Relief map design tool for visually impaired people

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LIMOS

Introduction

This research project, called ACTIVmap, is aimed at developing a tactile maps design tool for visually impaired people. Nowadays, the adapted map are made by redrawing manually the roads, buildings and everything that needs to be represented using a traditional map or aerial photograph (Géoportial, Google Earth...) as support. This is a time consuming process and does not permit a real adaptation to the handicap.

The need of research and technical orientations are motivated by the specific constraints of the target audience and the know-how of professionals of the visually impaired support (adapter-transcriber, locomotion instructor ...) and are the result of the collaboration between them and teams of researchers to covers the fields of cartography, computing and assistance to the visually impaired.

In order to realise the set of tools, we have to first identify and classify the constrains, due to the specificities of the visual impair but also by the exploration of new conception and fabrication approach.

After that, we brought professionals to participate to guide our choices and methods by their know-how. This invitation to participation was made through a map collection campaign adapted to the visually impaired public.

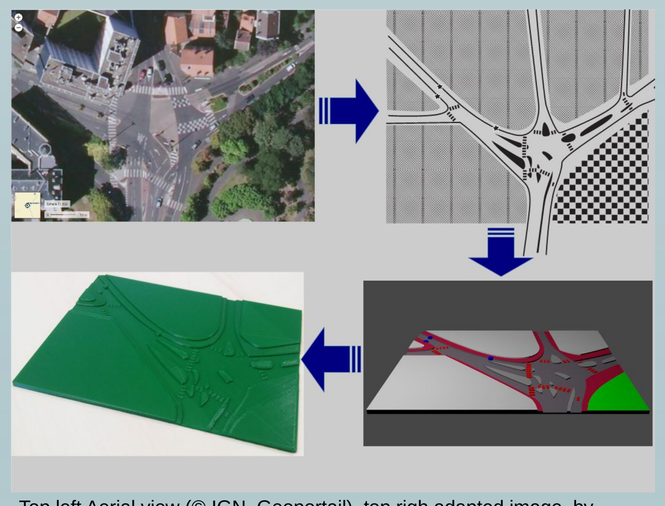
Finally, the results of this call for participation allow us to focus our research on the main needs in cartographic adaptation by taking into account the expertise of professionals in the field of assistance to the visually impaired.

Works

To identify and classify the constrains a scientific watch and analysis of studies conducted on visual impairment highlighted the need to exchange with experts in the field. Indeed a lack of norms and standards allowing to frame the realization of relief map for visually impaired encouraged us to exchange with these professionals and people suffering from blindness in order to better understand this handicap and the associated problems.

So, we organize a map collection campaign to made a set of samples that describe and illustrate the experts practices in map conception and adaptation. This involve that we spend time communicating and exposing our project to adaptation professional communities, and putting tools in place to enable them to participate. This was done through a website (https://activmap.limos.fr/) with an upload platform on a dedicated page explaining our request and offering a consent form for intellectual property rights (use, publication, sharing...).

In parallel we work on a prove of concept relief map done by 3D printing to explore a other way to fabric and a new representation mode of the map elements (roads, building…) with multiple elevation that offering the possibility to present more information (classic methods use textures variation and blind people can only differentiate 3 to 5 of these texture template on the same document).



Top left Aerial view (© IGN, Geoportail), top righ adapted image by MARTIN Durga (© CRDV), bottom left 3D model and bottom right the printed model made by ourselves

The involvement of a mapping organization allows us to take advantage of their knowledge on cartographic generalization, not used today for this purpose, which would simplify the geometric shapes representing the map elements, in order to simplify tactile reading and mental space representation by the visually impaired.

First Results

The participation campaign for the acquisition of adapted maps allow us to collect 113 maps. The results of the maps obtained are as follows:

Map scale	Number of map (%)	Comments
Building	1 (0,88%)	From building plan
Crossroads / junction	5 (4,42%)	From aerial view, floor and sidewalk markings shown
Square / block	12 (10,62%)	From aerial view (Geoportal...), some marked buildings (town hall...)
Street map / city centre map	65 (57,52%)	From aerial view or clasic plan, some buildings marked (town hall, church...)
city	14 (12,39%)	From plan, representation by zone (built area...)
Large scale	16 (14,16%)	very variable, mainly for the teaching of geography secondary school / high school

Use case	Number of map (%)	Comments
Locomotion / trip	50 (44,25%)	for mental representation and space's understand
teaching	15 (13,27%)	similar to the maps used in the history course, sometimes the layout is simplified and the map split when the information is numerous
Culture and tourist itinerary	43 (38,05%)	for understanding the place or following a route or a visit (can generally be related to a neighbourhood plan with points of tourist interest and / or highlighting a path to follow)
Transport	5 (4,42%)	only the route of the means of transport and the main stops are shown and not the urban environment

Prospects

Works carried out is the first step necessary for the realisation of the project. They made it possible to make choices as to the restriction of the field of application towards the plans of type plan of district / town centre, and, to direct the research. The experts' knowledge gathering and exchanges around the project led them to participate in the project and guide us in the development and implementation of tools to help them in their work.

The next steps identified will aim to facilitate tactile reading and to facilitate the mental representation of the space of visually impaired people, in particular by introducing and adapting mapping generalization methods to the constraints of the targeted disability. And in another way, we need to continue the work on the exploration of fabrication methods as 3D printing to bring new approaches and solutions for relief document's support.

The first reactions to 3D-printed maps look promising, but we are also waiting for more detailed feedback on the use of 3D-printed maps, experimented in the field by instructors in locomotion at the "Centre de Rééducation pour Déficient Visuel" (CRDV) in Clermont-Ferrand.

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