The Sound of Stockholm

A Storytelling Podcast for People with Blindness or Visual Impairment

by **RICA THISSEN** and **IRENE CHANG**

Currently, there is a significant gap in map resources tailored to blind individuals [2]. Most maps heavily rely on visual information, thereby restricting blind individuals' ability to grasp the layout of unfamiliar environments and form cognitive representations of new places.

Addressing this issue is crucial to bridge this accessibility divide and promote inclusivity in urban/city exploration for visually impaired individuals. This project focuses on enhancing the independence and confidence of blind individuals when exploring unfamiliar places.

THE GOAL

To provide a resource for the blind to explore a new city they have never been to before from afar. We intend to utilize audio and touch sensations to bring the map alive for a visually impaired person.

- Enhancing remote exploration for the visually impaired with audio and touch.
- Creating a clear audio-tactile map for meaningful guidance.
- Helping visually impaired users build a mental city layout through tactile maps and storytelling podcasts.

HAPTIC MAP PRODUCT

The completed haptic map is printed in A1 size. It includes key elements such as the major road network, building polygons referenced in the storytelling podcasts, parks/ green spaces, and Stockholm's coastlines to provide references during the exploration *(Figure 1)*.

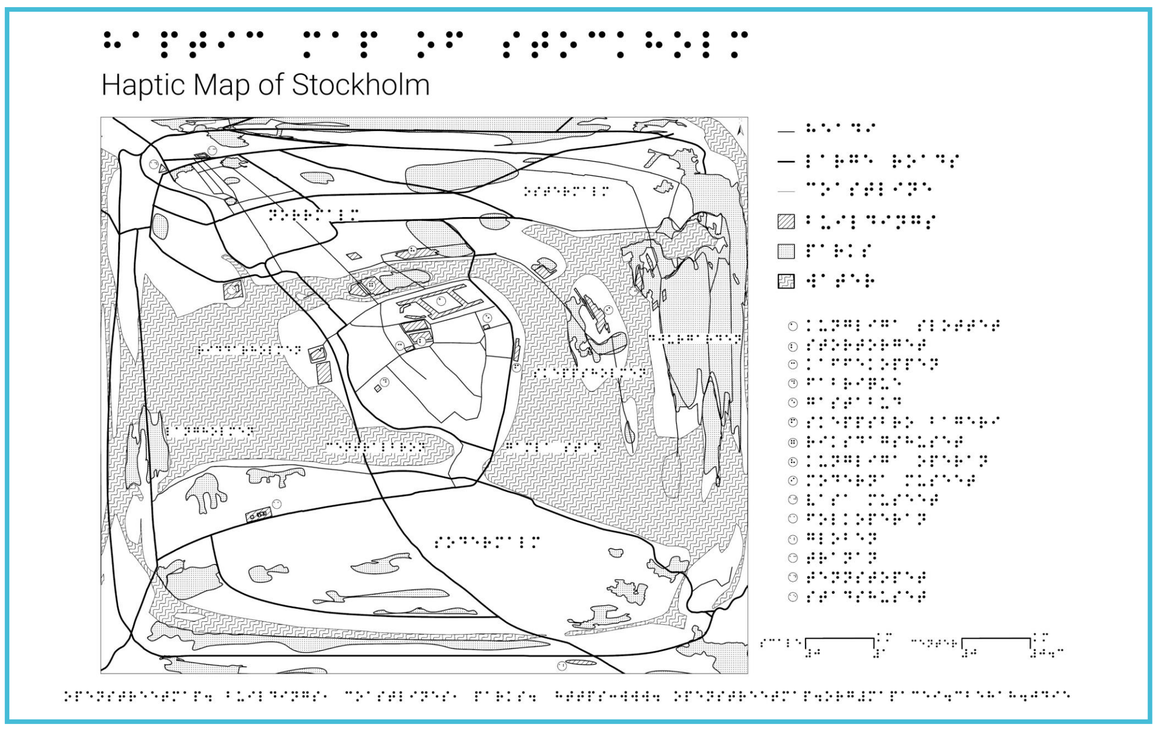


Figure 1: Final product of the project, the Haptic Map of Stockholm.

PERCEPTION STUDY RESULT

We conducted a survey on the cognitive approach to maps for exploration, which aided us in developing a guide for setting up text-based map representations. In the end, 46 people participated.

The majority of results indicate that more than 70% of participants initiate city exploration from the city centre or the centre of the map. They often anchor themselves by using a point of interest or other map features, such as starting from the city hall and subsequently discovering new places around it in relative positions (*Figure 2*).

MAP TRANSFORMATION

A haptic map is very limited in its information density. Therefore, we enlarge the structure of the city centre with a map transformation [1], while still showing the outskirts of the city. In order to disturb the haptic perception as little as possible, we compare the two different map transformations, bifocal magnification and fisheye-view magnification in *Figure 3*.

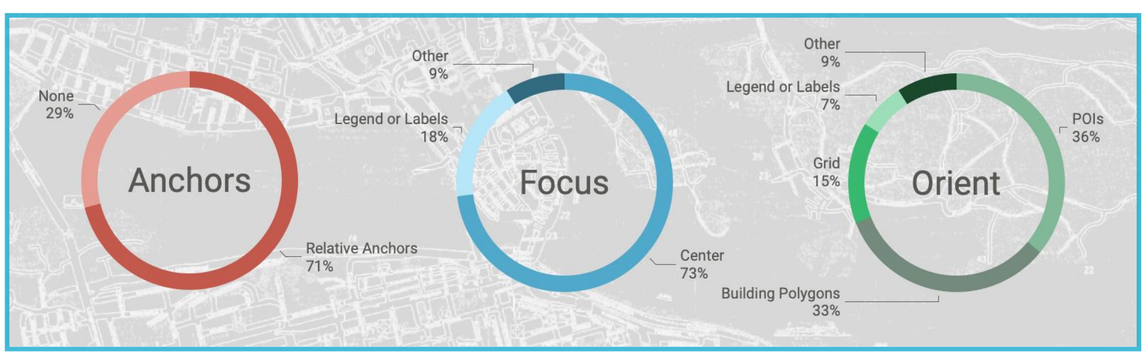
The bifocal function keeps straight lines as such but distorts the top, bottom, left, and right areas extremely. Because of that distortion, we chose the fish-eye view magnification for our haptic map. A drawback of this result, is the distorted representation of the circular motorways with their now rectangular appearance.

STORYTELLING PODCAST

The podcast guides the audience to explore Stockholm with the support of a haptic map, providing users with two sensory-rich experiences in the city. We recorded three episodes of podcast guiding through the following topics: an overview of Stockholm, the historical sites around the city, and Swedish food places.

CONCLUSION & LIMITATIONS

The haptic map is constrained by the need for spatial separation among its features for effective distinction during exploration, resulting in a distortion of the final map. Additionally, the podcast's limitation lies in its linear description, restricting users from exploring beyond what is explicitly covered in the podcast. Users are unable to choose what to explore or navigate between different places on the map. Given these limitations, we can identify a reason for the scarcity of accessible map-like products.



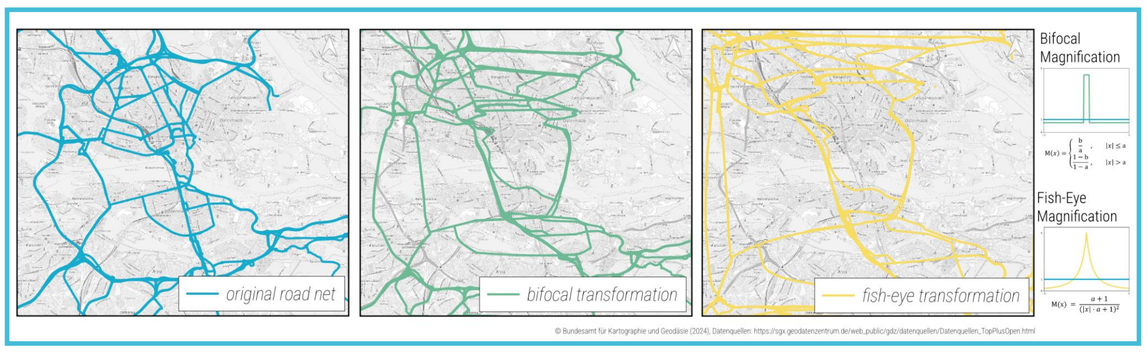


Figure 2: Graphs of map perception survey results in three categories: anchors, map focus, and orientation.
Figure 3: Comparison of bifocal and fish-eye transformations [1]. The magnification parameters were chosen to have a similar effect on the up-scaling of the city centre. Bifocal: a = 0.07, b = 0.3; Fish-Eye: a = 4. The base map has not been distorted.

IMPRINT

Mapping Project
Winter Semester 2023/2024
Technical University of Munich

Rica Thißen

Irene Chang

SUPERVISOR

Juliane Cron, M.Sc.
Chair of Cartography and Visual Analytics

KEYWORDS

haptic-map, auditory-exploration, blindness

LINK TO PODCAST

https://shorturl.at/aDLZ4

REFERENCES

[1] Leung, Y. K., & Apperley, M. D. (1994). A review and taxonomy of distortion-oriented presentation techniques. ACM Transactions on Computer-Human Interaction, 1(2), 126–160.doi.org/10.1145/180171.180173

[2] Ottink, L., Buimer, H., van Raalte, B., Doeller, C. F., van der Geest, T. M., & van Wezel, R. J. A. (2022). Cognitive map formation supported by auditory, haptic, and multimodal information in persons with blindness. Neuroscience & Biobehavioral Reviews, 140, 104797.doi.org/10.1016/j.neubiorev.2022.104797

[3] OpenStreetMap. Buildings, Coastlines, Parks. Available online: https://www.openstreetmap.org/#map=13/59.3258/18.0495 (Retrieved 1 December 2023).

[4] Stockholm stad Öppna data Dataportalen. Roads. Available online: https://dataportalen.stockholm.se/dataportalen/ (Retrieved 1 December 2023).

This project was created within the Cartography M.Sc. programme – proudly co-funded by the Erasmus+ Programme of the European Union.

Technische Universität München · TU WIEN TECHNISCHE UNIVERSITÄT WIEN · TECHNISCHE UNIVERSITÄT DRESDEN · ITC UNIVERSITY OF TWENTE. · Erasmus+ · cartographymaster.eu