Choose the easiest path: comparison of urban design for ease of cognitive mapping by blind persons

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INTRODUCTION

There are differences between the blind and the sighted persons in classifying and collecting the data about surrounding environment.(Golledge & Stimpson, 1997) Configuration of spatial elements, visible rules uf using it, clear thematic continuation facilitate coherence and legibility (Lynch, 1960). Lack of legibility causes a difficulties in cognitive mapping of the space in users mind and makes the spatial orientation and wayfinding difficult(Downs & Stea, 1973; Gould & White, 1986).
The use of tactile maps helps in wayfinding and spatial orientation.(Arthur & Passini, 1992).
Blind persons are able to evaluate spatial layout and legibility based on use of tactile map (Kuryłowicz, Bogucka, 2011).

The objective of this study:

•to examine which urban project is perceived as more readable and easier to learn than others.
•to compare the ease of use of tactile maps between sighted and blind people.
It is assumed that the ease of learning of the spatial layout might be measured by the time of completing assignments on tactile maps. Vision impaired people might perform tasks better than sighted ones, because of their earlier experiences with tactile materials.

EXPERIMENT

Two groups of participants (blind and sighted persons) were compared in their tasks performance on each presented map. The evaluation between maps was also based on quantitative and qualitative analysis based on spatial data concerning the chosen routes.

Dependent variables

Five dependent variables were measured in experiment:

1. the time needed become familiar with the map
2. the time to seek a path from the railway station platform into the amphitheater,
3. the time to show the chosen route from platform into the amphitheater
4. the number of trials of showing (tracking) the chosen route (how many times respondents change their minds about their choice while showing the route)
5. the number of errors in showing the chosen route

The participants were not informed about time measure procedure.

Participants

15 blind and 15 sighted persons)participated in this study. In the group of vision impaired people were seven women and eight men. Their ages ranged from 32 to 74 years. All of them read the texts in Braille and have the experiences with tactile graphics. All of them declared that they go out every day and use a white cane.
In sighted people group were 11 women and four men. Their ages ranged from 26 to 67 years.

Procedure

Order of presenting three maps to participants was different (shifted by one for each succesive participant) . Maps were preceded by the control map (without any design interventions).
Experiment had two stages: preparation and examination. In preparation stage participants were shown the control map that contains elements identical on all maps: a terrain's boundary, railroad tracks, existing buildings, existing main routes and a railway station platform. In this stage participants could learn the textures of each element. After getting familiar with the map participants were asked to show every element on the map. Examination stage consisted of presentations of designed maps. For each of them the study proceeded in the same schedule containing: learning phase, analyzing phase and evaluation phase. At the end of learning phase participants were asked to show the platform and the amphitheatre. In analyzing phase they were asked to chose and show the best way form the platform to the amphitheatre. In evaluation phase they were asked for their opinion and reflections about the spatial elements and an ease to become familiar with the map.
After showing of the last map participants were asked, which map has been the easiest and which the most difficult to use.

Research materials

The tactile maps based on students' projects for Schindler Award 2010 were presented in this experiment. The maps were printed on Tiger Braille Printer (VievPlus) in A4 format.
In James (1982) classification of tactile maps the research materials could be classified as a mobility map.

ACKNOWLEDGEMENTS

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RESULTS

General evaluation and comparison of the maps by vision impaired and sighted people

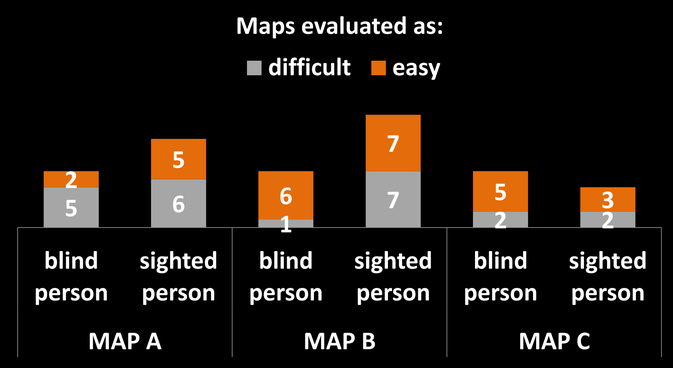

Figure 1. Number of maps indications as easy or difficult in blind and sighted persons group.

Both sighted and blind persons were asked to indicate the easiest and the most difficult maps.
Map A was indicated as the most difficult one and map B as the easiest one.
However perception of map B was different among the blind and sighted groups. Blind people group favored map B more. For sighted people group evaluation ratio doesn't allow to determine which map is best.

The influence of the map and the ability to see on the performance in spatial tasks

Figure 2. Tactile map viewing time as a function of the ability to see.

Figure 3. Route seeking time as a function of the ability to see.

Repeated-measures two-way analysis of variance (ANOVA) shows that blind persons significantly faster familiarized with maps (see figure 2): F(1, 28)=14,256, p=0,00076 and significantly faster found the route (see figure 3): F(1,28)=8,0494, p=0,00837. There was no differences in other tasks performance on different maps and by the interaction of the ability to see and the map.

Routes preferred by sighted and vision impaired persons

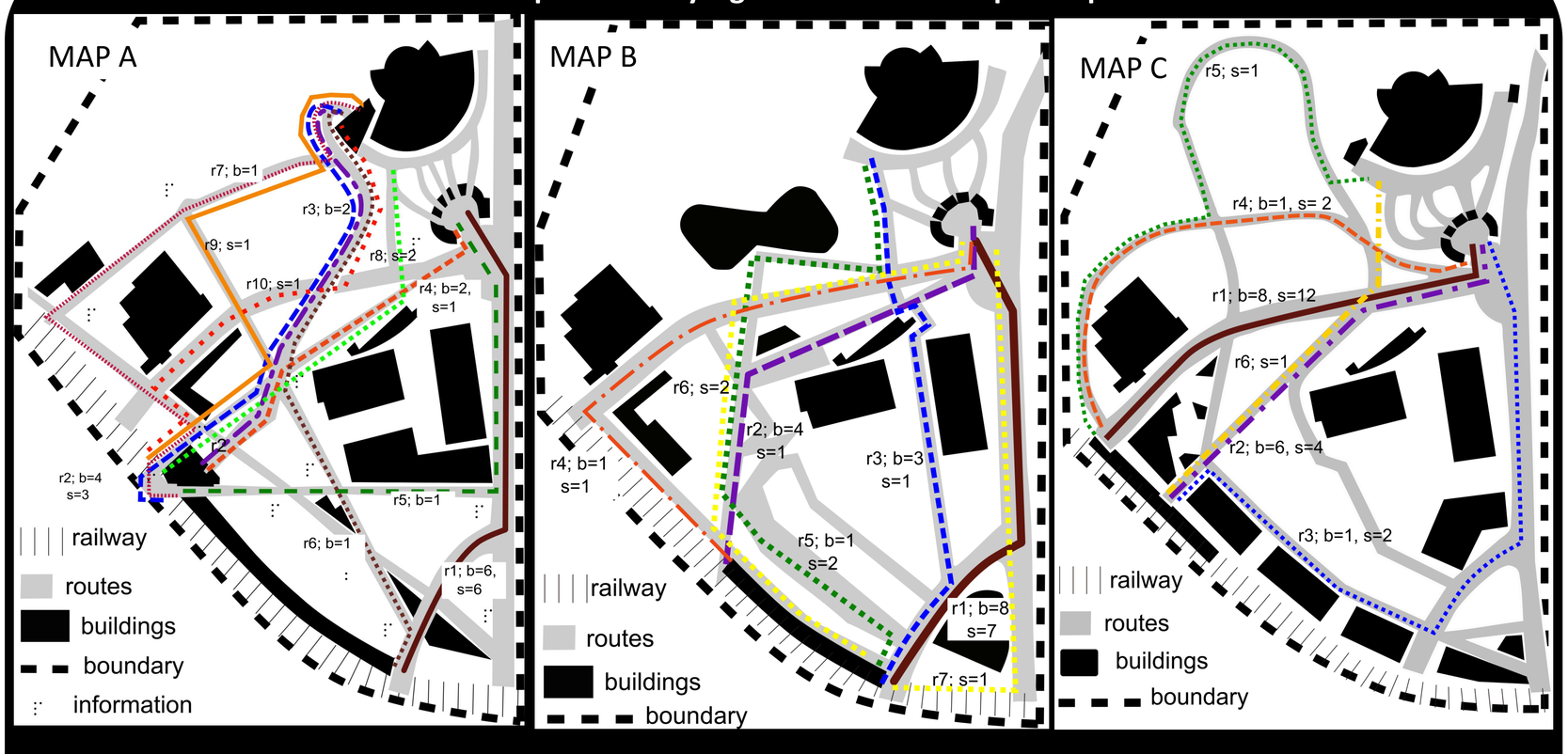

Figure 4. The maps A, B and C with indication of preferred routes form platform to amphitheatre (r1, r2, … - road markings; b – number of indications in blind persons group, s – number of indications in sighted persons group).

On the maps A and B the same route was indicated the most frequent as the best in blind and sighted persons groups.
On every map the best routes from participants point of view was the existing ones – not designed by the students.
There were few mistakes in route indication in sighted persons group, and no mistakes in the blind persons one.

DISCUSION AND CONCLUSIONS

This research confirmed the assumption about better performance of blind persons in tasks on tactile maps.
For blind people the map B was the easiest, but not for the sighted persons. The differences between sighted and blind persons performance and evaluation manner shows that it is impossible to investigate the spatial non-visual legibility on the basis of sighted persons experiences.
It turned out that it is difficult to offer an attractive alternative to existing major roads.

The objectives for future research:

• use a different technique to prepare a tactile material
• evaluation of existing layout of terrain - comparison between the graphic representation and the real space.

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