

Localisation with sketch based input

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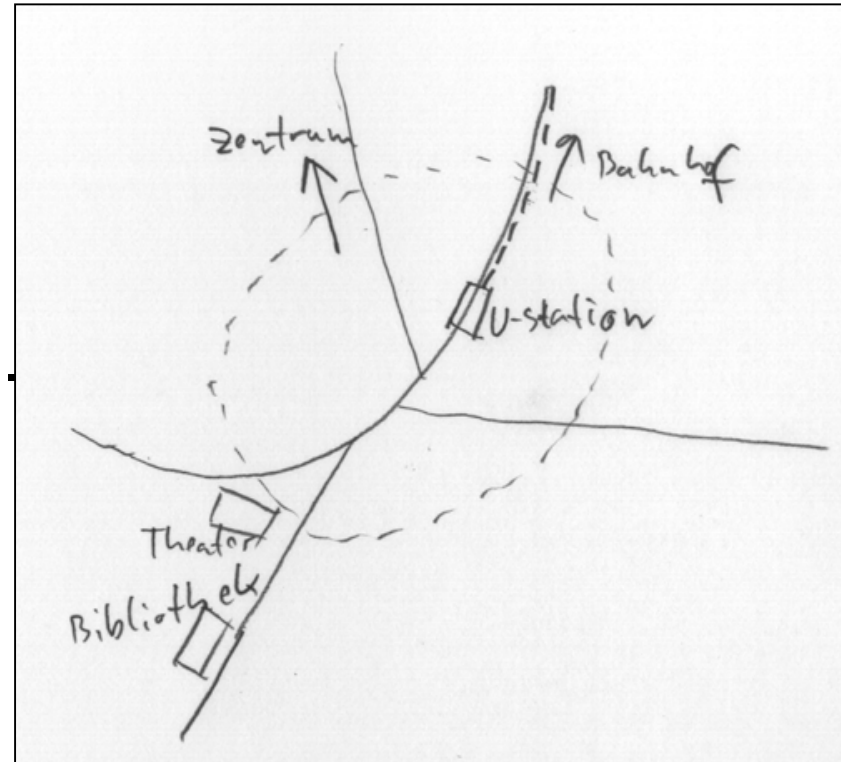
2nd Symposium on Location Based Services and
TeleCartography, Vienna 2004

Motivation

Where am I?

...just a sketch with the PDA...

...actually we are at
Aegidientorplatz!



- ▶ SPIRIT – Brief Overview
- ▶ Sketched places
- ▶ Sketch interpretation
- ▶ Localisation
- ▶ Outlook

SPIRIT – brief overview

- ▶ Project of EU in the IST-Programme
- ▶ International cooperation

Project aims:

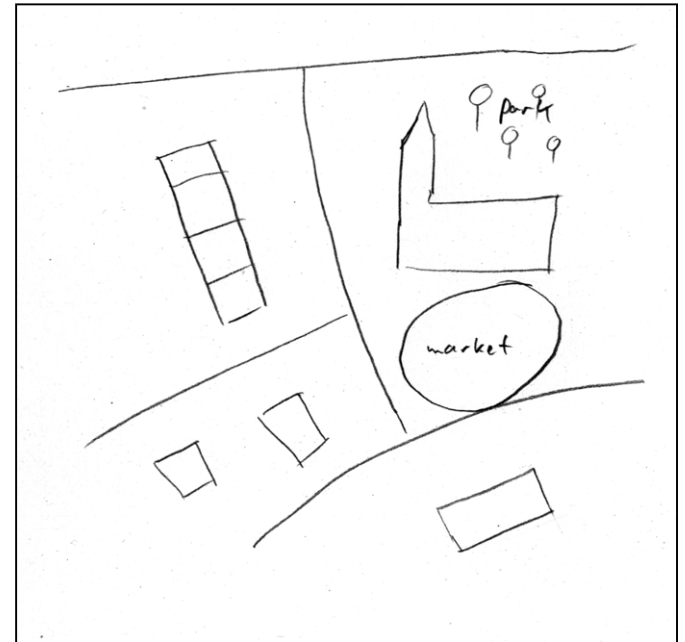
- ▶ Internet search engine
- ▶ Spatially aware

www.geo-spirit.org



Sketched places - definition

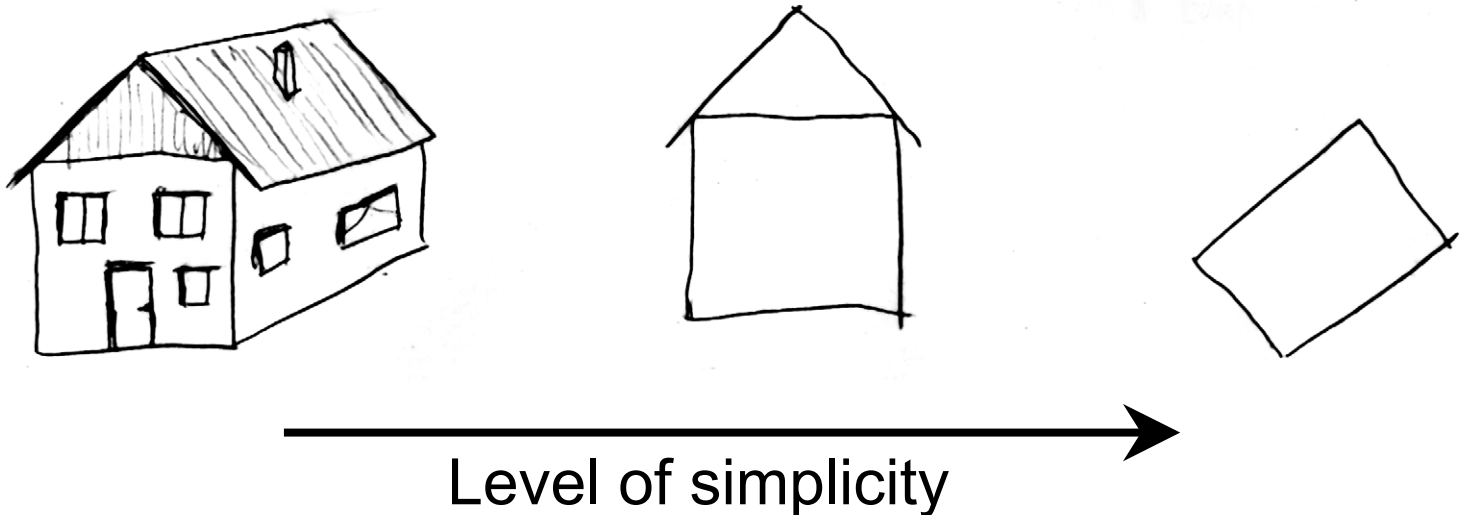
- ▶ Outline of spatial situation
- ▶ Build from lines
- ▶ Relations of human thoughts
- ▶ Precise or abstract reference



„Route description“

Sketched places - contents

- ▶ Selection of important features (landmarks)
 - Buildings
 - Roads
 - Places
 - Boundaries
- ▶ Abstract symbolisation of elements



Sketched places – on a screen

- ▶ Drawing tools
 - Mouse
 - Pen
- ▶ Drawing surfaces
 - Virtual (Mouse)
 - Physical (Graphic tablet)
 - Screen (PDA, TabletPC)
- ▶ Extended drawing capabilities
 - Drag&drop icons
 - Removing elements
 - Typed text



Sketch interpretation – basic problem

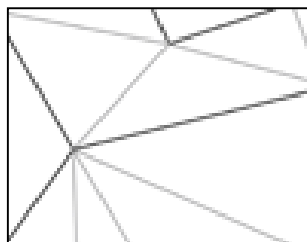
Sketch	Reference data
Uninterpreted	Interpreted
Picture coordinates	National reference frames
Relations of human thoughts	Geometrically exact

- ▶ Comparable description needed
- ▶ What is in the sketch?
- ▶ Where is the sketched situation?

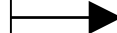
Sketch interpretation – three step solution

1. Geometry/topology
2. Pattern recognition
3. Localisation

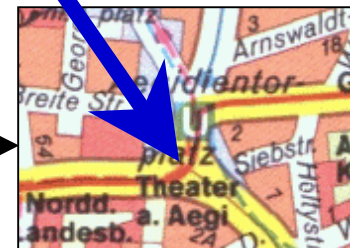
Level of abstraction



Geometry



Pattern recognition



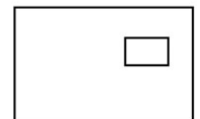
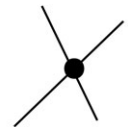
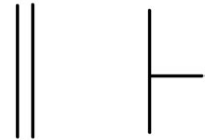
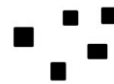
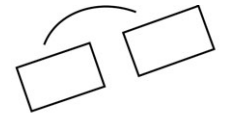
Localisation

Sketch interpretation - topological data model I

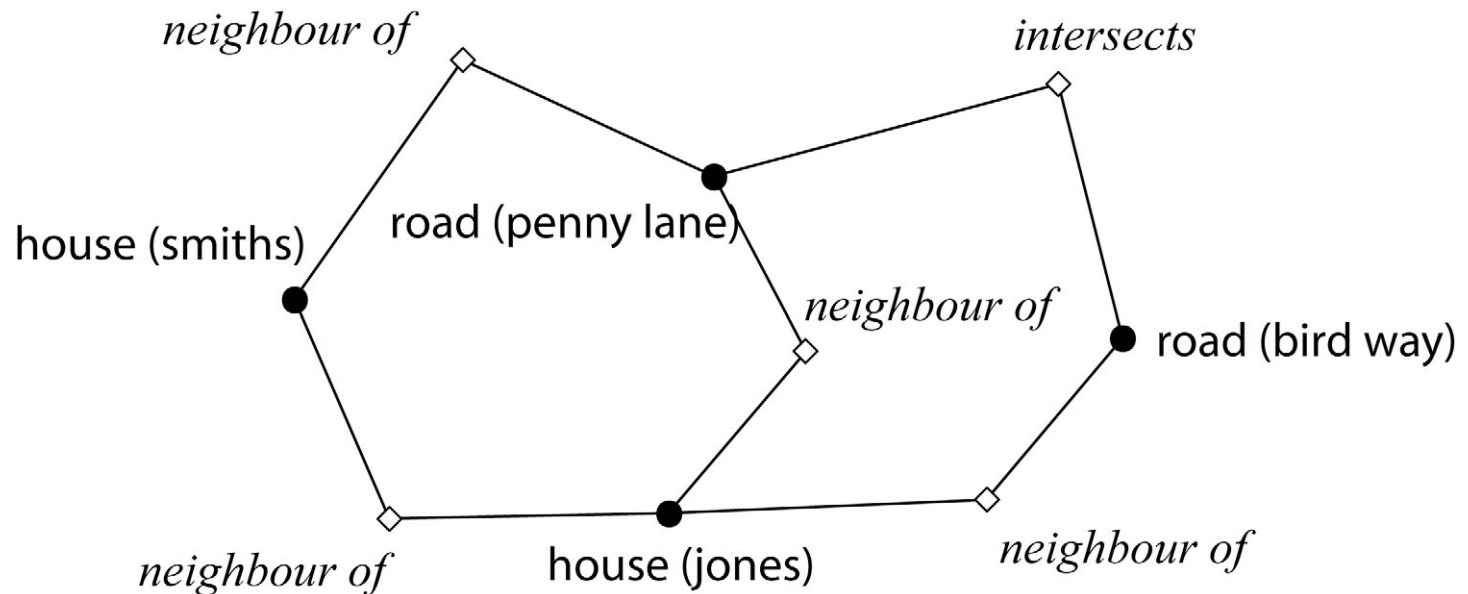
► Invariant: topological relations

- Neighbourhood
- Distance
- Direction
- Clusters
- Orthogonal/Parallel lines
- Crossing lines
- Contained in

► Semantic network

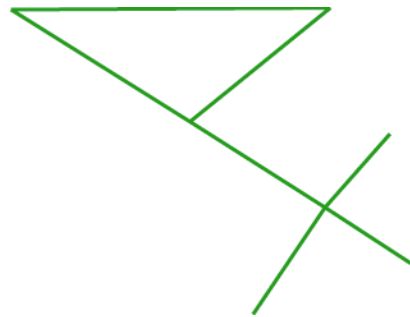


Example of a semantic network representation

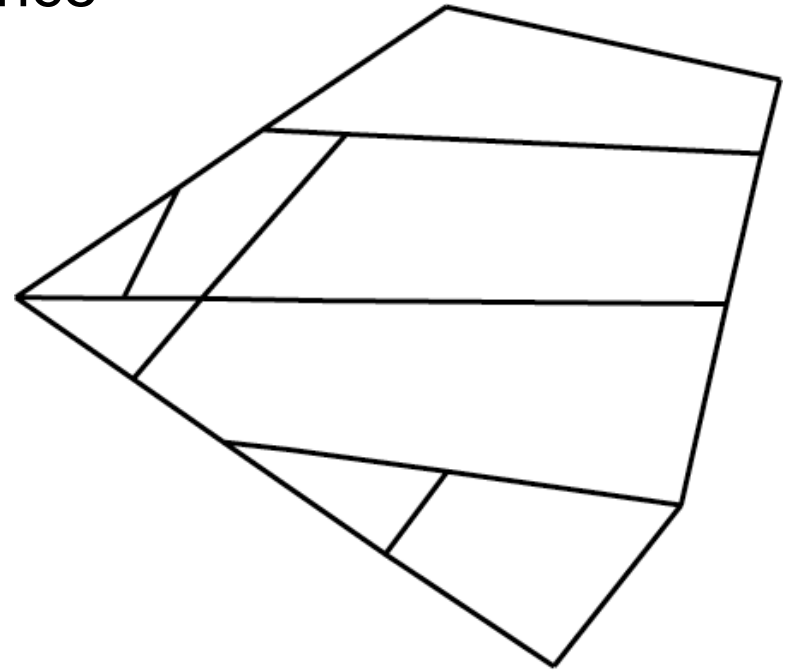


Localisation – problem definition

- ▶ Find identical partial graphs!
- ▶ Look up geographical reference



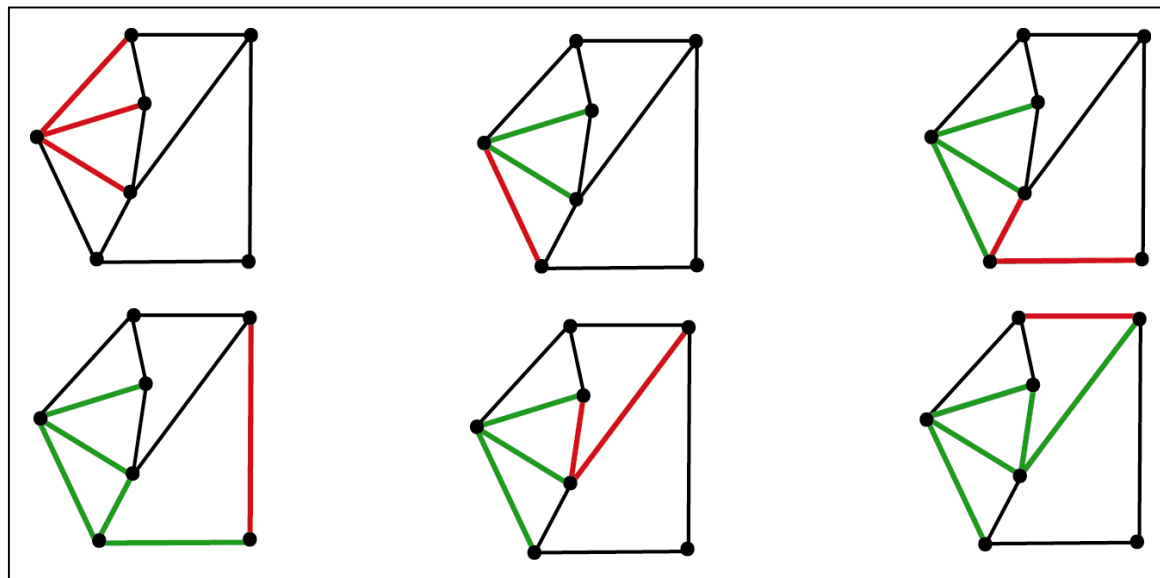
Pattern



Reference

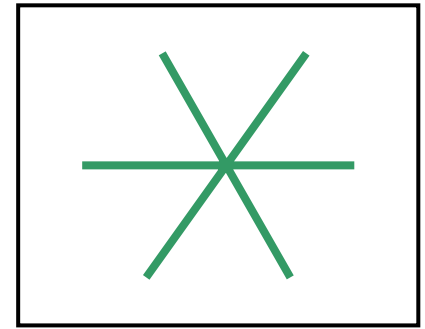
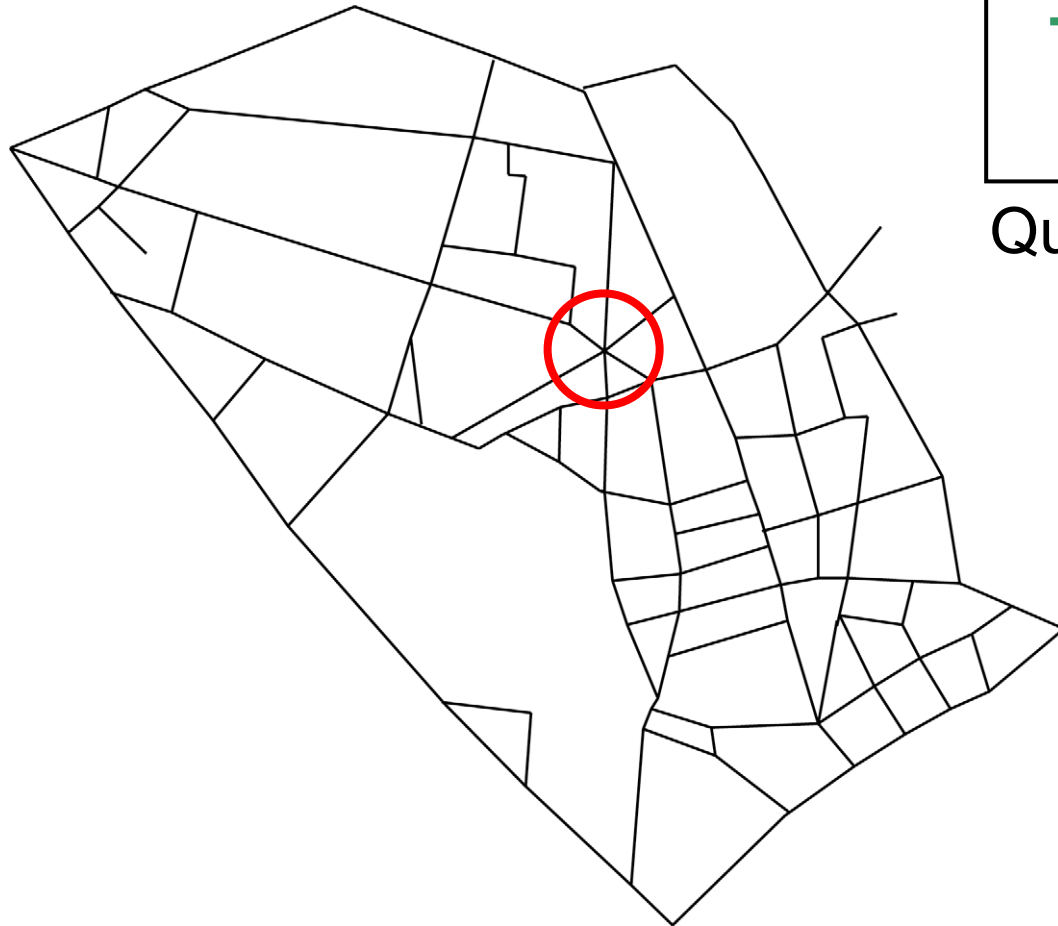
Localisation – partial graphs

- ▶ Constraint Tree Search
- ▶ Discover state tree
 - Produce combinations
- ▶ Restrict state tree
 - Forbidden partial solutions
 - Constraints



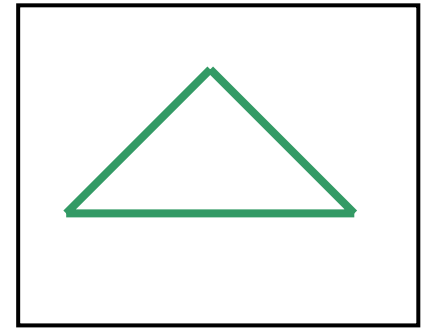
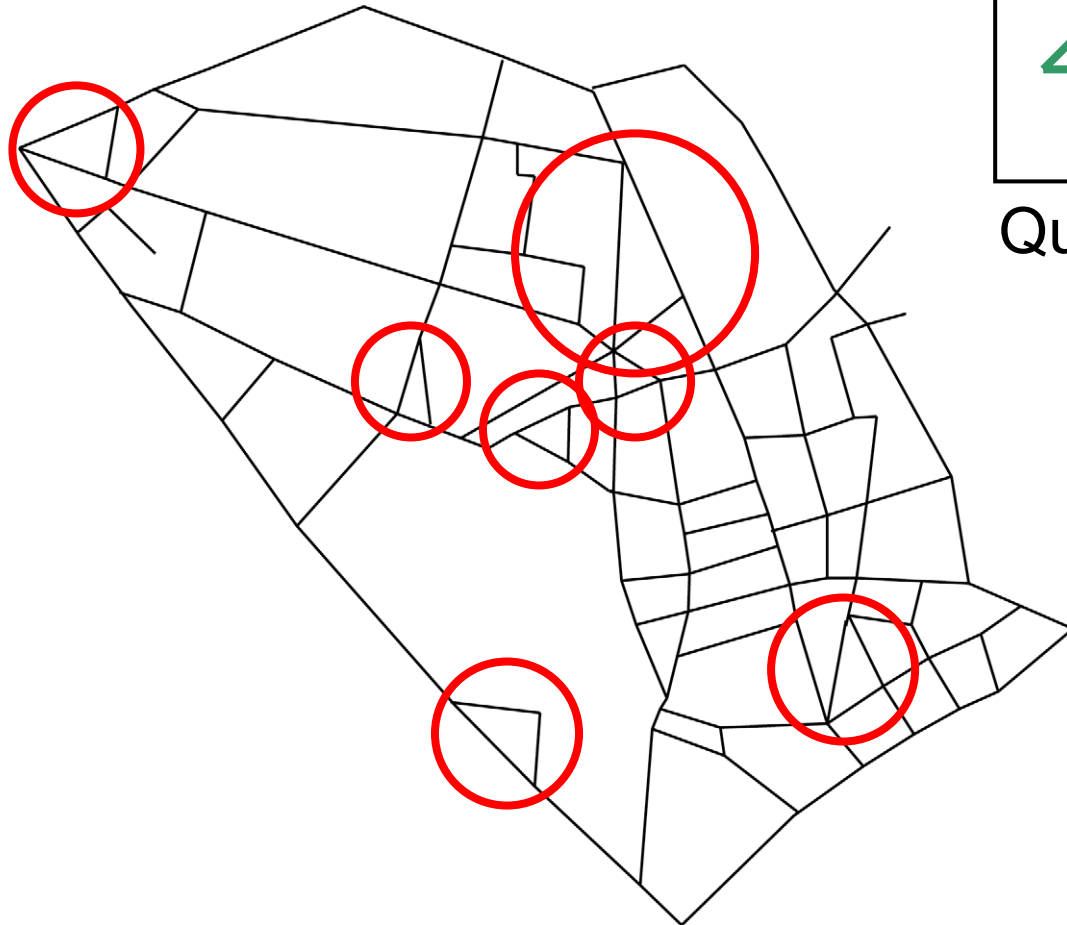
Search the state tree with backtracking

Localisation – example I



Query pattern

Localisation – example II



Query pattern

- ▶ Large data sets
- ▶ Specify topological relations
- ▶ Incomplete/unprecise queries



Many thanks for
your attention!

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