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## Tactile Maps in Geography

People gather geographic information mainly through sight. Maps and graphics are important in this process and the visually impaired user needs them in tactual format. Types of tactile maps are presented in this article. The design, production, and use of tactile maps are also discussed, including new computer technologies and current research.

### 1. Tactile Maps: the Concept and its Relevance in Geography

Maps are graphic representations of space, and as abstractions of reality, they belong to the world of images. Most maps are not available for the visually impaired person and they need to be translated to a tactual language using raised symbols. Maps are called tactile maps when they are in a format that lets them be 'seen' by touch.

People acquire and develop the concept of space mainly through the eye. Visual perception is fundamental for understanding the environment. People deprived of vision, either totally or partially, depend on the other senses to gather information on the real world and its geography. Tactile maps have raised symbols on a flat surface. They differ from models, which are three-dimensional, though both are perceptible by touch. Tactual perception works with movement (kinesthetic force), feeling raised images, surfaces, and objects by moving the fingers. This is called haptic perception and it allows visually impaired persons to explore the tangible, world. Besides tactile, other terms such as haptic, tangible, and raised relief maps are currently applied to the same concept.

Tactile maps have been used since Egyptian times where they first appeared as stones set in sand. Since then, many materials have been used, including wood, plaster, and even embroidery. With the invention of Braille in the mid-nineteenth century, it became possible to describe map features using a font that blind people could understand. Embossed images and Braille text have been used for 150 years in maps.

### 2. Types of Tactile Maps

Blind people learn about geographical space through direct exploration, verbal explanations, sounds, smell, gestures, models, and tactile images. Tactile maps are essential to navigate, to develop space perception, and to gather geo-spatial data. There are two main groups of tactile maps, based on their purpose, scale, and features:

#### 2.1 Orientation and Mobility Maps

These maps are directed only to blind and severe low-vision people who need to be aware of the physical environment in order to navigate in space. An orientation map gives an overview of the area. Mobility maps, as the name suggests, provide the kind of detailed information that is needed if the person is to move safely through the environment. Mobility maps show obstacles to be avoided, as well as elements to use such as sidewalks, or elevators. They can depict indoor and outdoor environments and both are always large-scale representations of buildings, routes, streets, transportation networks, neighborhoods, and recreation areas. Verbal maps, also called sequential maps, can replace tactile mobility maps to explain routes to blind people.

#### 2.2 Geographical Maps

Geographical maps represent larger areas in much smaller scale than mobility maps. They are classified as follows:

General reference maps include political and physical tactile maps, ranging from cities, states, and countries to the whole globe. Tactile topographical maps are relief models, also produced in colored plastic for the sighted user, which need adaptation for the blind by having all symbols in raised format.

Thematic maps portray qualitative and quantitative geographical information in tactile form. They show location, pattern, and structure of geo-spatial data on a wide variety of themes such as population, industry, climate, distribution of vegetation, and at all scales from local and regional to global.

### 3. Tactile Map Design, Production, and Use

Many authors have contributed significantly to tactile cartography. Research on tactile map design, production, and use has been carried out by a large number of specialists (e.g., Barth 1987, Edman 1992, Ishido 1989, James 1982, Kidwell and Greer 1973, Tatham and Dodds 1988, Schiff and Folke 1982, Vasconcellos 1996, Wiedel 1983, and Wiedel and Groves 1972). Guidelines for map design, production, and use can be found in the suggested bibliography, including issues like scale, standardization, degree of generalization, and choice of symbols.

### *3.1 Tactile Map Design*

The design of a tactile map involves a cartographic language with tactile symbols such as raised lines, points, and textures. Visual variables studied by graphic semiology have to be translated into tactual form to construct tactile maps. The nature of geographical data, either quantitative or qualitative, has to be considered when selecting the correct variable to represent the particular data element. Graphic variables (e.g., size, value, texture, color, orientation, and shape) can be expressed in point, linear, and area modes. Color is not part of the tactual graphic language, but elevation (height) can be used alone or combined with other variables in multiple ways, to represent features in addition to height of the terrain.

Clarity and simplicity are important qualities in tactile mapping, as is the use of a map legend or key. A collection of maps or a multi-layered tactile map can help avoid complexity and excessive clutter, making tactual perception easier. Tactile maps when designed for low vision users should combine visual and tactile symbols, preferably in color. Many studies have been done on the legibility and discriminative capability of symbols from the perspective of the visually impaired as map users. In general, choice of symbols, scale, and degree of generalization greatly depend on the production method to be used, including master construction and reproduction techniques.

### *3.2 Production Methods and Materials*

There are many techniques and materials used in the construction and reproduction of tactile maps. The advantages and limitations of these production methods might include, for example, cost, available technology, number of copies needed, or the user's ability to read maps. The most common methods are:

(a) hand-made collage maps using a large variety of inexpensive materials, usually prepared by non-specialists;

(b) molded plastic maps done in vacuum forming machines (e.g., Thermoform with Brailon plastic), and made from a master map prepared in a variety of materials such as embossed aluminum, collage, paper, or plaster carved manually or driven by computers;

(c) embossed paper maps done by Braille printing machines, using conventional or digital methods;

(d) silk-screen maps using puff ink, usually printed on paper;

(e) microcapsule paper maps compatible with conventional printers and raised by heat, largely used with digital maps.

Collage has very good discriminatory properties because of its varied textures, and low precision and low-cost reproduction capability. On the other hand, silk-screen and microcapsule paper maps have low discriminatory properties, but high reproduction capabilities. Besides these more common techniques, there

are others such as German film, virktyping, or thermo-craft. Each has its advantages and disadvantages depending on a variety of factors including costs.

### *3.3 Tactile Map Use: the Need for Training*

There are some rules to be followed regarding tactile map use. In general, more training is necessary for all producers and users. Before using maps, it is advisable to teach basic geographical concepts such as scale, point of view, relative positioning, orientation, location, and distance. Tactual graphic language has to be introduced to the users before tactile map reading exercises that help them to understand physical space and its representation.

It is important to consider the user's degree of sensory impairment, previous experience, knowledge about the environment, and cartographic skills. Tactual sense is coarser and it works by bringing pieces together to form a map. It is different from sight, which is synthetic with high resolution. Despite some limitations, blind people can have an excellent ability to decode map keys by using both hands simultaneously, one on the legend and the other on the map. In most cases, the visually impaired user needs personal assistance or good instructions to understand the message conveyed in a tactile map. Successful cartographic communication depends on different approaches and efficient training since many of the problems this group may encounter in map reading differ from those identified for sighted users.

## *4. New Technologies and Future Directions*

New technologies have introduced great changes and improvements in the area of tactile map production and use. Tactile maps with Braille text have been produced and used in many countries, but only a minority of blind people read Braille. In the late 1980s, a tactile-audio system called Nomad was developed. This system combined touch and sound so that a tactile map, when touched, spoke the information under the finger. Now, much more information can be placed on a tactile map and Braille is no longer required. Other problems related to map size, low resolution, and shape interpretation are removed.

Since the mid-1980s, there have been refinements of the Nomad system, and in the late 1990s a system called Tactile Graphics Designer or TGD, also by the Australian inventors of the original Nomad system, was developed. This new system allows the blind and visually impaired to draw their own maps and graphics using a combination of software and hardware, printer and embosser (Parkes 1998). Research in Japan, the United States, and Germany has also been focusing on dynamic refreshable surfaces using a matrix of solenoid driven pins, piezoelectric cells, and the possible use of dynamic shape memory to create tactile surfaces.

Thus far, these approaches have proved prohibitively expensive and no commercial products are available. This is an exciting field where computers, telecommunications, geographical position systems, and even phone and fax machines connected to the Internet will work together, facilitating the production of multi-sensory maps combining sounds, images, and tactile graphics. Both visually impaired and sighted users will appreciate this.

Design and production of tactile maps is a task usually done by other specialists. Concepts such as generalization and standardization can facilitate design and use, but they are not easy to deal with and are still a challenge for geographers and cartographers. Orientation and mobility maps are more likely to have a system of conventions established at the international level. In any case, it is important to prepare users and mapmakers to deal with tactile cartography. There is a need to produce and disseminate tactile graphics, especially maps, not only for the blind but also as teaching materials for all schools.

The International Cartographic Association has supported this initiative and a Commission on Tactile and Low Vision Maps was formed in 1984, aimed at the study and dissemination of tactile cartography. It has members from over 20 countries and has organized four major international conferences in the USA, the UK, Japan, and Brazil, and several regional meetings on all continents.

Tactile cartography helps to overcome informational barriers for those who cannot see, facilitating their access to a world dominated by images. It is very important to design, reproduce, and distribute tactile maps, and to teach how to use them. All kinds of maps and graphics should become available in tactual form, promoting graphic literacy and integration of the visually impaired. Future research should move from tactile cartography to a broader field of special needs cartography with maps reaching more people.

*See also:* Cartography; Spatial Cognition; Wayfinding and Navigation Behavior

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### Talk Show in Media

Talk shows can be defined as televised broadcasts of conversation. Usually a host and several guests discuss a topic in a studio. In TV guides a wide variety of programs are listed as talk shows, ranging from outrageous shows like *Ricki Lake* to serious political discussion programs such as BBC's *Question Time* and from therapeutically inclined programs like the *Oprah Winfrey Show* to the light hearted *David Letterman Show*. Talk shows are a hybrid genre, which contains both journalistic and entertainment elements in different combinations. Looking at talk shows one can trace a number of conversational techniques (interview, debate, informal conversation), varying subject matters (news related issues, entertainment, lifestyle, victims of human tragedy, personal relationships and family matters), and different types of guests (experts, politicians, celebrities, lay people). A broad distinction can be made between the night-time talk shows and the daytime talk shows. The night-time shows generally are entertainment shows or political discussions and broadcast once a week. The daytime talk shows are often broadcast more than once a week, aimed at women and deal with issues from people's private lives.

#### 1. History

The precursors of the television talk show are the listener-participation radio shows of the 1930s and 1940s and the 1960s talk radio with its emphasis on political debate, loud controversy, and shock. On radio the talk show still is a popular format. In the US there are radio stations that only broadcast live talk shows such as NBC's Talknet and ABC's Talkradio Network. Earlier roots can be traced back to public traditions like the nineteenth century literary circles, lyceums, and coffee houses where citizens gathered to discuss matters of common interest. Other influences