From Interaction between Language and Visual Representations to the Interaction between Language and Haptic Representations

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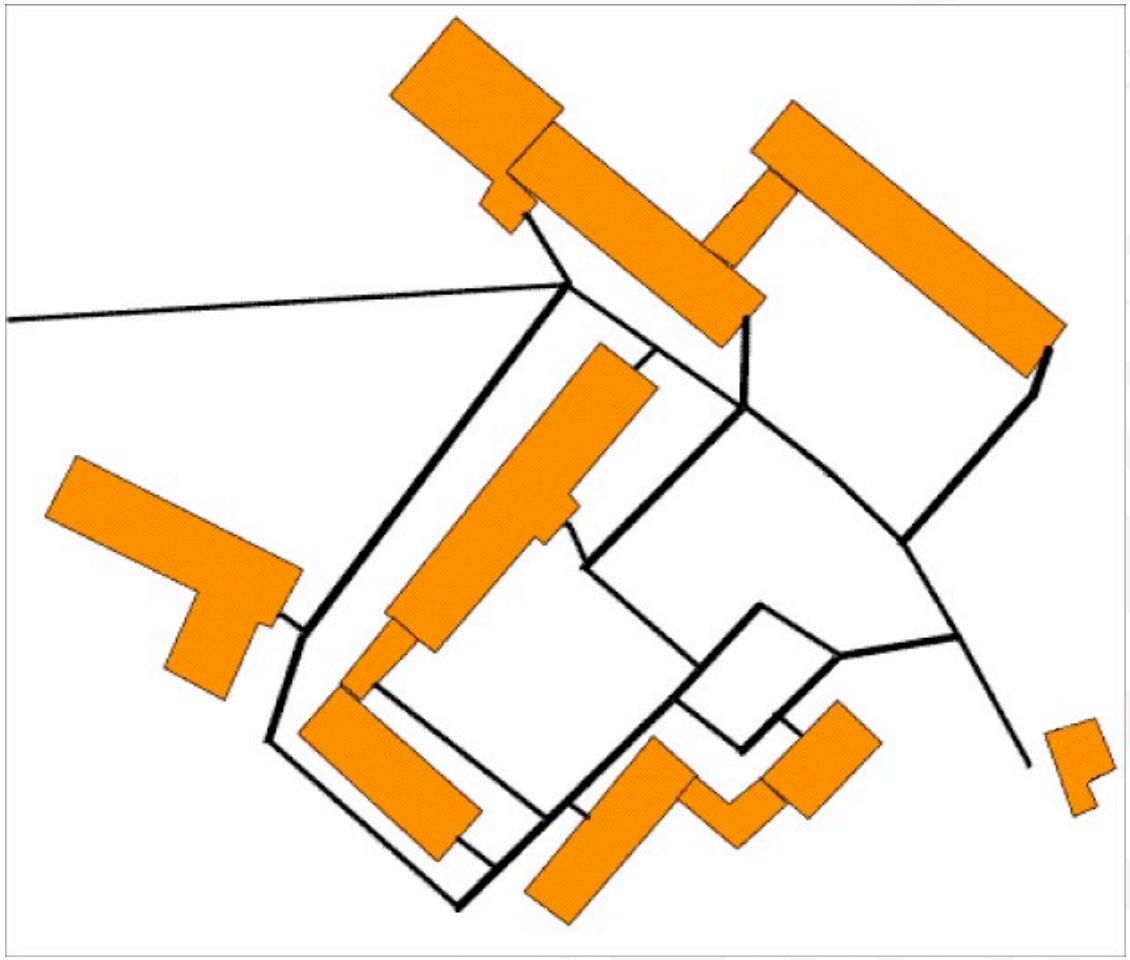
Language Representations

e.g. spoken or written descriptions

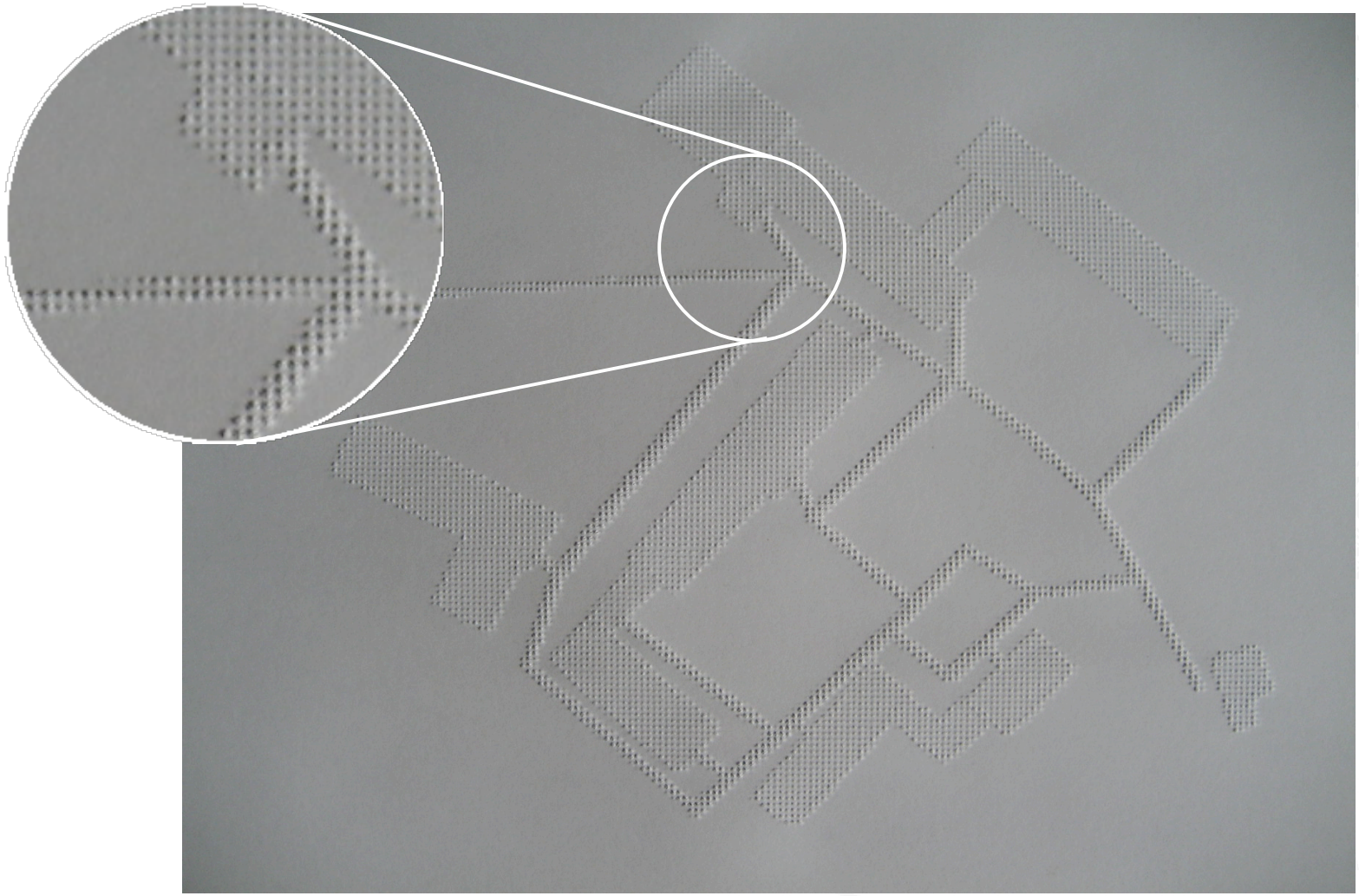
e.g. for orientation

The Computer Science campus is composed from 6 buildings, numbered A to F. When coming from the entrance gate the tallest building you can see is building F, just straight ahead. Building A directly to the left to the entrance hosts the library. Adjacent to it is building B where the cafeteria is located. The Computer Science campus is composed from 6 buildings, numbered A to F. When coming from the entrance gate the tallest building you can see is building F, just straight ahead. Building A directly to the left to the entrance hosts the library. Adjacent to it is building B where the cafeteria is located. The Computer Science campus is composed from 6 buildings, numbered A to F. When coming from the entrance gate the tallest building you can see is building F, just straight ahead. Building A directly to the left to the entrance hosts the library. Adjacent to it is building B where the cafeteria is located. The Computer Science campus is composed from 6 buildings, numbered A to F. When coming from the entrance gate the tallest building you can see is building F, just straight ahead. Building A directly to the left to the entrance hosts the library. Adjacent to it is building B where the cafeteria is located. The Computer Science campus is composed from 6 buildings, numbered A to F. When coming from the entrance gate the tallest building you can see is buildi

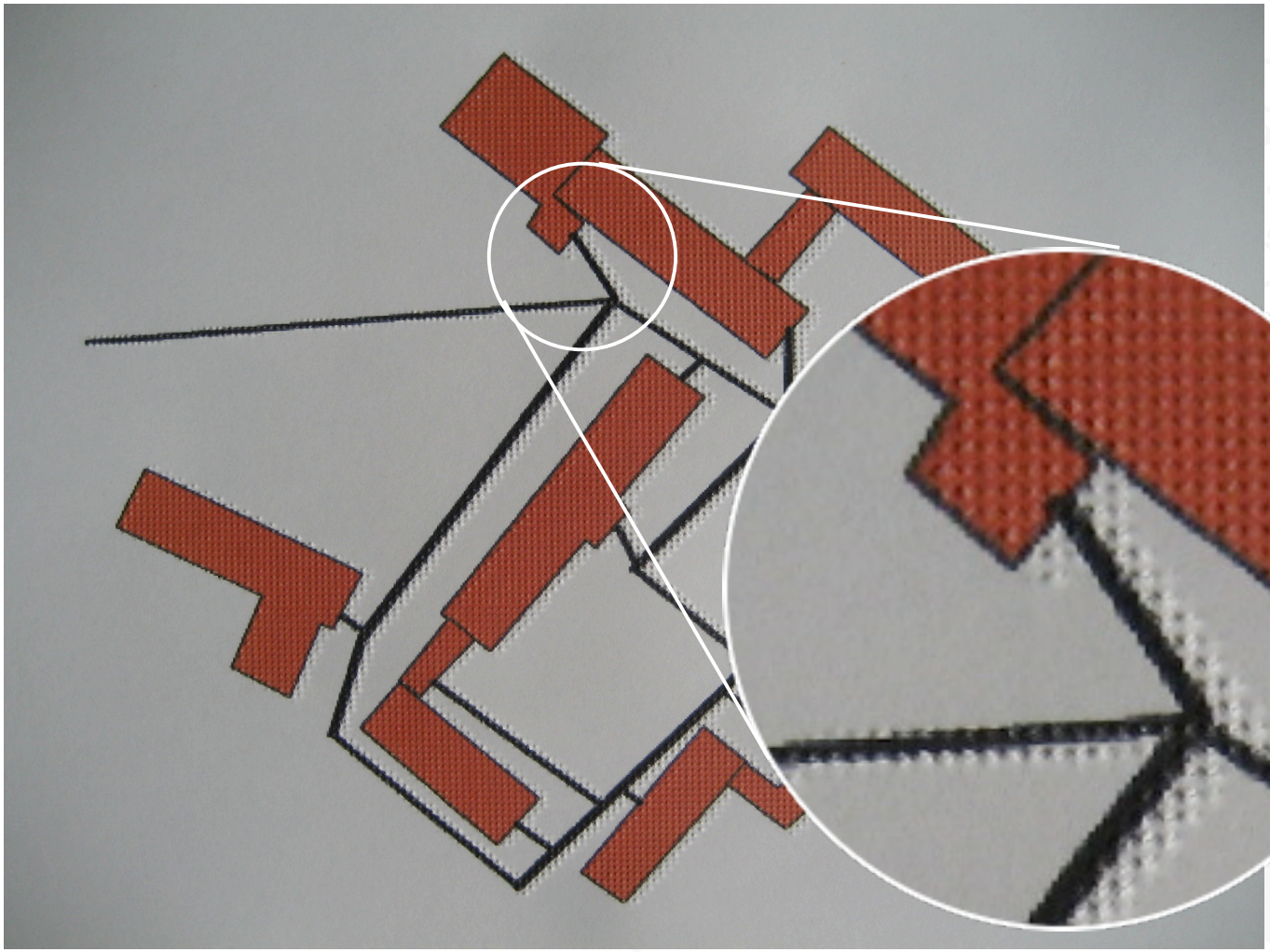
Visual Representations



Tactile Representations



Visual-Tactile Representations



Motivation

- Independent orientation & wayfinding
- Heterogenous groups of users
- Visually impaired persons (VIPs): limited spatial sensing
- Goal is two-folded
  - Investigate multimodal representations of space
  - Facilitate communication about space
- Common artifact as basis

➔ Visual-tactile maps and language

Agenda

1. Motivation ☑
2. Background
3. Problem Statement
4. Conceptual Idea
5. Research Questions
6. Research Agenda
7. Expected Results

Background : Visual vs. Tactile Modality

Visual Exploration	**Tactile Exploration**
Parallel	Sequential
Global	Local
High Detail	Low Detail

Background : Tactile Maps

- Accustomed maps for VIPs
- Raised lines and tactile symbols
- Conventions are hardly established
- No direct 1:1 transformation from visual maps

Challenges with Tactile Maps

- Special problems
  - Access is not instant
  - Exploration takes time
  - Overview is missing
- Example: tactile start-finish search
- Support by language to face problems
  - Touching & listening
  - Survey & context by language
  - Probably an extra gain from language information
  - Support understanding in a top-down fashion

Problem Statement

- Representations of the world in different modalities
- *But* communication about the same world
- Representation must prevent misunderstanding

Conceptual Idea

➔ Integration of representational modalities

- Different modalities in one map
  - Augment the representation in one modality with a representation in the other
  - Establish congruent concepts in both maps

State of the Art

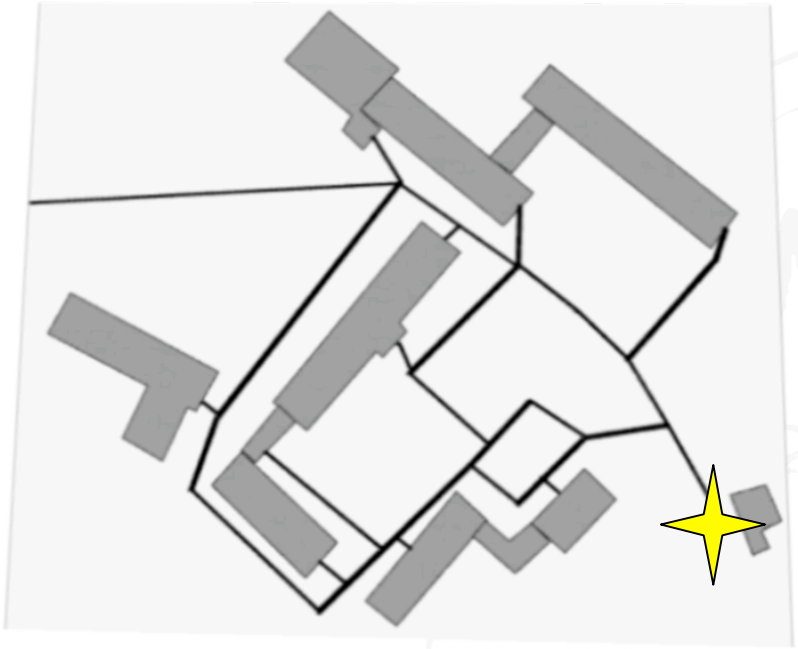
- Work of Loomis, Klatzky, Lederman, Heller and others
  - Visual maps and descriptions
  - Tactile diagrams & line graphs
  - Interaction of vision and haptics
  - Spatial representations in language
  - Drawings for/by the blind

Basic Findings on Tactile Maps

From interviews with users:

- Handling is uncommon
- Learning before reading
- All fingers involved
- Size of the map must be “right”
- Some conventions in encoding, but no standard interpretation

Examplary Class of Maps : You-Are-Here Maps



- Localized view of the near environment
- Found e.g. in parks, zoos, and campuses
- Nature: One origin to many destinations

Goals

- Missing so far
  - perspective on tactile YHA maps as special diagrams
- Facilitate the communication
  - Each actor must be able to interact with the map
  - Enable perception of the representations
  - Design cognitively suitable representations
- System of Design Conventions for visual-tactile YAH maps
  - Designed to fit cognitive abilities
  - Aimed at congruent concepts in all modalities

First Research Questions

- Motivation: Orientation is first task
- How to find the YAH point?
  - raised vs. flat YAH symbol
  - distinct vs. usual YAH symbol
  - verbal instructions
  - tactile guiding line
- Is ease-of-use maintained?

First Findings from Interviews

Design of YAH symbol

- Advantageous: higher than the rest
- Shape must contribute to the meaning
- Stick to one size in map and legend

Design of map

- Guiding line must not interfere with other line types
- Important
  - Legend
  - Spacing

Experiments about Finding the YAH point

- Subjects: trained, sighted, blind-folded persons
- Evaluation against a map with standard YAH symbol
  - Raised symbol (higher than the rest)
  - Special symbol (of same height as the rest)
  - Verbal instructions describing the position of YAH symbol
  - Guiding line from frame to YAH point
- Evaluation criteria
  - Objective: success rate and time to find YAH point
  - Subjective: Perceived ease-of-use

Expected First Results

- Evaluated design proposal for You-Are-Here symbol
- Design proposal on how to find the YAH point
  - Suitability of raised symbol
  - Suitability of special shape
  - Suitability of spoken language
  - Suitability of guiding line

Research Topics in the Future

e.g.

- Different “pop-out” effects
- Different types of lines
- Minimum level of correspondence between representations in multimodal maps
- Principles of interaction between visually impaired and sighted people
- Systems of maps: factors that influence the frequency of maps in an area

Thank You for Your Attention

Time for questions...

News about maps for visually impaired persons at
www.maps4vips.info

Get in contact with me now or via
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Questions for a Discussion

What can we learn from the investigations in language and vision for the interaction of touch and language?

Can we use the approaches from the research on the Visual World Paradigm to guide the investigation in discourse about visual-tactile maps?