CREATION OF CARTOGRAPHIC TACTILE SYMBOLS AS FUNDAMENTAL ELEMENTS IN THE PROCESS OF COMMUNICATION

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Both in everyday life as well as in scientific studies, people need to communicate; for this, they use diverse forms, symbols among them, which permit them to express ideas, properties, situational characteristics and relationships.

Communication is information transmission, where we find a transmitter and a receptor, in this case a vision impaired person. For this reason, symbols must accomplish a series of properties in order to obtain a good image in relief.

Within the tridimensional cartography projects for visually impaired supported by the Instituto Panamericano de Geografía e Historia (IPGH), and currently within the Project CIDI/OEA “Design and Production of Cartography for the Visually Impaired in Latin America”, it has been studied for years the best way to design a series of symbols related both to physical aspects of the soil as well as a particular theme, so as to later propose that such designs be used in cartography for the blind in all countries of Latin America.

The research area of cartography for the blind, followed since 1987 at the Cartography Department of the Universidad Tecnológica Metropolitana (Santiago-Chile), which has originated the Tactile Cartography Center in the year 2003, is becoming an interesting alternative to the blind in Latin America, supporting them by means of the creation of cartographic and didactic tools (atlases, maps, charts, tridimensional graphs, etc.) in order to obtain an optimal formal education and improve their moving in the immediately surrounding world. In this context, a great challenge is set for the cartographic science: that of contributing in amplifying their possibilities of development in an area that is not solely related to visual communication, but also with tactile cartography, where the creation of tactile symbols acquires a fundamental importance.

Giving information by means of relief symbols is convenient to give the blind a realistic idea of their surrounding and a more profound view of the processes in nature and in society (Tschrirner, 1984). Design and creation of these symbols must comply with a series of properties where it must be considered the variation of height, texture, form and size and orientation.

The present development of information and the way of accessing it has had a notable change in this last years, where products of the new technologies, infrastructures and several services, among other aspects, have been generated, having as only goal the improving of communication and the access of information to people, improving their quality of life and the economic development of society, all of which has a bases the society of information.

What is Society of Information?
[My Translation] “People are essential to all system of information ... and the social mechanisms of exchange, support, learning of information and knowledge, are as or more important than the technologies of information that we have developed. We must learn more about how people exchange information in time of designing more efficient systems of information ... “. This abstract of the edition

I. INTRODUCTION

With the use of tactile cartographic symbols, it is achieved that blind people have access to tridimensional cartography, where they have been able to identify information relative both to physical and political aspects of different countries. This has allowed them to have access to the knowledge of their surroundings, achieving more autonomy and a better integration to society, thus giving the users specific information in an area related to geography and cartography.

Information society is composed by many people who have different skills or impairments to obtain information in a simple way. Among these, the visually impaired are the objective of this investigation, people who don’t have the skills to use a keyboard and buttons that characterize our society, are the ones we want to communicate information by means of tactile geographic symbols.

Communication by means of tactile symbols is transmission of information where there exists a transmitter and a receptor. In such case, a visually impaired person will use touch as sensitive organ, perceiving in a slower way (Miñambres, 1996) and acquiring a more sequential character.

II. KINESTETIC TACTILE SYSTEM

It is such the interrelation between the tactile and the kinetic systems in the search and transmission of information to the brain to codify, associate, and interpret, that they must be treated together. [M.T.] “It is indispensable the movement for the impressions and their connections to progress successfully”. Revesz (1950) suggests that the tactile impressions can only be obtained when touching involves movement.

Very often we call ‘skin senses’ the tactile-kinetic system, which involves touch, movement and body disposition within space. These senses assume a great importance for development and constitute the primary stage of learning in visually impaired people. These aspects were considered in the design of cartographic tactile symbols, knowing that the resulting information in the map is less precise than the visual information, which can be transitory or inconsistent and, sometimes, difficult to integrate in one sole mental image.

III. REPRESENTATION OF INFORMATION IN RELIEF

The representation of information by means of graphic forms requires symbology based in tactile symbols, which can be a factor of favorable incidence in the utilization of relief maps and other types of tactile drawings. This will allow a more efficient use of touch for the reading of maps and other forms of graphic representations. The use of symbols in relief is convenient to give the visually impaired a realistic idea of their surroundings and a deeper view of the processes in nature and in society (Tschimer, 1984).

It is for this that the design and creation of such cartographic symbols must comply with a series of properties where to consider variation in height, texture, form, size and orientation.

The symbol is the element by means of which maps talk to us, show us the form of the terrain or the way to give specific information, e.g., location of a country capital city, specific symbol, roads by means of a line, a city by means of a circle, or a specific area where the symbol will be disposed by means of the working scale and its true position. When the represented element will not be able to be totally assimilated to reality, we will have to recur to a convention or agreement to use an element that will identify it, which is called symbol.
IV. TACTILE MAPS

Tactile maps do not consist only in transferring information from visual maps to relief, since several aspects must be considered before beginning with the cartographic design, such as characteristics of the user, his/her capacities and needs, his/her basic understanding of cartography, which will be illustrated by means of tridimensional symbols duly investigated and proved.

Cartography, as it is well known, is a process of communication involving one transmitters and one or more receptors, receiving the message that the former wants to transmit, in this case, geographical information. It is clear in this case, that the receptor will be a visually impaired person, i.e., a receptor with special characteristics, which implies that the message will be transmitted by tactile means.

It is because of this that the design of the map must count with elements of tridimensional representation that can be easily recognized by the receptor, which will permit him/her elaborate a mental image of the space that s/he is touching. The map in relief can be done in several ways, be it a handcrafted map, microcapsulated material in relief, thermofornted, audiotactile, etc., but all must have as an objective to give information as true as possible, by means of tactile symbols.

A good map with a tactile symbology well designed, can become an interesting tool for the teacher or tutor of a blind person within the teaching – learning process, as Vasconcellos, R (op. cit.), states: [M.T.]

“\textit{In the case of the visually impaired the importance of maps is even greater. Diagrams, illustrations, models and maps, even when they are abstractions of reality, concrete the space, synthetizing information perceived by means of touch. Maps can be used for location, orientation and mobilization, together with the compass in the scale of edification. These resources can be used by people who are visually impaired, as an auxiliary in the displacements in their everyday life, at school or in their neighborhood. This way a map is fundamental in the construction of space by the user, mainly because it cannot reach spatial information by means of sight.}”

We can thus say that graphic and cartographic language can be oriented to other senses, where the blind receives the image which is non visual but tactile, elaborating his/her own mental image of the phenomenon, where the cartographic symbology plays a fundamental role in the transmission of the message.

The creation of an image in relief is not easy, since it will have a series of limitations which we must know in order to obtain a successful design, such as size, fragility, material, among others; i.e., we are limited by the sense of touch to achieve a good design of an image in relief, since touch lacks perception in a holistic sense, that is to say, assimilate the perspectives or relations of extreme size.

We have to consider that the difficulty in identifying individual symbols is increased with the number of them that we are taking into consideration. For this reason, it is advisable the making of several maps, where we will give the information according to the proposed objectives. These symbols will be punctual, lineal and aereal at different heights, fixing under the tips of the fingers, varying in form, size, exterior line and elevation, with a simple design of angular borders with textures clear and recognizable.

V. THE SYMBOLS

The material objects and the facts or concepts that are registered in the geographical space are translated to the maps by means of graphs, drawings or symbols. The material objects and the real forms must be represented with exact shapes and project in their real magnitude, but normally the scale imposes a reduction in the size of the objects represented, for which reason we must recur to a representation deformed and engrossed.

Symbol is the graphic representation of an object or fact in an evocating, simplified or esquematized way, without a rigorous implantation. A symbol visually translates the phenomenon and it can be figurative or abstract. As a result of this, cartographic symbology consists in disposing localized signals by means of a punctual, lineal or zonal implantation and, in this particular case, in a tactile way.

The current research project, approved in 2002 by the Consejo Interamericano para el Desarrollo Integral de la Organización de Estados Americanos (CIDI/OEA), “Design and Production of Cartography for the
Blind People of Latin America”, is based in the experiences derived from the IPGH projects in this line of research, carried out from the beginnings of the nineties.

As a counterpart, in this initiative the Universidad Tecnológica Metropolitana has collaborated actively in the physical implementation for this project. In this context, a great challenge is set for the cartographic science, that of contributing to amplify its possibilities of development in an area that not only relates it with visual communication, but also with tactile cartography.

For years since in this project, it has been studied the best way to design a series of tactile cartographic symbols, related to human and physical aspects of the terrain, which allow the best way possible of representing the information given, in order for later propose that the designs used in cartography for the blind can be standardized to other countries in Latin America.

With the symbols that the Tactile Cartography Center already has designed, it is pretended to support the visually impaired to develop their skills, optimizing their formal education and their knowledge of the world from a geographical perspective, where by means of the symbology there can be a representation of the phenomena related with socio-economical and cultural aspects at the level of city, country and continent, achieving an integration of the students with a visual disability to the programs of study related with geography and basic aspects of geocartography.

VI. PRODUCTS

The symbology designed is being used in a series of cartographic products, among which we can name the political maps at world, continent and country levels, physical maps and didactic documents on basic concepts of geocartography, population maps at country level, cartography at large scale of the immediate surroundings and a Manual of Geographical Concepts, in which it is found the definition of the concept in Braille system, in bold, a photograph of the concept and a tridimensional model of it, with which we seek a second objective, which is to integrate those who see into using this kind of material.
Matriz physical map South America

Thermoform political map South America

Cover of the Manual of Geographical Concepts, which is accompanied by the impression of the concept in Braille system, in bold, thermoform and photograph of the concept, with the object of the manual be possible to be also used by people with vision.
VII. RESOURCES

This research counts with the collaboration of Argentina and Brazil, being benefited by the produced material eighteen countries in Latin America which belong to the OEA, which permits to evaluate the cartography being generated in different cultural realities.

Within the human aspect, there is a group of specialists integrated, who support from their perspective some fundamental aspects for the good development of the project. The professionals participating in the research are cartographers, a geographer, a psychologist, a teacher specialized in visual deficiencies, a bibliotecologist, a designer, a differential educator and a B.A. in Sociology who is a blind person.

VIII. INFRASTRUCTURE

The infrastructure available for this project is that of the Workshop of Production of Tactile Cartography, the Laboratory of Digital Tactile Cartography, a Maquette Workshop, a Development Unit, a Direction Office, a Meeting Room, a Training Room and a Secretary. Also, within the dependencies where the center functions there is a thermoform machine, a Piaf printer, a Braille printer, computer and audiovisual equipment. Also, stationary was designed for the corporative image of the Center, consisting in logotypes, letter sheets, envelopes, stickers, folders, and a Web page in process.

IX. RESULTS

With the development of this work, we expect to achieve that the visually impaired in Latin America have access to the special tridimensional cartography of each country, the American continent and the world, which will serve as support to teachers and parents with the integration of blind people, where the representation of information by means of tactile cartographic symbols plays a very important role.

The possibility of blind people to access the knowledge of their surroundings by means of maps or maquettes, is a form of communicating information and of integration to the environment in which they develop.

To achieve that by means of cartography with tactile symbols the blind enhances his/her autonomy, is one of the objectives of this projects. The problem of the control of the environment is not solved on its own, but it is a tool in the area of mobility and orientation, where the utilization among others of physical and political maps in relief, can give a solution to the knowledge of the geographical space.

Besides, it is expected to augment the qualification of professionals from different countries in Latin America in the administration and management of the cartographic material in a micro and macro scale, by the carrying out of workshops and seminars in the different countries.

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