

You-are-here Maps for Blind People : First Experiments in Cognitive Design of Non-visual Spatial Representations

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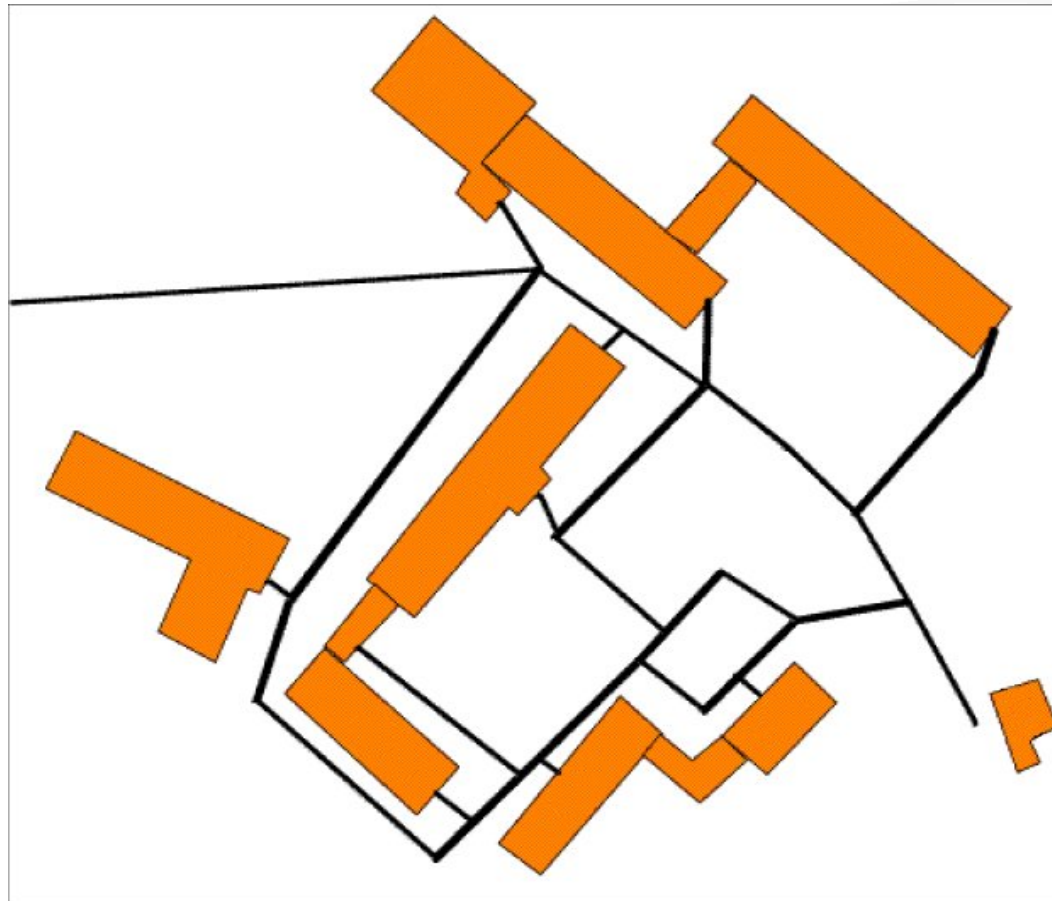
Language Representations

e.g. spoken or written descriptions

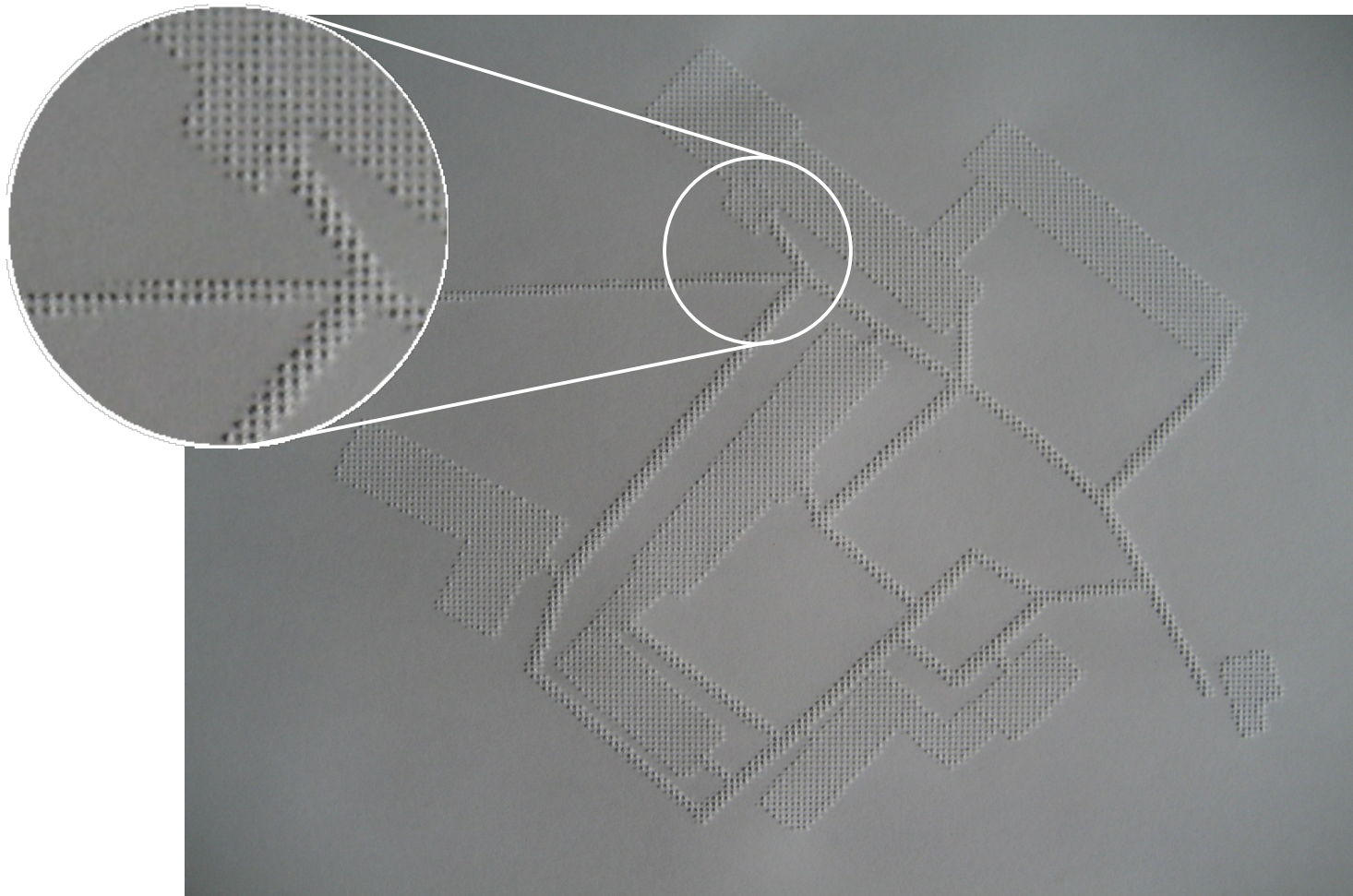
e.g. for orientation

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

Visual Representations



Tactile Representations



Visual Modality and Tactile Modality are very different

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

Challenges in using tactile representations

- Access is not instant
- Exploration takes time
- Overview is missing

Mimicking Sequential Encoding

- Visual perception is – even for contour perception – not sequentially
 - Haptic encoding of contours is – very often – sequentially
- Question:
What happens in sequentially visual line perception (= line following through an aperture)?







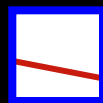




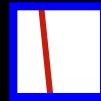


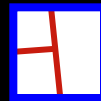


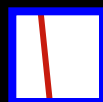


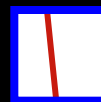


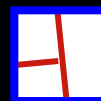




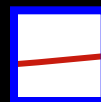


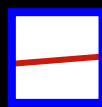


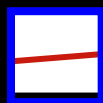


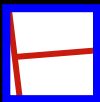


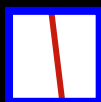


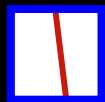


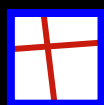


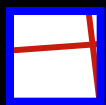


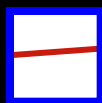




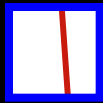


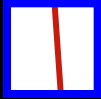


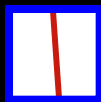








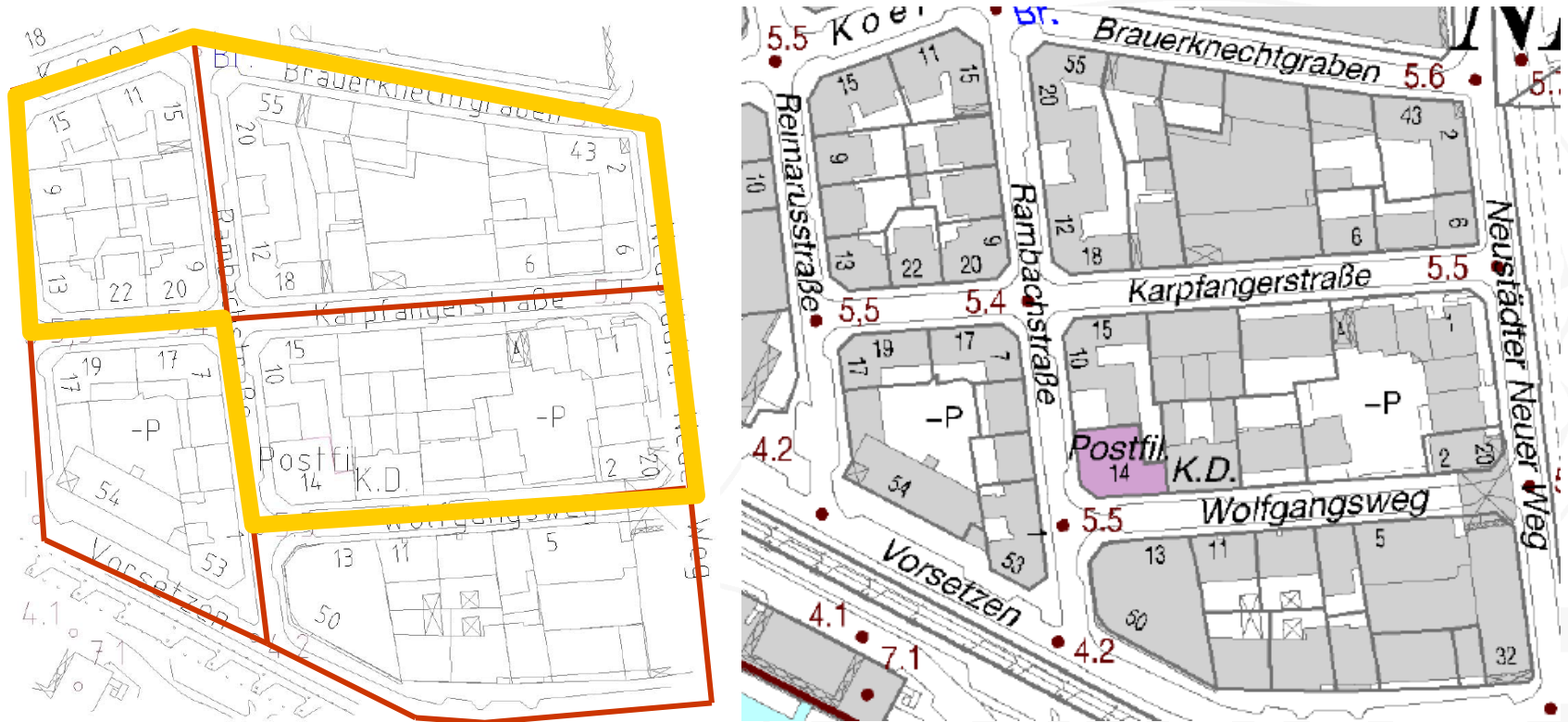




Mimicking Sequential Encoding

- Visual perception is – even for contour perception – not sequentially
- Haptic encoding of contours is – very often – sequentially
- Question:
What happens in sequentially visual line perception (= line following through an aperture)?
- Try to draw a sketch map of the line structure you perceived!

The route you perceived through the aperture



Visual & haptic group are nearly identical in accuracy if encoding is sequential. Original experiment by Loomis, Klatzky & Lederman.

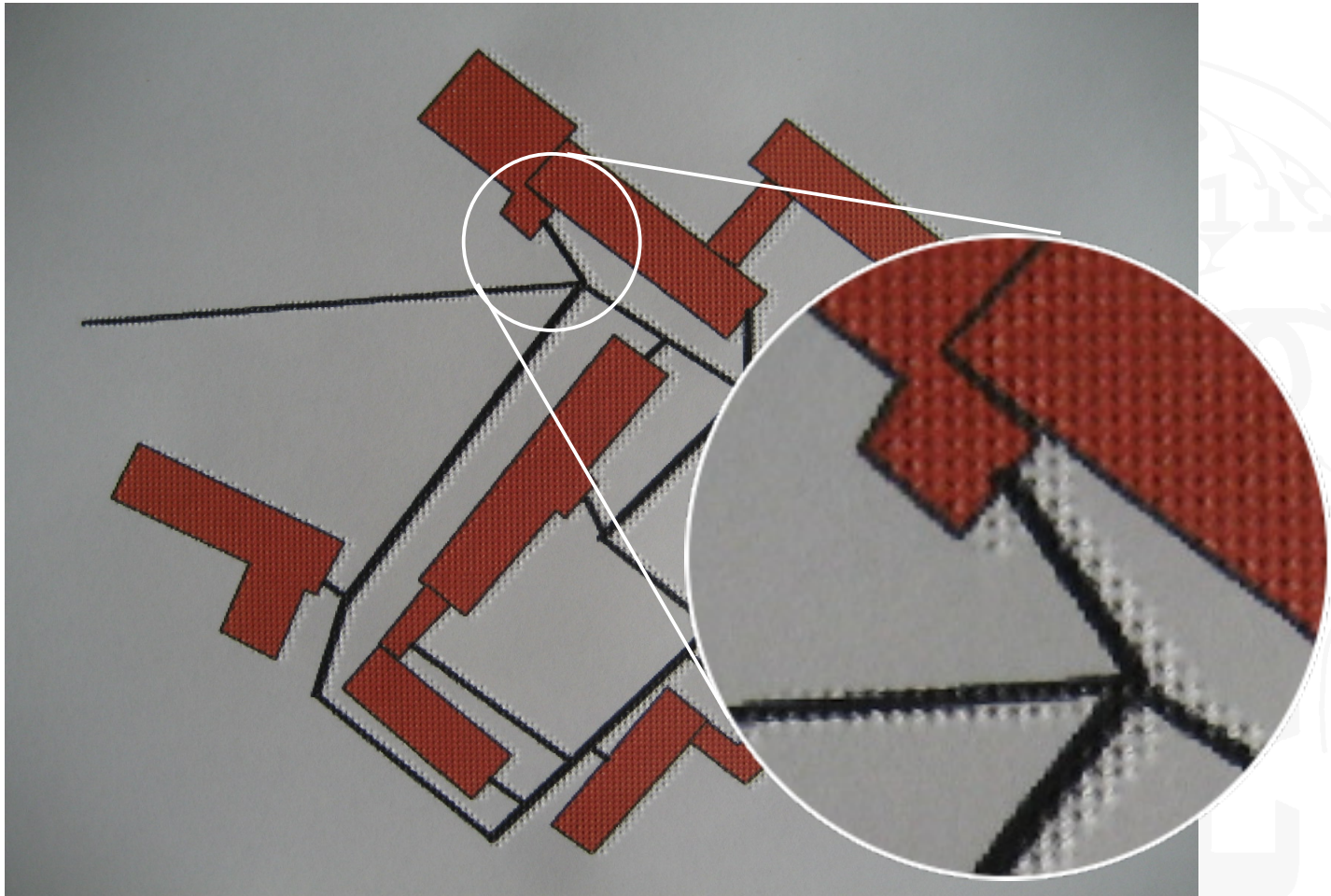
Motivation

- Visually impaired persons (VIPs) need to gain survey information to ease independent orientation & wayfinding
- Goal is two-folded
 - Investigate multimodal representations of space
 - Facilitate communication about space
- Customized maps for VIPs

Maps for VIPs (www.maps4vips.info)

- Multimodal
 - Touching & listening
 - Survey & context by language
 - Probably an extra gain from language information
 - Support understanding in a top-down fashion
 - Multiuser
 - Interaction of VIPs and sighted people
 - Probably mutual support
 - Support communication through a common artifact
- ➔ Idea: Visual-tactile maps and language

A Visual-Tactile Map

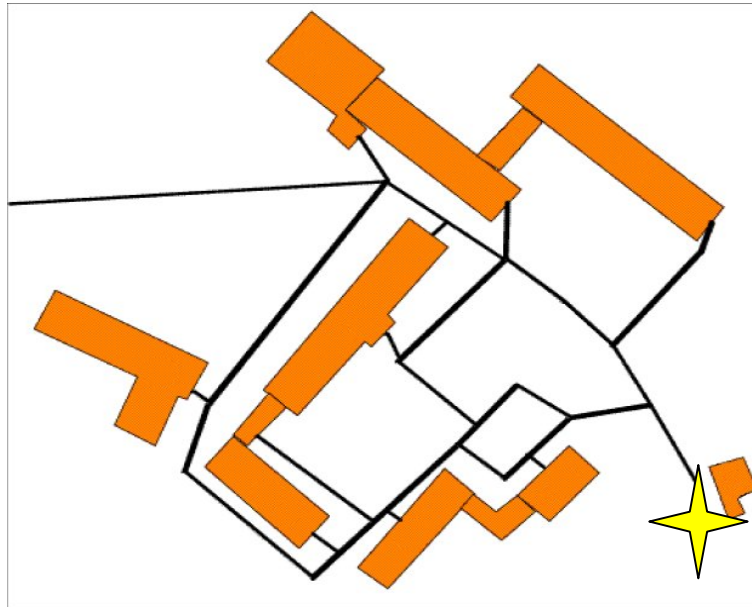


Basic Findings on Tactile Maps

From interviews with users:

- Each map is a singleton as it is hand-crafted
- No standards for encoding
- No standards for interpretation
- Learning is a must before reading
- Usage is not very common

Exemplary 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

Problem Statement

- How can we finding design conventions for visual-tactile YAH maps when the potential users (VIPs) cannot evaluate it's usefulness as they – in most cases – are not accustomed to any kind of maps, haven't learned to use and probably cannot comprehend it?

Research Agenda 1: Understanding & Comprehending Concepts in Tactile Maps

Approach: Users with internalised conventions from visual map investigate different tactile maps to establish conventions for tactile maps

1. Experiments about understanding the YAH symbol and detecting the YAH point
2. Experiments about interpreting and comprehending YAH maps

Subgoal: A set of conventions for tactile YAH maps that seem reasonable for users that already know conventions from maps and map use.

Research Agenda 1: First Findings about Detecting the YAH Point from Interviews

Design of YAH symbol

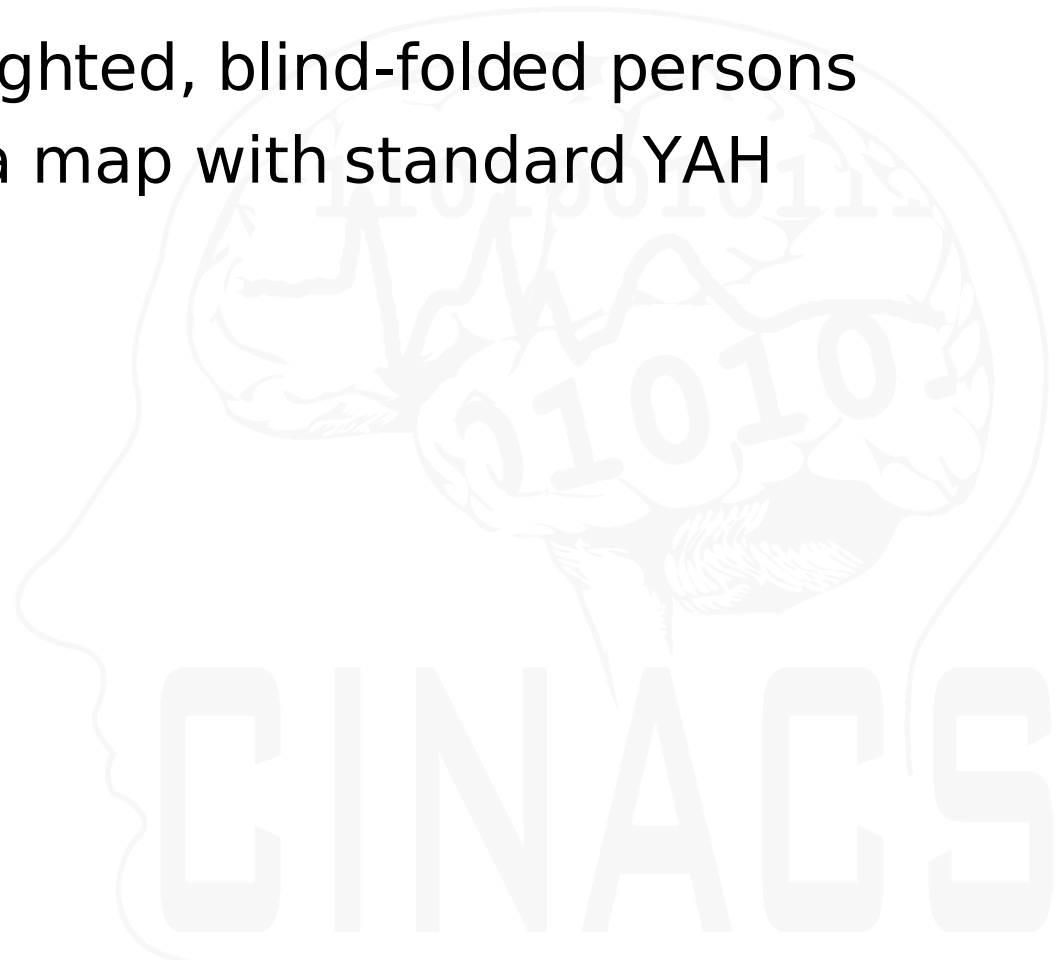
- Advantageous: higher than the rest
- Shape must contribute to the meaning
- Stick to one size in map and legend

Design of map

- Important
 - Legend
 - Spacing
- Guiding line must not interfere with other line types after one-time-use to find entry point

Research Agenda 1: Upcoming Experiments about Finding the YAH point

- Subjects: trained, sighted, blind-folded persons
- Evaluation against a map with standard YAH symbol



Example Tactile Map with Standard YAH Symbol



Research Agenda 1: Upcoming Experiments about Finding the YAH point

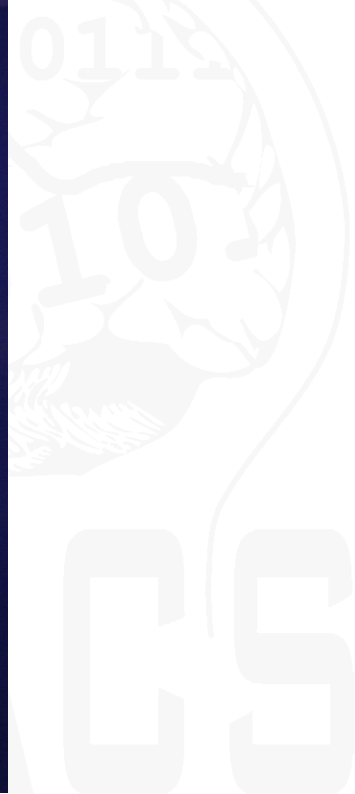
- Subjects: trained, sighted, blind-folded persons
- Evaluation against a map with standard YAH symbol
 - Raised symbol (higher than the rest)
 - Special symbol (of same height as the rest)

Standard vs. Special vs. Raised Symbol



Research Agenda 1: Upcoming Experiments about Finding the YAH point

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 - Special symbol (of same height as the rest)
 - Guiding line from frame to YAH point





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 - Verbal instructions describing the position of YAH symbol

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

Research Agenda 2: Multimodal Maps

3. Studies on multimodal training of VIPs with identified conventions: interaction of language and tactile maps to support understanding and comprehension

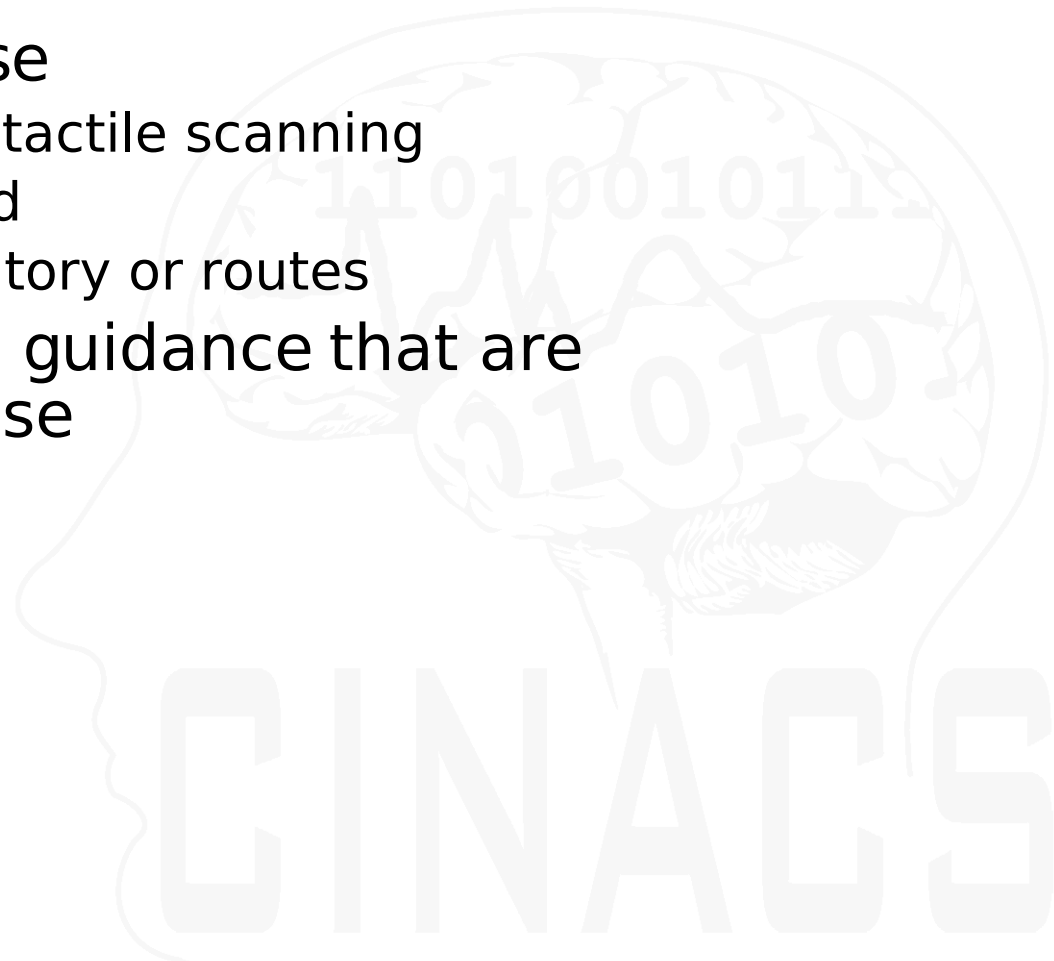
Subgoal: A training that helps VIPs in handling a map, which supports them in establishing a survey representation of their environment.

4. Studies about the multimodal communication between sighted and visually impaired persons

Subgoal: VIPs and sighted can engage in a meaningful conversation about a visual-tactile map.

Research Topics in the Future

- Influence on map use
 - level of expertise in tactile scanning
 - personal background
 - Perspective: exploratory or routes
- Types of attentional guidance that are beneficial for map use



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

How can we make sure that the learnings from the investigations in map concepts with sighted people can be of real use for maps for VIPs?

