

# Mobile Edutainment and Multi-Modal Interaction

**Rainer Malaka**



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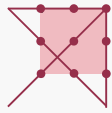
**European Media Laboratory Heidelberg**



## Introduction



- The goal of computer interaction is to retrieve, interact with, or manipulate some data with relation to the real world.
- The user's interest is not to interact with the computer but the corresponding real-world items.
- A tourist who visits a city is interested in finding optimal routes to his target locations, visiting sights or eating in a restaurant.
- Users are usually not interested in the technical system itself.
- New technologies allow for new solutions
- Goal: technology that disappears as technical item but rather becomes an extension of the users own capabilities
  - “we throw a ball and do not make our arm throw it”
- the whole system augments the user's reality



CRUMPET



Deep Map



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## Mobile Multi-Modal Interaction

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- Input/Output Modalities
  - keyboard, written text, mouse/pointer often slow
  - usefulness of spoken language
  - spoken language still only for narrow domains or predefined commands
  - perspective of a disappearing computer where the device becomes invisible and the user only realizes the output of the system.
- New Modalities:
  - Input: User location
  - Output: The environment
- Examples of EML projects
  - Deep Map: research prototype of a language-controlled tourist guide, with VR-Components
  - SmartKom, integrates many Deep Map functionalities, dynamic vocabularies
  - GEIST: visual augmented reality
  - EMBASSI: generic modality management
  - CRUMPET: pen-based interaction



## Deep Map

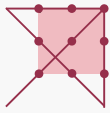
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First EML Project incorporating

- individual tour guidance
- mobile system
- multi-modal interface (NLP, pictures, text, ...)
- wireless online access to networks





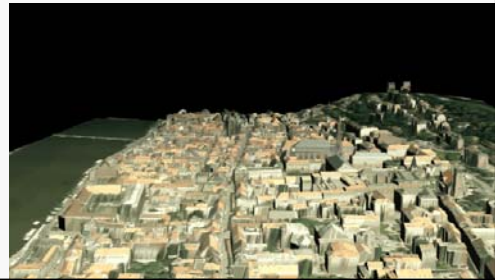
# GEIST - From 3D to 4D

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Edutainment, AR project

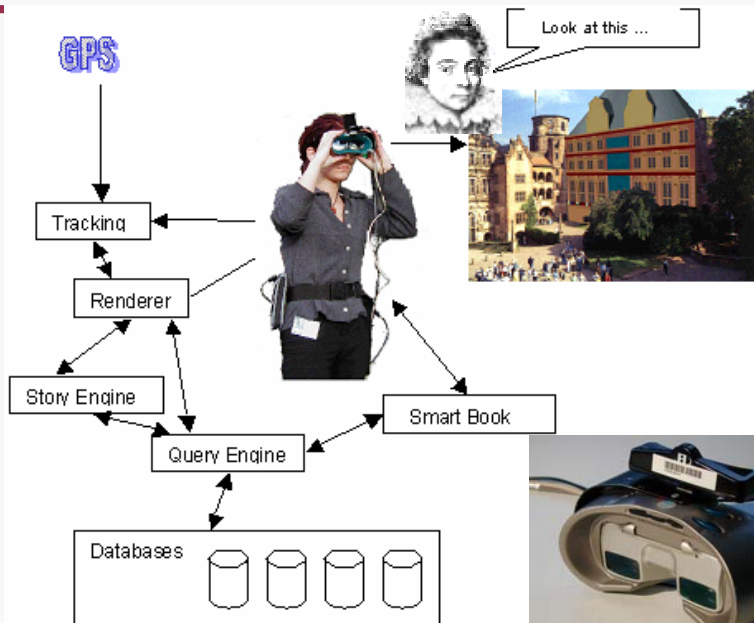
30 Years War: reasons, events, results

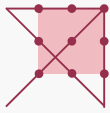
- how did the buildings look at that time (castle, sacral buildings, profane buildings)
- Collaboration: Fraunhofer Institute and ZGDV, Darmstadt



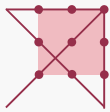
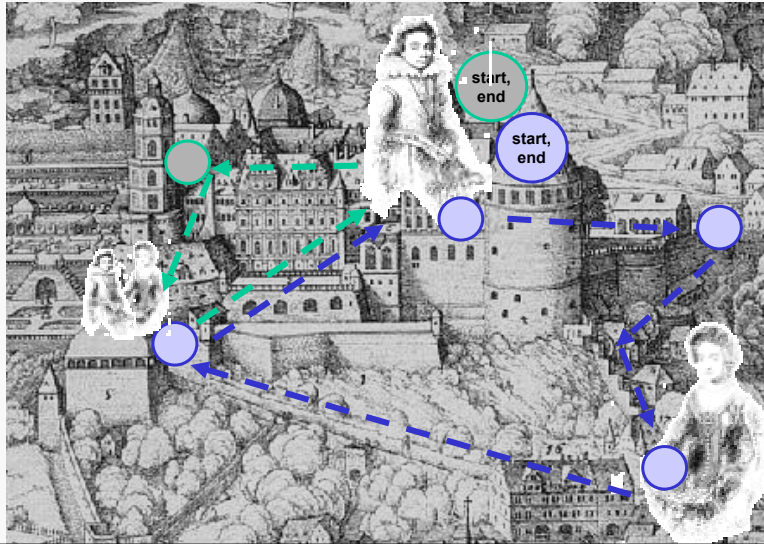
# Augmented Reality

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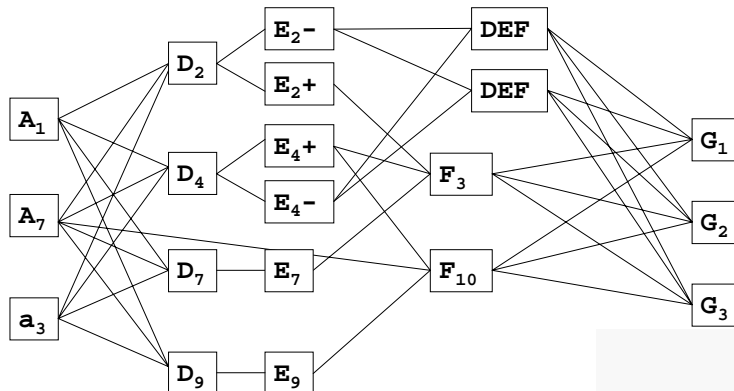


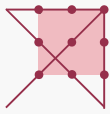
Experiencing (hi)story



Story Model

- script from author
- multiple story lines
- adaptes to user state, preferences, ...
- interaction through "magic equipment"



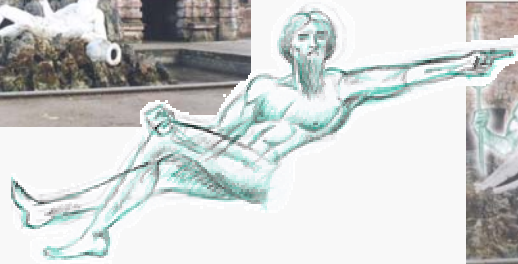


# GEIST-Characters

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## Storylining

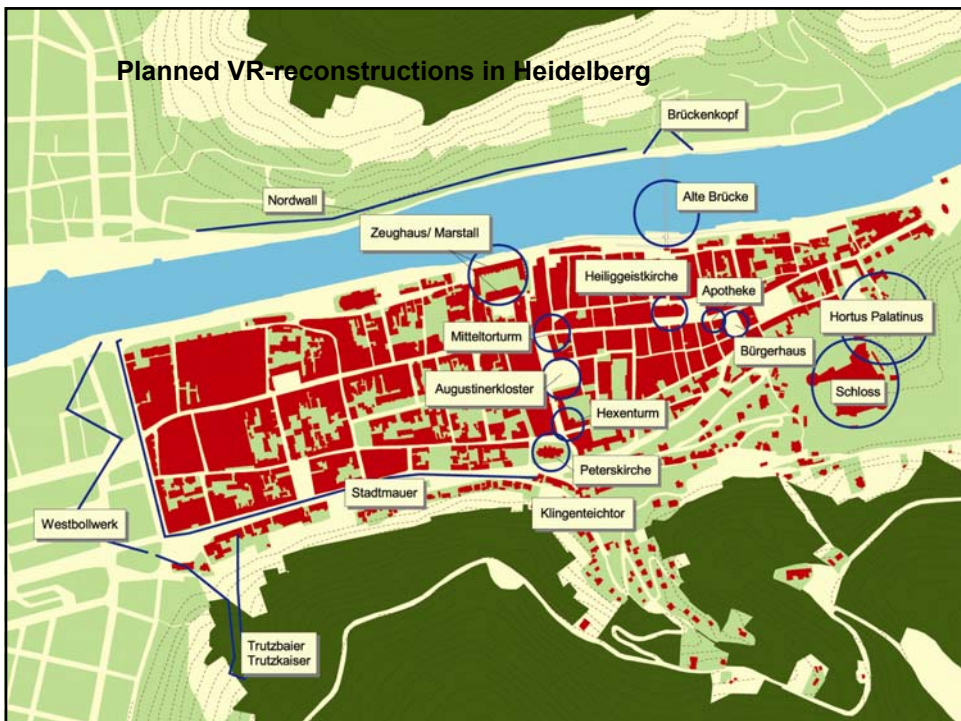
- stages defined in the city
- 4D models, historical databases
- characters (H-anim standard)

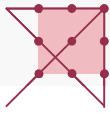


Herrn Salomon De Caus ist dort oben bei der Galerie, zu Boden. Mit ungeschickten Personen unterhält er sich erst gar nicht!  
Findet heraus wie der Götter in lateinischer Sprache genannt wird!

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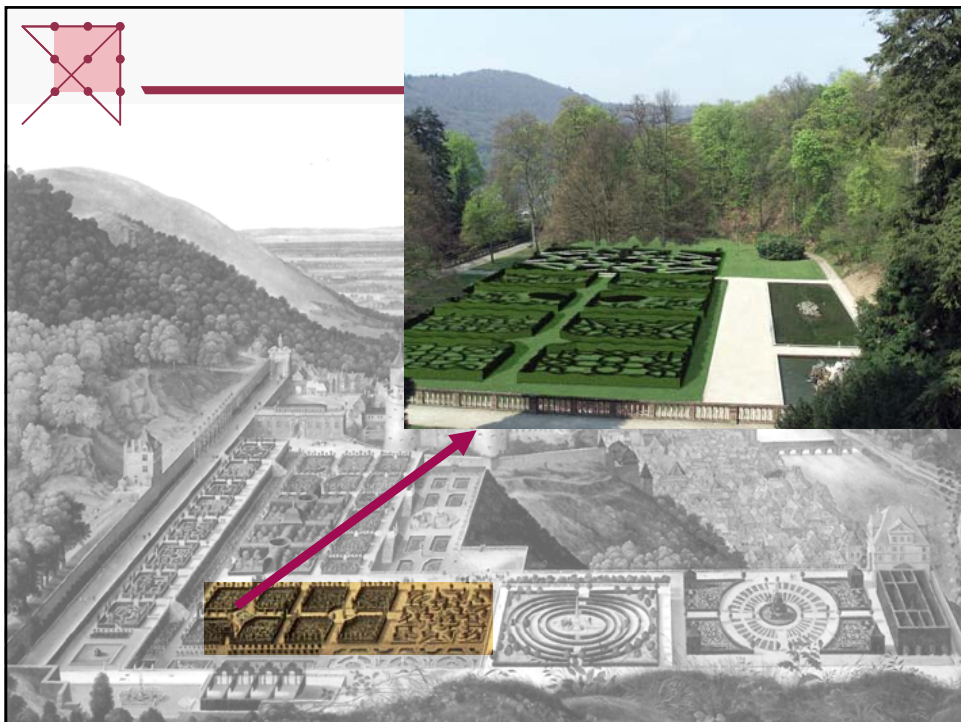
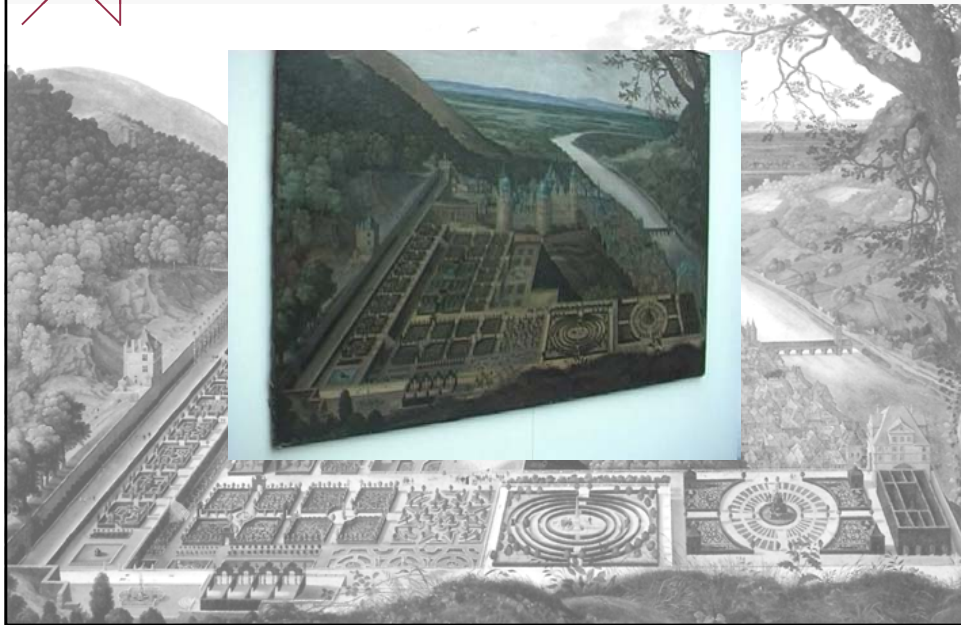
## Planned VR-reconstructions in Heidelberg

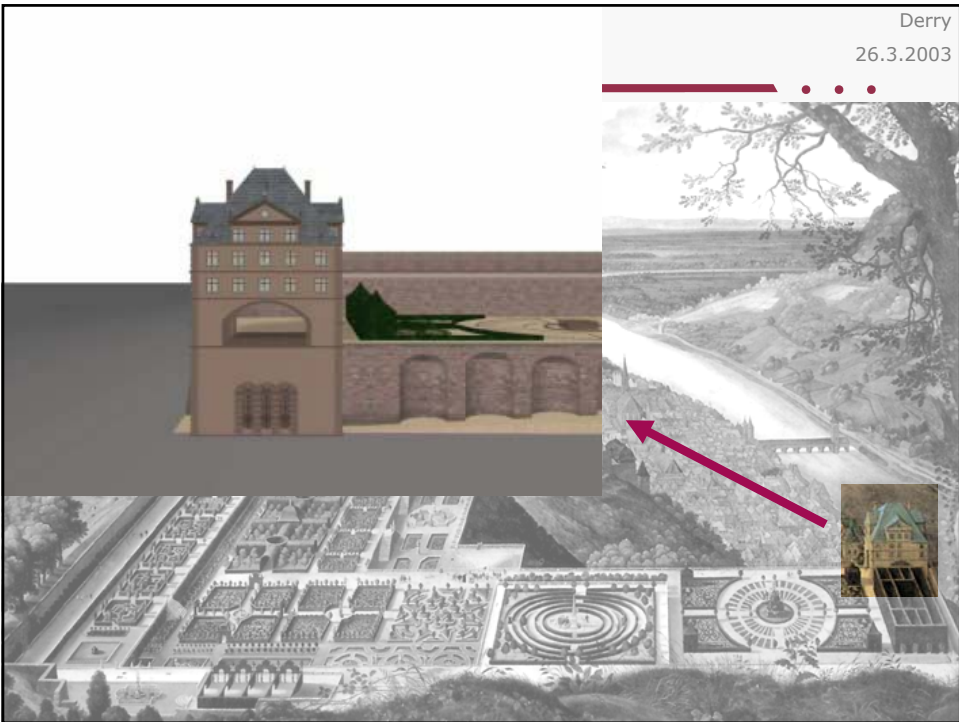
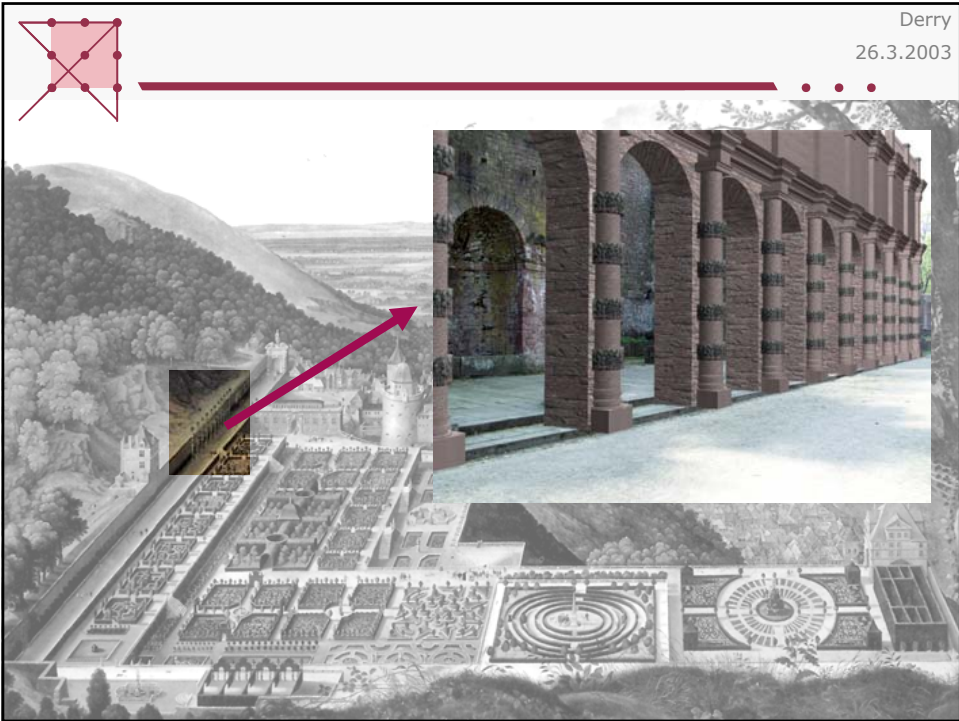


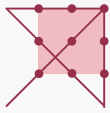


# Hortus Palatinus

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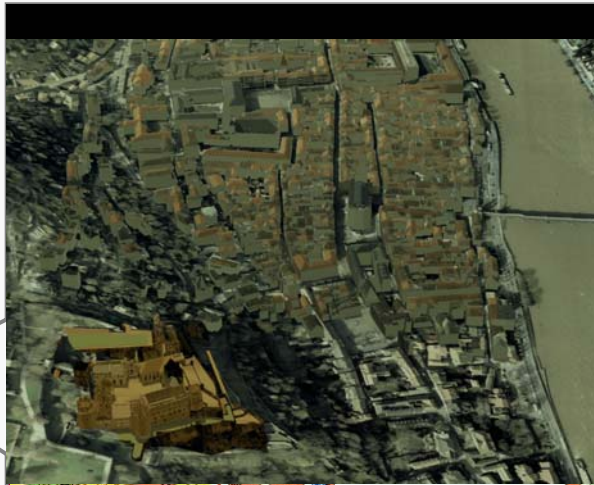






## Content Presentation

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Deep Map

HD-Map



## Towards Automatic Modality Selection

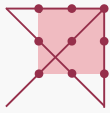
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- Constraints:
  - available devices
  - inherent restrictions of the modalities (e.g., an avatar needs a display)
  - communicative goal
- user- and dialog-specific aspects:
  - user's preferences (e.g., user does not like spoken text)
  - situation (e.g., can audio be understood)
  - previous dialog acts



EMBASSI

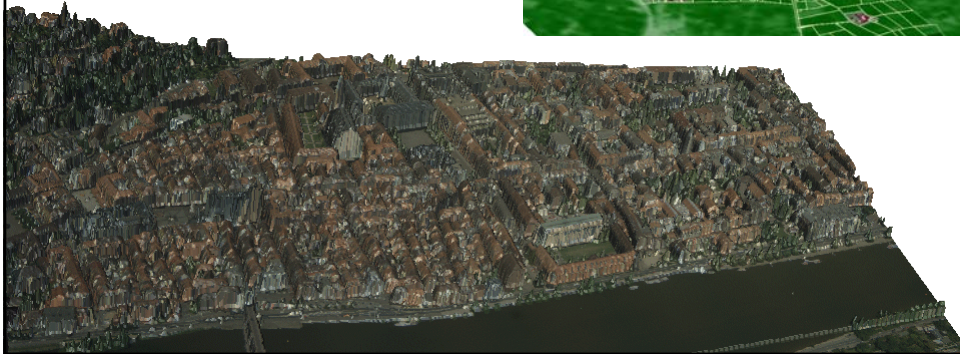
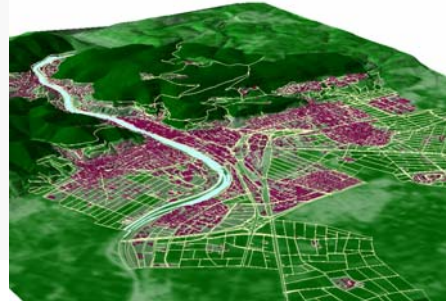




## Integration of 2D/ 3D Geo Data

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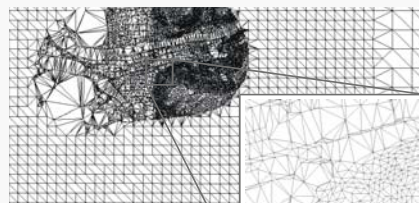
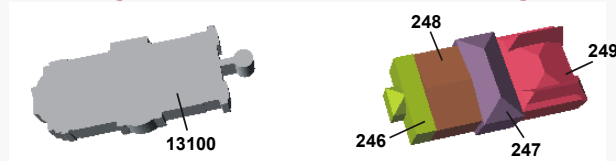
- ALK + satellite image on 2,5-D landscape model
- Buildings extruded
- ODF/VRML from Laser Scan (FRITSCH)
- Old town of Heidelberg



## Medienanpassung 3D GIS

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- distance-dependent LoD for computed tour
- 3D data in digital height model in GIS
- triangulation just-in-time
- multiresolution triangulation dependent on tour
- buildings: ODF-models vs. extruded ground space



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Results:  
-VRML models for tours  
-dynamic LoD


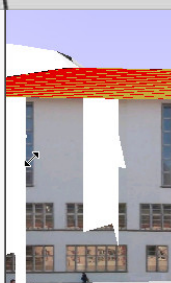
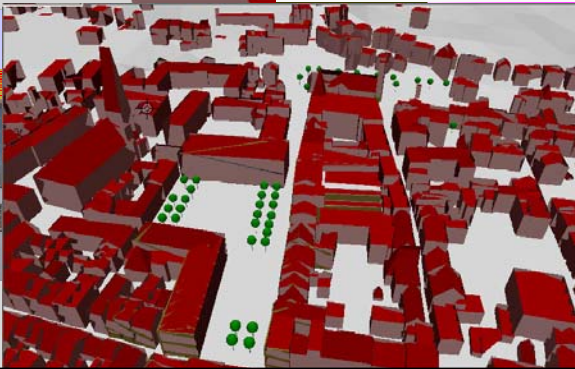
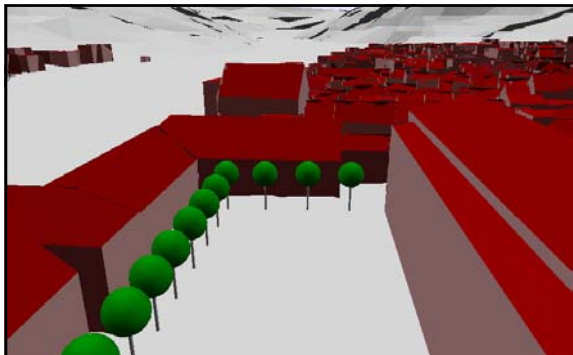




Image Understanding



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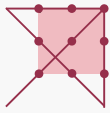


This building is the „Hotel zum Ritter“

„What's this?“

built-in camera

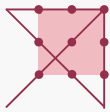
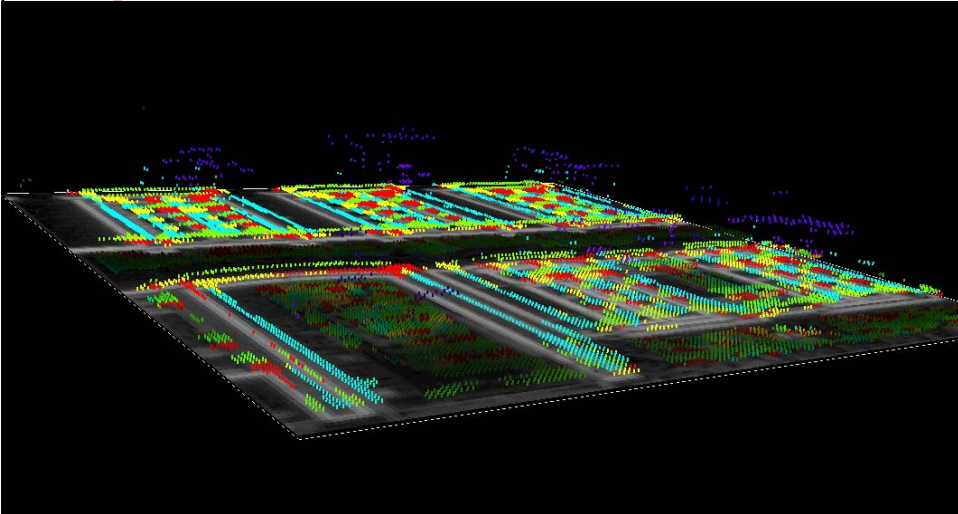




## Results: Pyramid view

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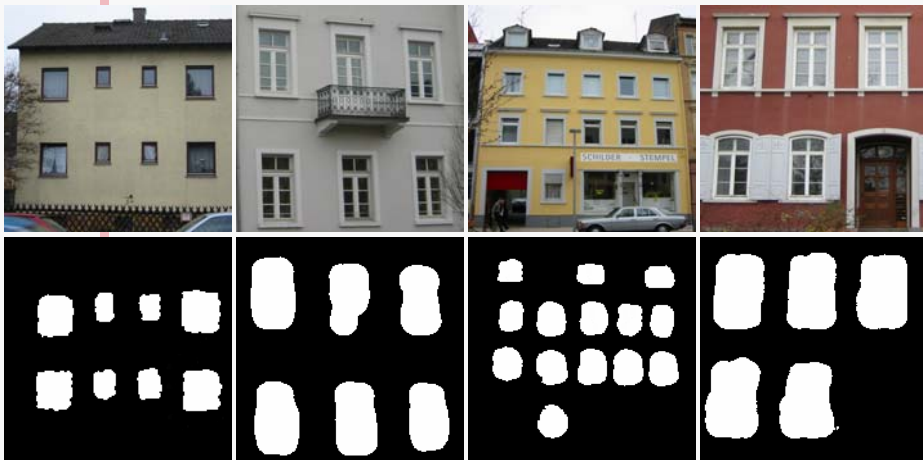
- View in the pyramid.  
(Colors distinguish different types of detectors.)

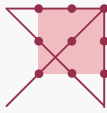


## Results: Segmentations

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- Segmentations of complex building facades are feasible.





## Conclusion/Remarks

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Mobile computers can be a medium for visitors of a city to interact with a city

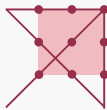
Edutainment is a great application for mobile interactive systems

New modalities: environment, position, ...

Some hard problems to solve: multi-modal interaction, vision, language understanding, ...

Mobility needs multi-modality

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## The Team

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