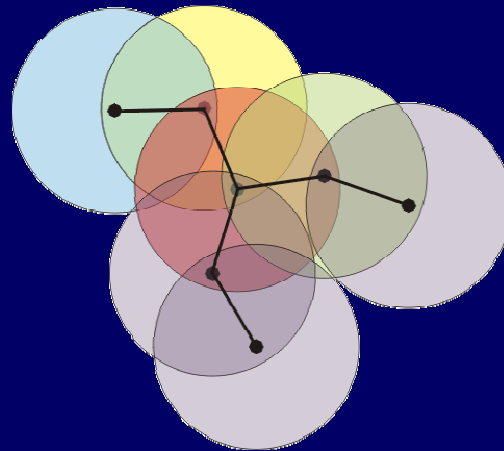# ManetLoc

A location based approach to distributed world-knowledge in mobile ad-hoc networks
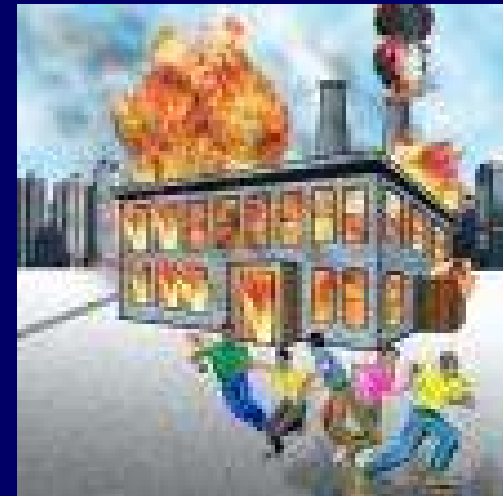
Marcel van Velden - April 19, 2005

T U Delft

Delft University of Technology

Agenda

- Introduction

- Problem description

- Implementation: ManetLoc

- Demonstration

- Future work

- Questions

TUDelft

Introduction

- Crisis situation
  - Fire
  - Smoke
- Communication infrastructure
  - Non existent
  - Overloaded
  - Damaged
- World knowledge
  - Map

TU Delft

Problem description

Design and implement a **(1) multi-agent-system** that can **(2) operate in environments without a pre-setup infrastructure (only a mobile adhoc network)** and **(3) without any pre-knowledge of the world**, which is able to **(4) process** and **(5) fuse location information from different users and sensors remote in space and time** and **(6) distributes location information and location based services (such as guidance) to its users.**

TU Delft

1. Multi-agent

- Agent
  - Autonomous to a degree
  - Exhibit goal directed behavior
  - Interact & negotiate with other (possibly human) agents to achieve goals
  - React 'intelligently' to dynamic and unpredictable environment
- Goals
  - Build world model
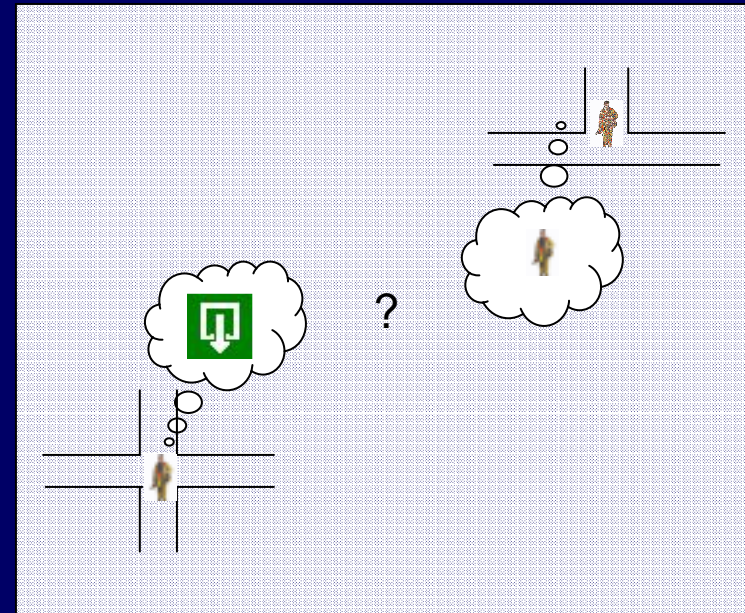 - Distribute world model
  - Provide services to users

TUDelft

2. Without pre-setup infrastructure

- Unavailable
  - Wired network
  - GSM
  - GPS
- Available
  - PDA
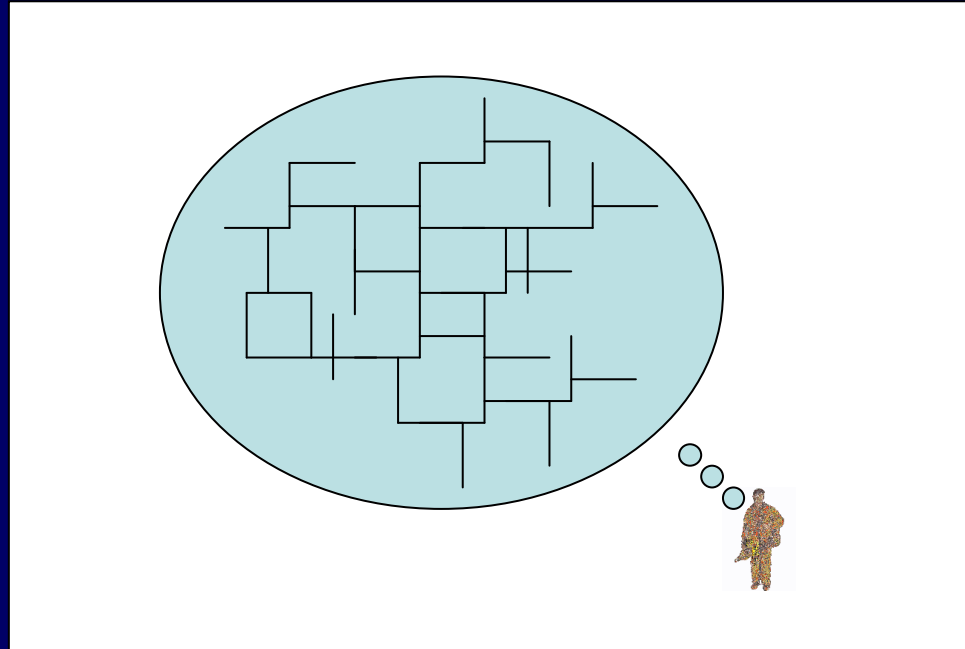 - Mobile Adhoc Networking (MANET)

TUDelft

3. Without pre-knowledge

- World model needed to solve problems
  - Crisis state
  - Locations
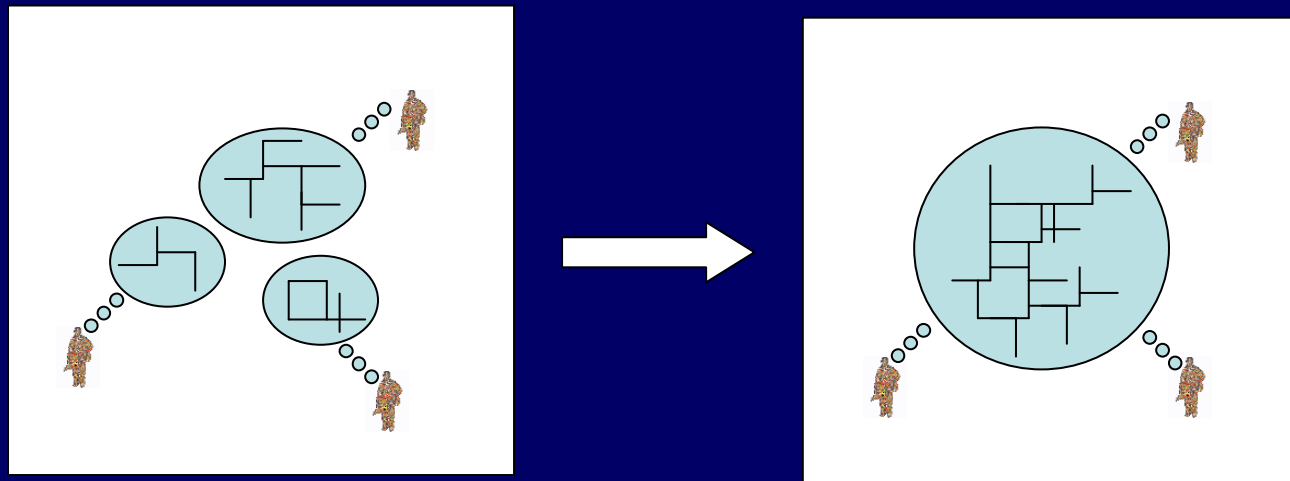   - Individuals
    - Exits

4. Process location information

- Input
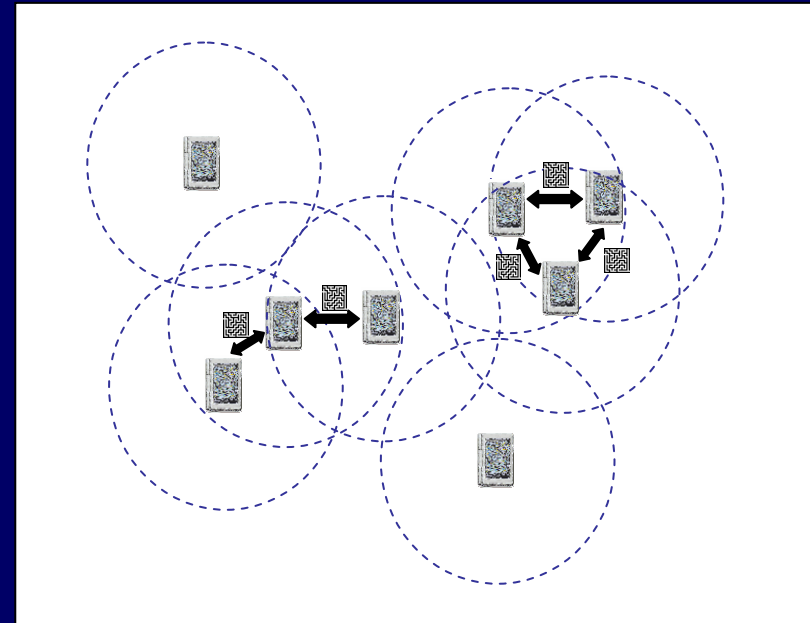 - User
  - Sensors
  - Other
- Output
  - World model

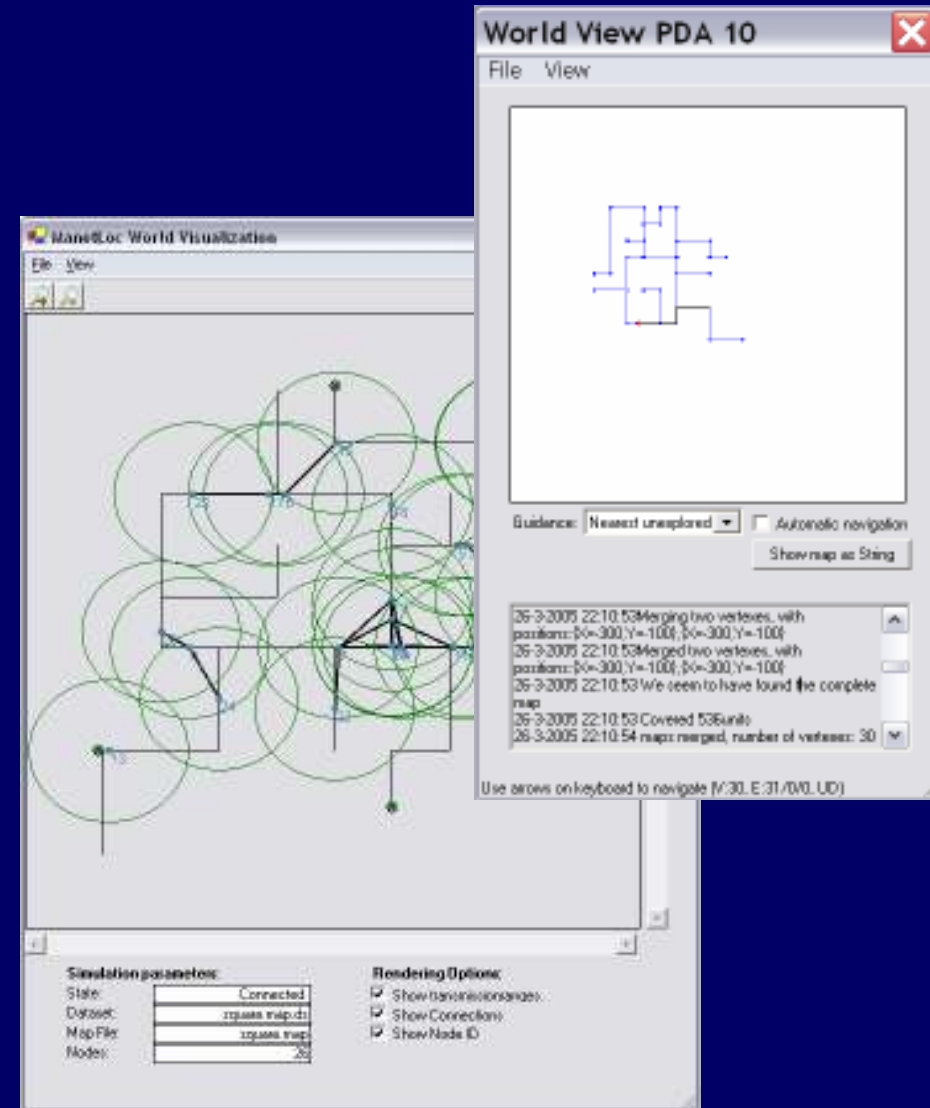# 5. Fuse location information

- Match
- Merge

6. Distributed

- No central server
- Ad-hoc communication
  - WiFi
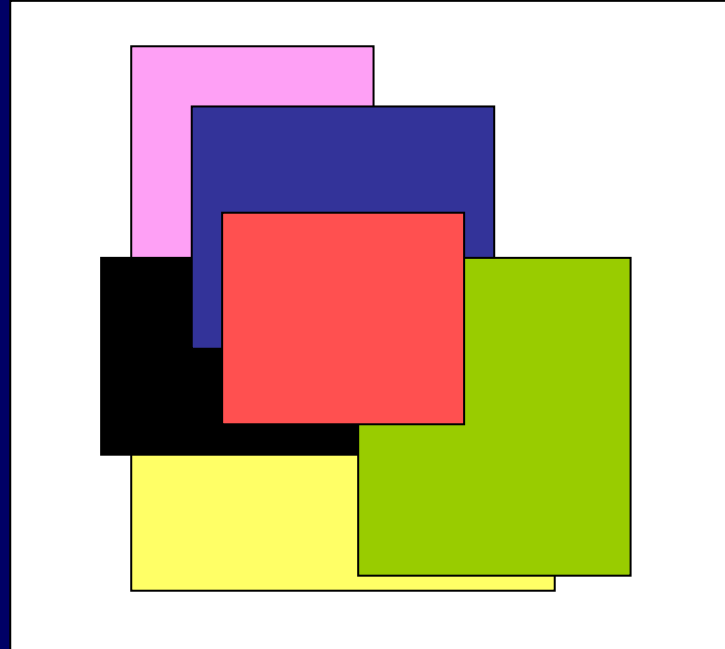 - Bluetooth

Implementation

- ManetLoc
  - Simulation
  - Based on AHS
  - Rectilinear world
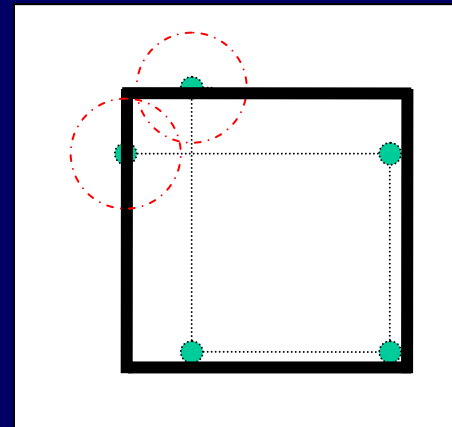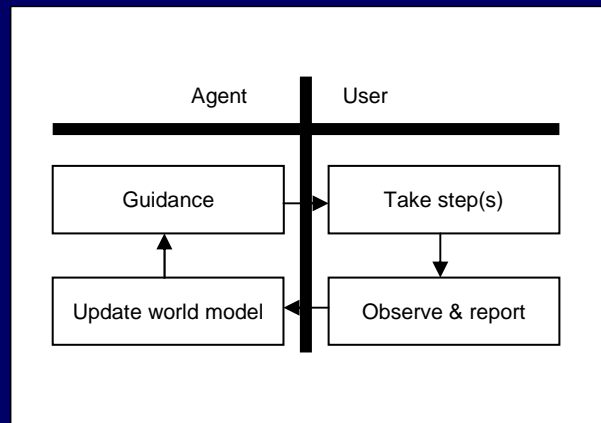   - Intersections
    - Edges
    - Exits

Modules

- Exploration
- Mapping
- Distributing
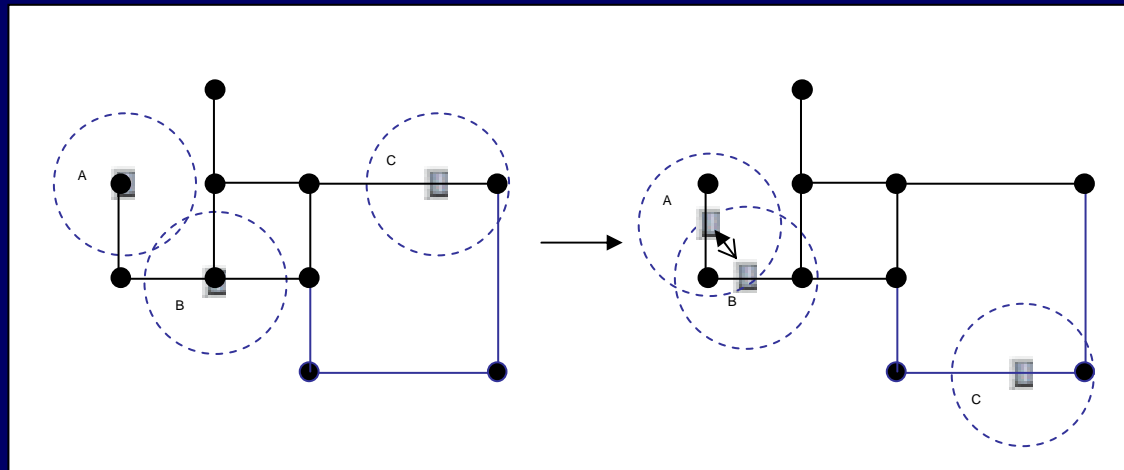- Matching
- Merging
- Agent services

TU**Delft**

Exploration and mapping

- User input
- Sensory data
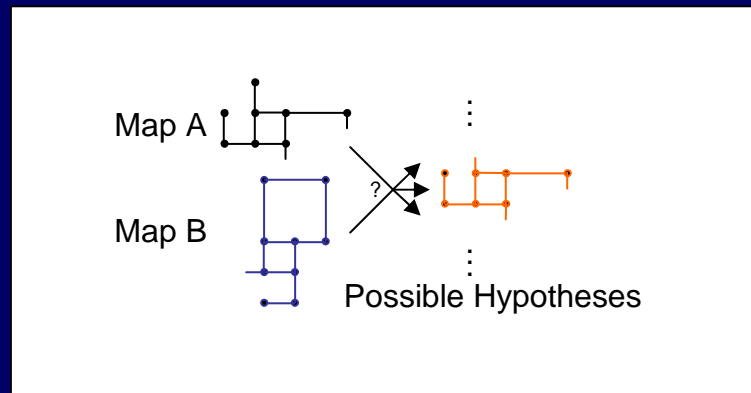- World model
- Closing loops

Distributing

- Check if useful
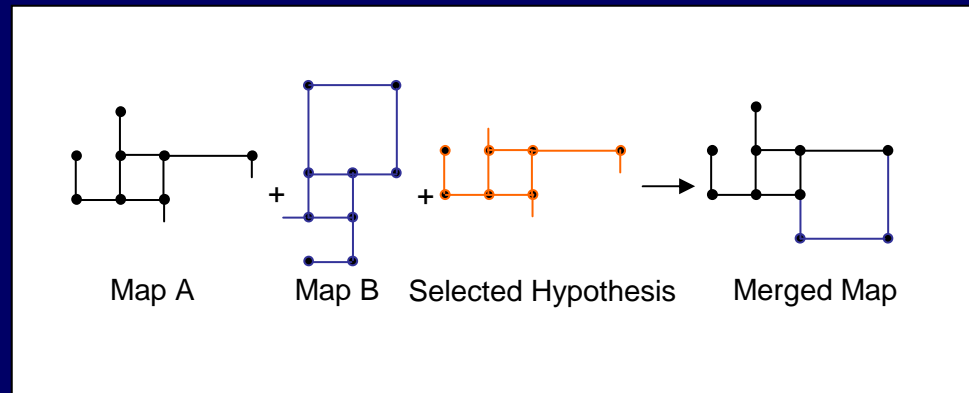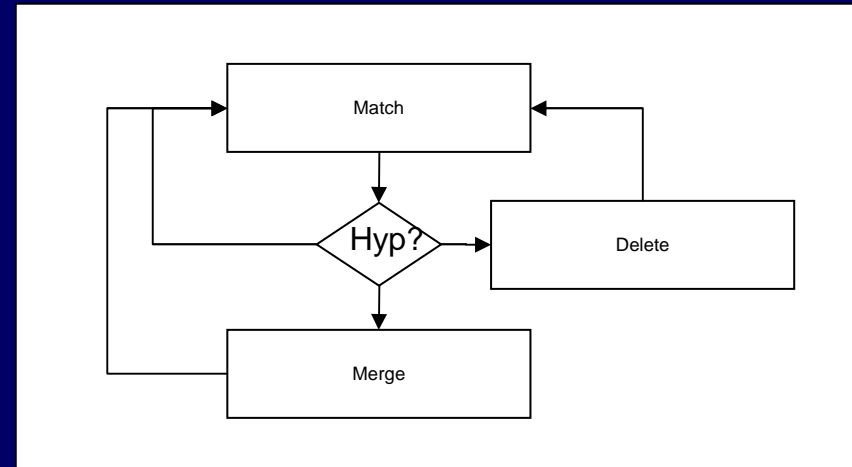- Convert to interpretable string
- Broadcast

Matching

- Vertex matching
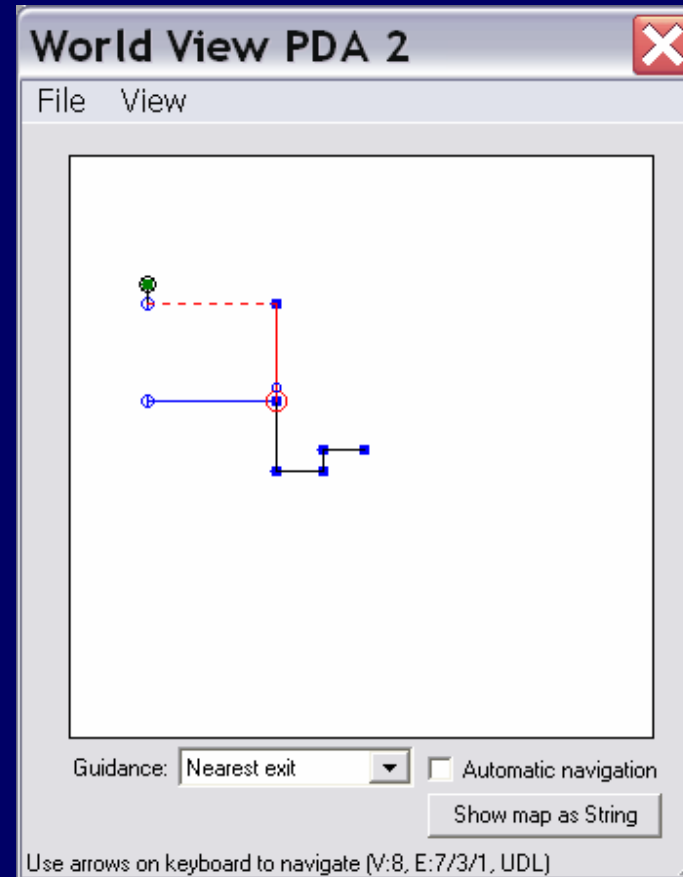- Growing hypotheses
- Combining hypotheses
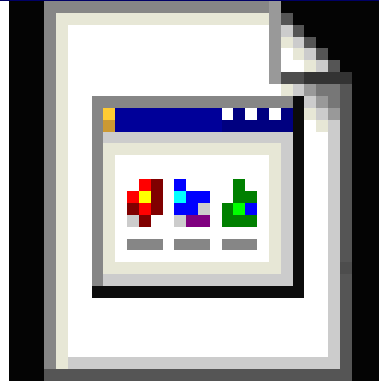
Merging

- Rotate
- Shift
- Add new vertexes
- Connect

Map A + Map B + Selected Hypothesis → Merged Map

Agent services

- Guidance
  - Exploration
  - Nearest exit

Demonstration

Manetloc.exe

TUDelft

Results

- Tests
  - Usability
  - Correctness
  - Completeness
  - Performance
- Concept works
  - Better results for larger worlds
  - Most gain in pre-explored world

*TU*Delft

Future work

- Real life system
- Input
  - NLP
  - Iconic
- Data distribution
- Dynamic data
- Levels of detail
- Planning
- Execution

TUDelft

Questions

?

TU Delft

Thanks

Marcel van Velden
m.c.vanvelden@student.tudelft.nl

T U Delft