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Adaptation of maps to pupils with severe visual impairments

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Abstract:

The creation of tactile maps for teaching geography is focused on pupils in schools. The target user group represents children aged 7 to 15, which is a period of preparation for the future, in which the emphasis is on acquiring skills, developing skills, and acquiring knowledge.

The education of pupils with severe visual impairments is implemented according to the School Education Program (SEP), which is prepared individually by each school based on the Framework Educational Program for Basic Education (FEP BE) valid for primary schools in the Czech Republic. Pupils acquire basic knowledge of the Earth. They learn to understand the importance of natural conditions for human society, etc. Topics include: planet Earth (shape, size and movements of the Earth, alternating day and night, seasons, time zones); Landscape sphere, its parts (lithosphere, atmosphere, hydrosphere, pedosphere, biosphere); Cartography and Topography (including explanations of terms such as globe, map, and map symbols); Continents and oceans; Polar regions, Africa, America, Asia, Australia and Oceania, Europe; The European Union and the various regional parts of Europe; Czech Republic (its location, state borders, position in Europe, natural conditions of the Czech Republic, population, economy of the Czech Republic, regions of the Czech Republic; social geography, languages, nations, structure, religion, urban settlements); Economic geography (overview of the world economy, individual sectors and industries, economic organizations in the world); Political geography (characteristics of states, international political organizations). The volume of curriculum for pupils with severe visual impairments is not reduced in any way compared to regular teaching.

In the special schools focused on the education of pupils with visual impairments, the most often maps used for teaching geography are thermo-vacuum relief plastic foils, sometimes plastic globes, and simple maps printed using PIAF fuser (which is essentially the cheapest possible way of creating tactile maps, but is uses only black contours, that are volumed above the paper level).

At the Department of Geoinformatics, Palacký University Olomouc, the TouchIt3D technology has been developed (Fig.1). This technology allows creating the interactive 3D tactile maps, connected to the smart device, and the map is connected to the audio tracks, which gives the user much more information than it is possible by Braille or anything else directly in the map (Vondrakova et al., 2019a, 2019b; Barvir et al., 2019, Brus et al., 2019).

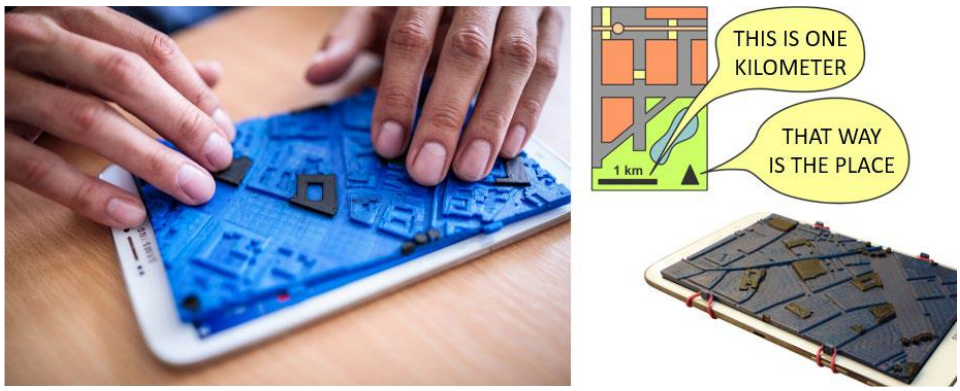

Figure 1. Principle of TouchIt3D technology. Audio tracks start after long touch to specific areas in the tactile maps.

Within individual teaching, it is appropriate to use TouchIt3D technology, where one student works under the supervision and guidance of an assistant or teacher.

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The information must be displayed clearly and intelligibly on tactile maps. Pupils with severe visual impairments read tactile mostly only by touch, while the visual perception is marginal. In some cases, pupils can distinguish light and dark colours, so contrasting colours are used for individual layers of our tactile maps.

After considering all aspects, the key topics for geography in primary school were selected. Within the pilot project of tactile maps production, the topics were divided into two basic sets. The set for understanding geospace is based on working with maps of various scales, from large scales to small scales. It presents the geospace from the building's scale through the street, city, region, country, continent, and the world, to the space scale. The main goal of these maps is to show users with severe visual impairment what the connection is between distances they cannot imagine in the real world. The second group includes three thematic maps, which can be used for teaching thematic content in the geography of Czechia (Fig. 2).

Figure 2. Set of maps for understanding geospacer (on the left) and set of thematic maps (on the right).

The paper introduces the concept of creating these tactile maps, how we approached the methodology, map design and map creation, how the implementation, and user testing took place. Emphasis will be placed on user aspects and their consideration in the process of cartographic creation. Finally, plans for future development will be presented.

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