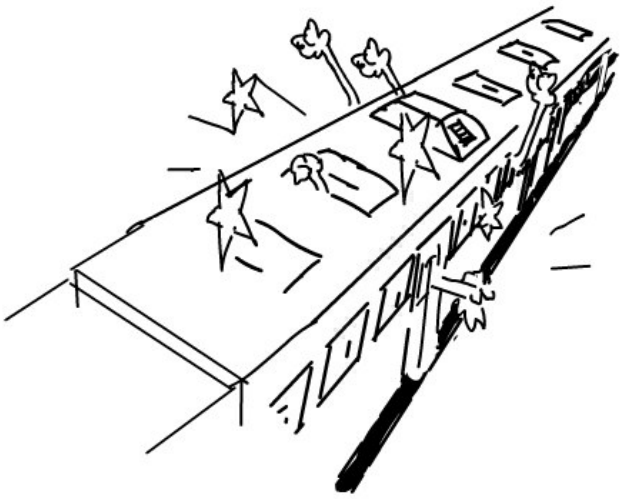
Storyboard #8 “Last minute”	**Objects**
 1. A train is going to leave; Passenger A shows up in hurry, he has to move on when he found No.4 compartment is full. . **Text Stories** T1: A man with two luggage boxes is running and he wants to get on the train. But the compartment No.4 is full of passengers. T2: There is a train comes with full of passengers and a man, who is carrying two briefcases, hurries up and tries to catch the train. T3: A man is carrying two luggage boxes wants to get on the train. T4: A man was rushing to a train, while the train was full of people and started to leave. T5: A man is running and taking his two suitcases in order to find a less crowded car. His passes car No.4. T6: A passenger wants to get into a crowded train. T7: The train is going away. A person wants to catch up the bus. ☺ T8 (Text balloon): Oh, the train will leave soon. I need to catch it up. T9 (Text balloon): Passenger: Wa…It’s full, go to the next. (The compartment is full, so passenger continue moving forward) T10 (Text balloon): A passenger with two boot wants to take a train which gonna take off soonly.	-Passenger A -Compartment -Compartment number information -Gate of the compartment -Passengers -Suitcase. **Relations** Passenger A is trying to ***get on*** the train. **Features** -No.4 Compartment is ***full of people.*** -Passenger A is ***running*** and ***moving forward.*** **Observed Objects** Number information– O49 Suitcases –O18 A man -O6 Train – O1 Compartment- O16 **Observed Relations** Leaving –R48 **Observed Features** Crowded -F38 Running – F4

Storyboard #8 “Last minute”	**Objects**
 2. When he comes to No.5 compartment, the door is almost closed. **Text Stories** T1: So he decided keep on running to compartment No.5, but it is still very full. T2: He comes to another compartment, but the door is closing, so running to another. T3: The train almost closes the door and about to leave. T4: The guy rushed one more carriage and wanted to get into the train. But another man was one second earlier than him to get into the train and the door was closed. T5: When his passing of car No.5, the door of this car is closing. T6: He could not get in till the train is about to leave. T7: He passes the number 5 platform. ☺ T8 (Text balloon): Oh, the door is closing. Wait me! T9 (Text balloon): Passenger: miss it again..!!(Come to the next, the door is almost closed.) T10 (Text balloon): Passenger: oh shit, almost got it	-Passenger A -Compartment -Compartment number information -Gate of the compartment -Passengers -Suitcase. **Relations** -Passenger A is trying to ***get on*** the train. **Features** - The gate of compartment is ***closing.*** -No.5 Compartment is ***full of people.*** -Passenger A is ***running*** and moving forward. **Observed Objects** Number information– O49 Gate - O12 A man -O6 Train – O1 Compartment- O16 **Observed Relations** Closing – R48 Quicker Earlier ,than - R30 Leaving – R49 **Observed Features** Crowded -F38 Running – F4

Storyboard #8 “Last minute”	**Objects**
 3. The leave time is 9:00, it is very close, and so the guy is worrying about the time and in a big sweat. **Text Stories** T1: The time is already 9:00; the train is almost to leave. T2: It‘s nine o’clock. T3: It’s 9:00. T4: The train would leave at sharp 9 and the man kept running. T5: But the time is near 9:00 which is the starting time of this train. T6: The clock shows the train is leaving. T7: It is nine o’clock that the train will leave at that time. T8 (Text balloon): Oh, it will leave soon. Nine o’ clock. T9 (Text balloon): Passenger: I can’t miss it, it‘s 9’clock. Hurry up!(the train is about to leave) T10 (Text balloon): Passenger: I must get this train, the other one is coming in one hour. ☺	-Clock -Passenger A -information board -suitcase. **Relations** -The train is going to ***leaving.*** **Features** - It’s almost 9:00. - The ***leaving time is 9:00*** - Passenger A is ***running*** and ***moving forward.*** -Passenger A is ***in a sweat*** **Observed Objects** Information Board –O3 A man -O6 **Observed Relations** **Observed Features** Leaving – R49

Storyboard #8 “Last minute”	**Objects**
 4. Coming to No.6, it is still full and all the passengers are scared of get one more in, however, it is the final chance. **Text Stories** T1: He arrives at the compartment No.6, he is already exhausted. T2: He tries to get into the train from No.6 gate, but it’s very full already. T3: The man still wants to get on and he pushes the button on the train’s body. ☺ T4: One more carriage later, the door was open. But the people seemed unhappy to let the man into the carriage. T5: Finally, he finds car No.6 although this car is still crowded. T6: He decides to get in, though the train is already very full. T7: He arrivals no.6 platform at the last minute. T8 (Text balloon): Oh, hurry up! T9 (Text balloon): Passenger: full again….all full? (The next compartment is still full) T10 (Text balloon): Passenger: shit! Full again, I don’t want to waste one stupid hour on the station	-Train -Passenger A -Compartment -Compartment number information -Passengers -suitcase. **Relations** -Passenger A is trying to ***get on*** the train. -The train is going to ***leaving.*** **Features** - No.6 Compartment is also ***full of people.*** -Passenger A is ***breathless and in sweat.*** -Passengers show ***scared expressions.*** **Observed Objects** The man -O6 Passengers -O11 **Observed Relations** Push a button – R45 Exhausted – R47 **Observed Features** Showing unhappy expression – F19 Crowded – F38

Storyboard #8 “Last minute”	**Objects**
 5. He jumps into the train and hits some people down. **Text Stories** T1: He catches on the train anyway. T2: So when he gets into the train, some people inside are falling down. T3: It’s very crowded in the train. T4: The man finally got into the carriage, and started fighting the people who were already in the carriage. T5: He runs into the car No.6. What a mass! T6: He jumps into the train. T7: Two many passengers are inside this bus. T8 (Text balloon): Oh, go on the rampage, I catch the train. T9 (Text balloon): Passenger: This is the last chance, just do it(he jump to the train) T10 (Text balloon): Passenger: full again! Again! If I didn’t get in here, the train will leave, that’s it. Here I come!! Get ready for me! ☺	-Train -Passenger A -Compartment -Compartment number information -Passengers -Suitcase. **Relations** -The Passenger A is ***getting on*** the train. **Features** - No.6 Compartment is also ***full of people.*** -Some passengers are ***knocked down.*** -Passenger A ***jumps into*** the compartment. **Observed Objects** The man -O6 Passengers -O11 Compartment Number in formation -O49 Compartment- O16 **Observed Relations** Getting on the train – R6 **Observed Features** Crowded – F38 Jumping into, Piling into –F49

Storyboard #8 “Last minute”	**Objects**
 7. The train starts moving and the No.6 compartment begins shouting. **Text Stories** T1: And the train is very full. T2: The door is closed and then there is a mess in the train. T3: And the train is going to explode. T4: Finally, the train was in a mess. T5: The train is moving and very crowded. T6: People in side the train are angry at him. T7: They fight with each other. T8 (Text balloon): The train is so crowd! T9 (Text balloon): What a mess! T10 (Text balloon): Door closed. A lot of scream come out off the train. Passenger: I get it, ouch! ☺	-Train -Compartment **Relations** -Train starts ***moving*** **Features** - A ***crowded*** compartment - ***Full of noise*** **Observed Objects** Passengers –O11 Train -O1 **Observed Relations** Leaving –R48 **Observed Features** Full of people – F38 Noisy compartment – F50