Usage of Multimodal Maps for Blind People: Why* and How*

Anke Brock, Philippe Truillet, Bernard Oriola, Christophe Jouffrais
IRIT – University of Toulouse / CNRS , France
Contact: anke.brock@irit.fr

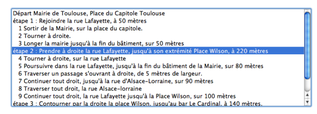
* WHY

INTRODUCTION:

Navigating is not always obvious for a blind person, especially in an unknown environment. This often means that the visually impaired travel less, which influences their personal and professional life.

Many websites offer the possibility of preparing an itinerary. Often, this information is presented in the form of a visual map[1] (allocentered representation) and a corresponding roadmap[2] (egocentered representation). The roadmap is accessible for visually impaired people using a screen reader (technical aid for the blind for accessing the screen content). However information in the roadmap is limited to the important steps of an itinerary and does not help to understand the environment, which is necessary to enable a flexible and autonomous navigation (e.g. a change of itinerary in case of roadwork). Visual maps are very useful for spatial knowledge but are inaccessible.

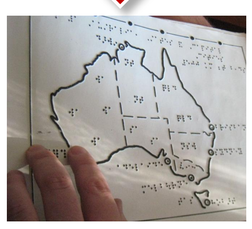
[1] Visual map (allocentered representation)



[2] Roadmap (egocentered representation)

CLASSICAL APPROACH: tactile paper maps

- Pertinent but with limitations:
  - Information is static
  - Less information can be transmitted than visually
  - Require knowledge of Braille
  - etc.



MULTIMODAL APPROACH: interactive multimodal maps

Tactile map placed on touch surface with audio output


- Information on request
- More information can be transmitted than with tactile map


State of the art: usage of MONOTOUCH devices

NEW APPROACH: usage of MULTITOUCH displays

Advantages of multitouch compared to monotouch:

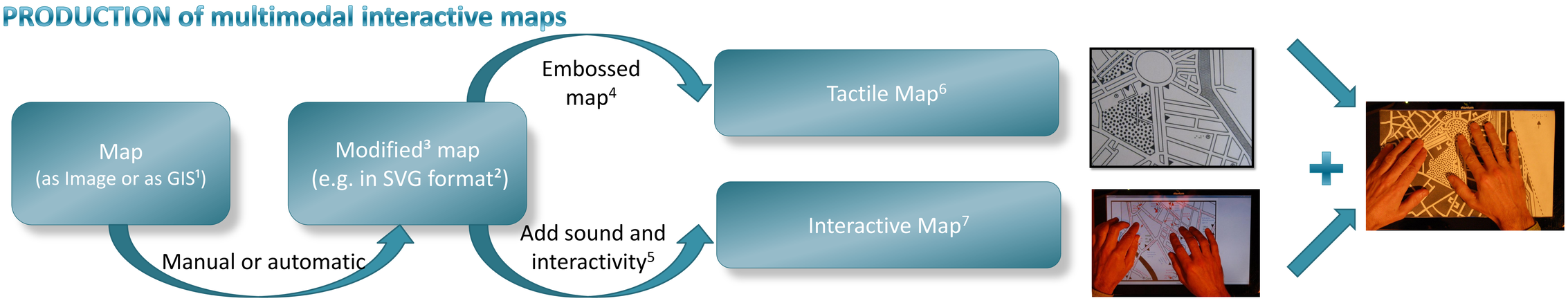
- Blind people normally use more than one finger at one time
- Multi-point and gestural interaction is possible
- Exploration strategies of tactile maps by the blind can be analyzed

REQUIREMENTS for multitouch device

- Technology: must be usable with a tactile map placed on its surface
- Accuracy: inaccuracy of finger position can result in errors in audio output [1]
- Number of inputs: real multitouch characteristics, at least 10 inputs
- Size: with preference A4 or A3
- Orientation: with preference landscape
- Programmable interface: access to touch and gestural events

We use Stantum Multitouch display [3].

PRODUCTION of multimodal interactive maps



* HOW

[1]GIS: Geographical Information System

[2] SVG (Scalable Vector Graphics): [2]
graphical and XML format,
usage of labels to distinguish different element types

```
<path
   style="fill:#000000;fill-opacity:1;
   d="M 202.75573,109.1617 L 191.21931
   id="building066"
   transform="translate(0,284.3617)"
   inkscape:label="#path5899" />
```

label

[3] Modifications: [4]

- Simplification (decrease information content)
- Usage of textures and symbols for different types of information
- Ensuring readability (distance between tactile elements in map,…)

[4]Different printing techniques exist (we use regular printer with swell-paper and fuser)

[5]Handle touch input and associate sound output with elements on the map

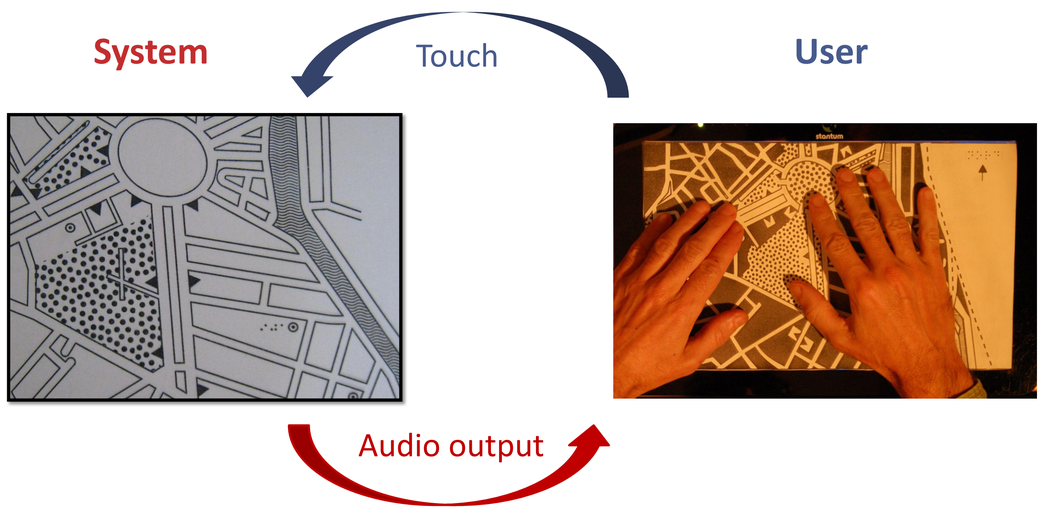
[6]Tactile information

- Outlines of the roads and buildings
- Textures for parks and rivers
- Symbols for public transportation

[7]Audio information

- Name of roads, buildings, parks, rivers,…
- Bus stop and connections,…

USAGE of multimodal interactive maps



RESULTS

Preliminary evaluations:

- Usable
- Pertinent for acquiring spatial knowledge

FUTURE WORK

- Further improvement of interaction techniques
- Analysis of the exploration strategies of tactile maps by blind people
- Formalization of the multimodality: which modalities, how and when?

DISCUSSION

Technical limitations exist:

- Limited choice for technology satisfying our requirements
- Idea: replace printed tactile map with deformable tactile display?

REFERENCES:

[1] Power, C. 2006. On the Accuracy of Tactile Displays. *International Conference on Computers Helping People with Special Needs*, 2006, pp. 1155-1162.
[2] Scalable Vector Graphics (SVG) 1.1 (Second Edition), *World Wide Web Consortium (W3C)*: http://www.w3.org/TR/SVG/
[3] Stantum, Unlimited Multitouch – Home: http://www.stantum.com/en/
[4] Tatham, A. The design of tactile maps: theoretical and practical considerations. *15th International Cartographic Conference*, 1991

QR Code: