

RECOGNITION AND APPROPRIATING OF SPACE ON BLIND PEOPLE THROUGH THE CARTOGRAPHY- UNIVERSIDAD DEL VALLE CASE

René Serrano ^α; Iderley Medina ^β; Carlos González ^δ; Ciro Jaramillo-Molina, ^ε
Universidad del Valle, Ciudad Universitaria Meléndez, Calle 13 No 100-00. A.A 25360
Cali, Colombia. cjarami@univalle.edu.co

ABSTRACT

The Universidad del Valle, at Melendez Cali, Colombia, has a blind population of sixteen (16) persons, in which case the primary difficulty is their development inside of it, to develop their daily activities. This situation owing to the complexity of the same case, as well as the lack of suitable channels that allow them to get access to the data about surrounding physical space. The tactile cartography is the most appropriate tool when you think about an innovation that allows to the blind individual to enrich and enlarge the information of his immediate space, because the map is a representation of a given place, therefore is the main access channel to spatial information; as the visual limitation is recognized, is needed its elaboration in high relief, taking account that things should be perceived by eyes, are going to be perceived by hand tact.

This paper is aimed to elaborate a tactile map of university campus that allows get access to spatial information of it, increasing the spatial representation and cognitive map of blind individual, so achieving to improve the autonomy of mobility, to get appropriation of the different university spaces that in turn improves the life quality, thus equalizing the opportunities of access to the university's physical environment.

An essential element on this process was the direct inclusion of blind population from the action research methods and quasi-experimental method of chronological series; in the first method the work is done on beneficiary population directly, looking for practical solutions that improve the conditions of those that are involved. The second one pursues to apply an independent variable, on this case the tactile map, for determining the influence of dependent variable (the spatial representation and mobility that favor the blind people autonomy) before and after, taking account the cartographical material design and manufacture in digital format as while it has the rigourousity of lab work, is open and values the users critical appraisal of the product in all of its stages (abstraction, simplification, final modeling and pilot tests).

The diagnosis produced valuable information about the relationship between blind individual and university campus, featuring the main difficulties with respect to the displacements, architectural barriers, spatial signaling, places recognizing and handling, namely, all of the aspects related with mobility and orientation, also was inquired into the

^α Licentiate on Social Science (Candidate). Universidad del Valle. Cali. Colombia

^β Geographer (Candidate). Universidad del Valle. Cali. Colombia

^δ Forestal engineer, Landscape specialist. Universidad del Valle. Cali. Colombia.

^ε Civil Engineer. Professor of Geomatical and Civil Engineering College. Universidad del Valle. Cali. Colombia.

degree and handling of high relief material and tactile cartography. The semi-structured interview-workshop at individual and collective level, the direct observation for analyzing and substantiate the information gathered in the interviews, and the technical work on the creation of digital plan were the used technical tools.

The obtained results are:

- Enlargement of metal or cognitive map of the blind individuals.
- Bigger autonomy on the displacements by the university campus and appropriating of both cultural and physical spaces of university
- The performed study serves as a source for future projects of accessibility or projects of spatial type giving the relevant data.
- As didactic innovation it's a key for showing the physical space to future students or visitors with visual limitations.
- Being a simple and complete map, it gives benefit to any user inexperienced on the maps use.

This paper powers the search of new ways to do knowing the space to people with visually limited, making the cartography a useful tool not only for geographers and related individuals but also for the common city-dweller. In addition, it explores new domains into the cartography by showing it as a powering tool for blind persons at being a rehabilitation instrument, because it allows the teaching of immediate spaces of the blind individual, giving him safety and reliance. As a final point, it purposes a new look to the space by sensitizing about the importance of other senses than vision for the bringing near to world which surround us.

Key words: *tactile cartography, visual deficiency, spatial representation, mobility.*

1. INTRODUCTION

From geography which studies the space by excellence and geographical education that is a new focus and it's concerned on the education of citizen of twentieth- first century about conscientization and better use of it, with the purpose of integrate him and make it own, the synthesis of degree project on tactile map manufacture for the visually limited students of the Universidad del Valle¹ that facilitates their displacement, recognition and using of urban² physic spaces of Melendez campus trying to improve their life quality on it, as a acknowledgement of individuality on development of student welfare programs and equality of opportunities from recognition and appropriation of different physical and social spaces of this institution.

On this context, a featuring both of beneficiary population of project and of physical space of the Universidad del Valle is done, mainly based on the methods the action – research and on the method quasi-experimental of chronological series that involve directly and

¹ Paper “Tactile cartography. An innovation for visual deficiency people. Proposal for the Universidad del Valle, Melendez campus Cali, Colombia”

² When be spoken about physical space within this paper, it refers to which goes to access to buildings, that is on an urban scale, not to the insides of them.

completely into the plan to the blind people that are to be beneficiary of it, with the aim of finding the elements that go to be a main part of tactile map, which is achieved by abstraction and simplification of all the elements of university campus leaving only the basic ones for their interpretation and spatial orientation within university.

2. FROM CONVENTIONAL CARTOGRAPHY TO TACTILE CARTOGRAPHY

Cartography is the instrument which achieves to get close and allows reading the different representations that can be done of the space. It has been thought and designed for seer people, therefore at thinking about mobility and spatial representation for blind people is needed to cross the borders of visual things and inquiry on the new sensorial domain, the tact; motive for which a series of changes and modifications to traditional cartography is essential without it lose its primordial sense, that is, to be a useful tool for spatial representation providing the needed information for achieving a mayor autonomy on displacements, appropriation and/or recognition of space by visually population incapacitated.

On matter of representation of tactile cartography and its elaboration Maestro Cano (2004, supported by other authors (Clark, & Clark, 1994; Edman, 1992; Gardiner & Perkins, 1996), points out some necessary recommendations.

In first place, the generalizing process of information has to be essential ruling out all of those elements that are not absolutely necessary for plan understanding. In second place it has to keeping in mind the symbology that are divided in three types:

- *Lineal Simbology*. It hasn't be lower to 5 millimeters thus avoiding be confounded with punctual symbols.
- *Punctual Simbology*. It's recommended diameters around one third of fingertip size for achieving an optimal legibility.
- *Superficial Simbology*. This replaces the color variable by texture variable; which can be wrinkled, marbled, and smooth, depending on desired color to express, a key consideration is avoiding the saturation of texture.

As a final recommendation is needed to taking account the representation of scale, which has to be expressed in a graphic way to be read by the fingers for which it's called tactile scale.

The tactile cartography collects and represents the whole of information about surroundings that is necessary for orientation: as well as for advancing decisions on paths easing the recognition of obstacles³, the referring of key places and the recurrent use on different displacements that are realized by blind individuals. This lead in a bigger autonomy for visually handicapped people by amplifying the spatial representation, thus promoting a better utility and getting own of spaces.

³ These obstacles are referred to the architectonical or permanent ones because blind individuals find temporal obstacles too, like is the case of walking sellers place on walker ways among others.

3. UNIVERSIDAD DEL VALLE TACTILE MAP.

The Universidad del Valle is a superior education institution, of public and regional character localized in the south west of Colombia, formed by 7 seats, in Cali city, works the Meléndez headquarters. This campus had 15222 students for the year 2007⁴, time when the population with visual limitation was accounted for 13 students and 3⁵ students in the San Fernando campus, who also frequent the Melendez campus, cause in there is found the special room for students visually unabled.

Taking account the previous situations a characterization of blind population is realized, taking as a reference point the type of visual limitation (that is, acquired, congenital, total or partial) that will determine in part, the spatial handling degree that is had about physical space, ratifying it with the direct work that is made on they. A spatial analysis of university campus, its composition or structural elements and recognition and orientation and mobility degree of this population on this space is done as well. For this purpose, is essential the information obtained from project beneficiaries and their contributions in the whole of researching process.

For obtaining a tool in accord to the needs of persons that go to use it, the tactile map on this case, this project was developed from two research methods, the action – research (el método de investigación-acción) and quasi-experimental method of chronological series (Hurtado y Toro, 2001, p.39, 117-119); these methods were chosen owing to their comparative advantages; the action-research involves to the community that is directly benefited in the whole investigative process, in addition to give benefit it directly and immediately by finishing the project; another important point is that researchers that are concerned for this type of methods try to find the formulation of actions for transform the reality of community from its formation and contributions of benefited community.

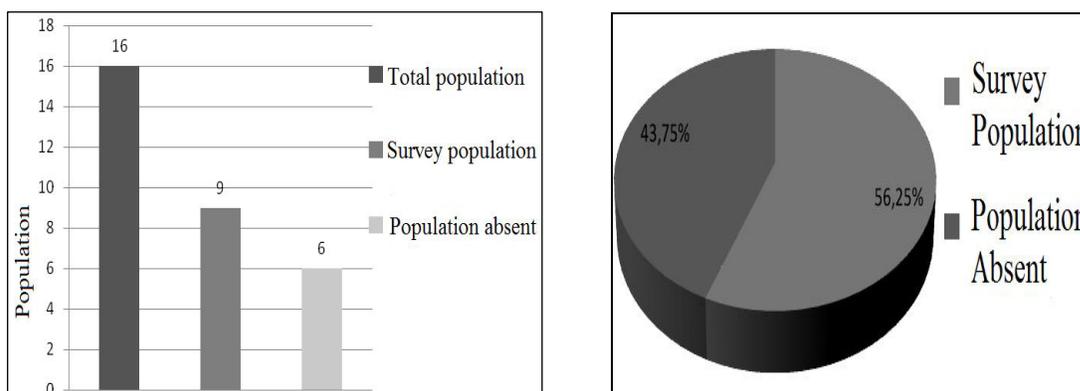
With regard to quasi-experimental method of chronological series, this consists of applying a treatment or independent variable, the tactile map, on a group and submits it to several observations to subsequently, by comparing the measurements before and after of treatment, determine the influence of independent variable on dependent variable or spatial representation and mobility of blind individuals in favor of their autonomy. This is close of the aim of last investigation stage, given that it consists of using of high relief map for determining the perceptual impact that causes this tool on studied population.

For choosing the targeted population was used a type of sampling that isn't probabilistic, specifically the incidental one (causal) having as a criterion its visual limitation. As a result a total of 16 blind persons were obtained, which is agreeing with 0.11% of student population of Meléndez campus. A representative sample of nine students was used, accounting for 56.25% that was chosen using the sampling method of “snow ball” for

⁴ Data supplied by La Dependencia de Sistemas del área de Registro Académico by the year 2007.

⁵ Data supplied by La oficina de Bienestar Universitario by the year 2007

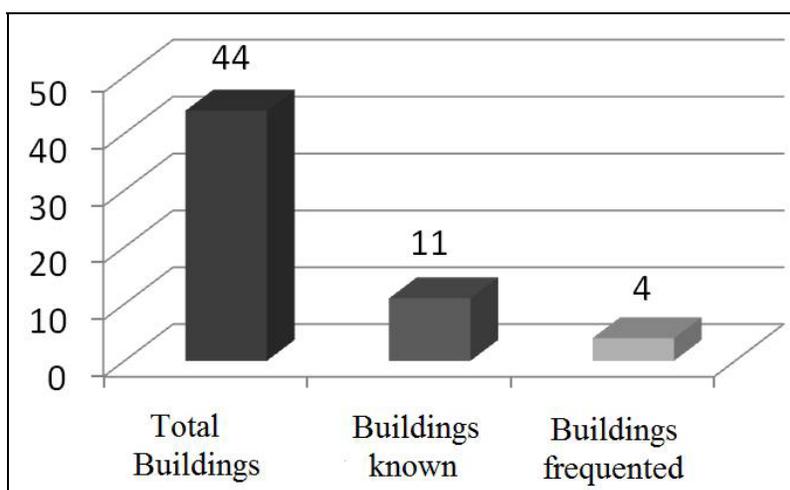
carrying out the workshop-survey in where the first individuals called for survey led in others until complete all the representative sample (see graph 1).



Graphic 1. Total blind population and assistant to the survey

As the techniques and instruments have to be according to purposes of investigation and its methodologies, the measurement instrument to be used is the semi-structured interview, that consists of general and specific questions made on a collective and individual manner for characterize the ways and mobility of blind persons, as well as difficulties posed by physical barriers. For a practical use and of results, this interview was developed as a workshop, in where the individual part of interview is confronted at the same time with the collective of blind persons that attending to interview with the objective of try to encompass all of issues with respect to the space's matter. This allows drawing out the primary and relevant aspects for making the tactile map and its respective user's manual. This diagnosis throws out the following results:

A very generalized ignorance about university facilities, infrastructure and access ways was observed resulting on the recognition of only 11 buildings out of 44 buildings that form the Meléndez campus and the frequent use of only four of them (see Graph 2).



Graphic 2. Spatial knowledge of the university

Taking account as basic cartography the plan of university campus elaborated by the Universidad del Valle planning office is submitted an analysis and abstraction of physical spatial information of university determining the ways, buildings and the more relevant landmarks on the path and routine space of population visually limited belonging to the university (see figure 1).

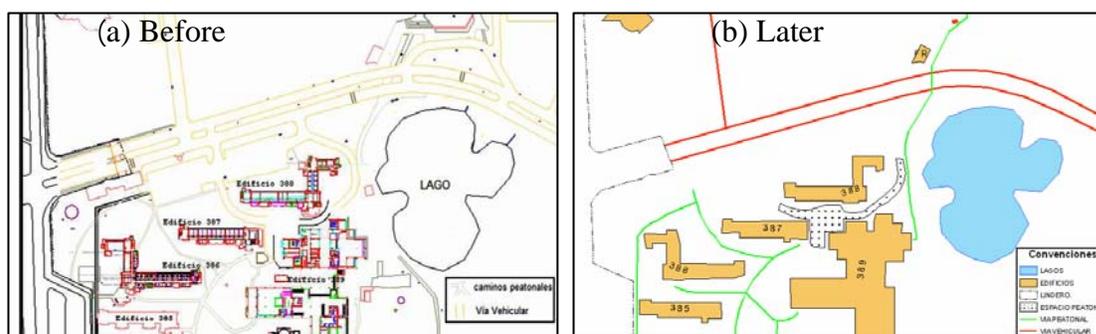


Figure 1. Example of abstraction of physical urban space

After getting the elements that are going to be part of the map, was proceeded to simplify those that their complexity were difficult to perceive for their recognition by blind people, such as buildings, and some ways (see Figure 2). For this task like for the abstraction, were used the geographical information system **ARGIS®** version 9.1 and **Autocad Land 2000®**. After the abstraction and simplification process, was chosen the symbology needed and suitable for the spatial elements interpretation of university that are going to be part of the map.

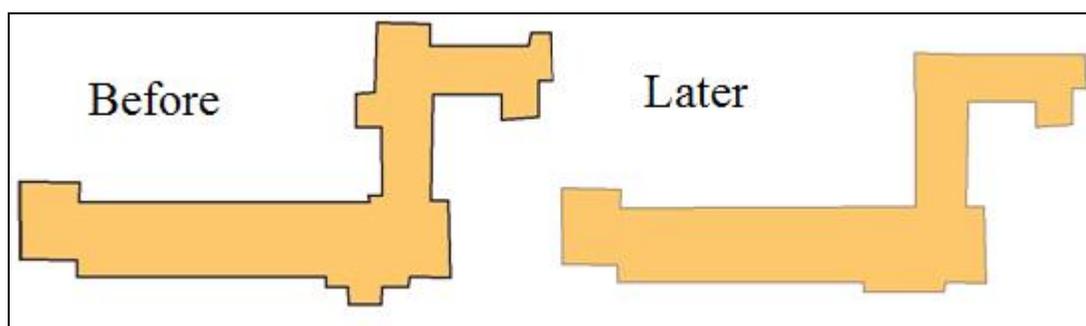
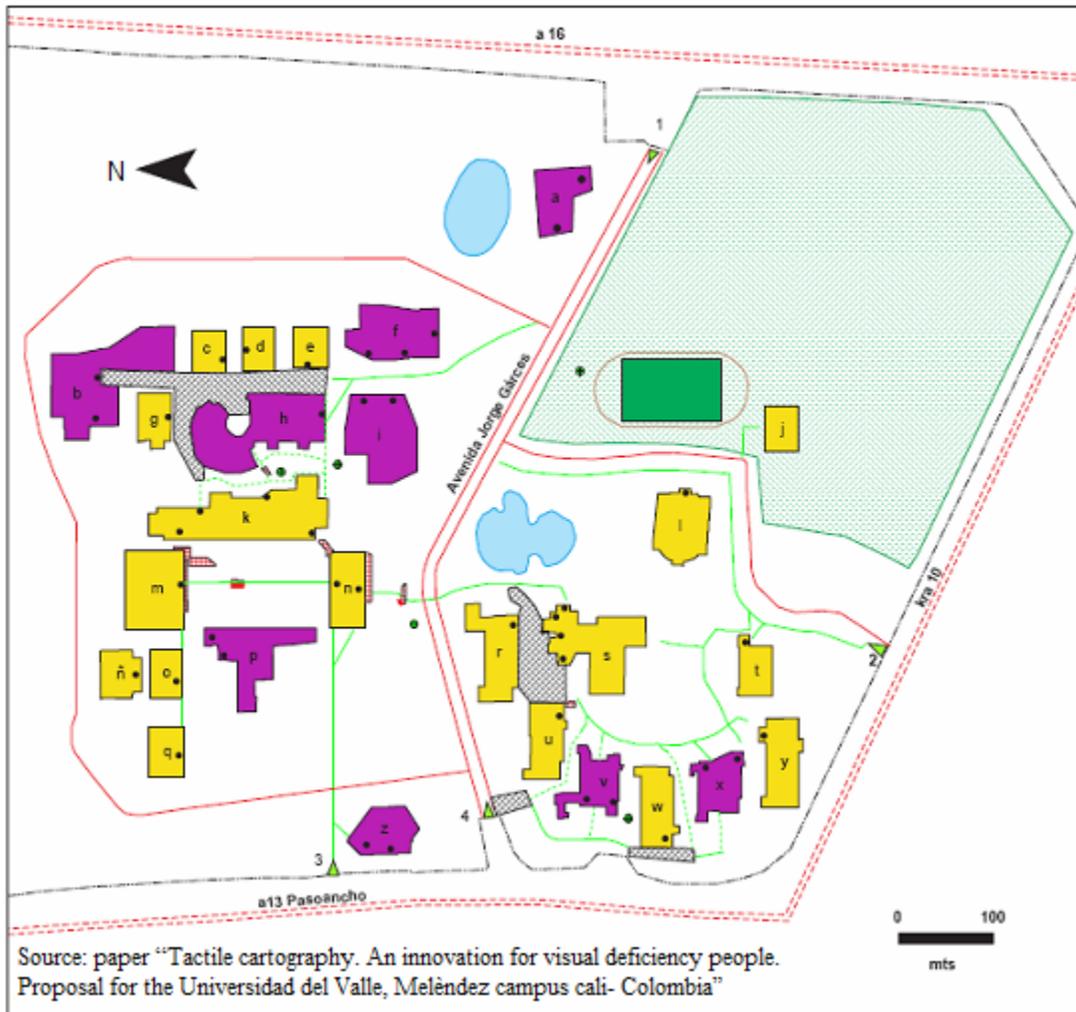


Figure 2. Simplification of buildings

Once that plan has been digitally designed, normally is proceeded to making the matrix for the subsequent manufacture of material in the termophor machine; in this case a matrix made by hand for performing a pilot test, even though this process is by hand, it can't to take it lightly because the success of this stage depending the optimal results of finished cartographical material. This test resulted in some recommendations by blind individuals, as the involving of another elements needed for their orientation, differentiation of textures and the spinning of map at 270°, taking account the cognitive map from laterality use which blind persons have.

After that the plan be made digitally with its respective checks from pilot test, the plan was send to Institute of Tactile Cartography at Chile for printing, place in which experienced persons on this matter notified the necessity of some changes that should be realized with regard to symbology and representation for the best understanding and easy labeling of finished material. As a result, the digital plan shown in the map 1 was obtained.



Map 1. Digital map for the development of tactile map

Due to the material is made for people with few or no experience on plan or maps interpretation along with the tactile map was made a user manual that contains those necessary aspects for right use and handling of this cartography. As a first step was carried out, the characterization of map and its constituent elements, as well as the symbology to be used. On second place, the type of adequate strategy to access to the information of plan in a general way was established-that goes from upper left side to come the lower right side doing a run on the same way of the reading, after of having a global image a detailed reading is done from recognized elements into the plan.

With the high relief plane is the development of a test to evaluate the efficiency of it, therefore the evaluative test was conducted with the people purpose of the project, in order

to identify and assess the effectiveness grade of the tactile plane, assessing such aspects as the relevance and clarity of information, degree of recognition of spatial information, ease in the handling cartographic material, understanding of the level of information, recognition of the symbols used, and finally expansion of the spatial representation through the high relief plane.

From the survey applied, is obtained the following results:

Is completely identified by people who attending the test, the information contained in the plane, the north, buildings, routes, among others. The mental image of blinds who attending the test was compatible with the tactile plane as easily they were able to identify the elements that make up the mental image they have of the university, this leads to have some data on the physical plane for the recognition of new places and hence the expansion of their mental map.

Spatially is understood how easy was represented in the plane, but for two persons involved in the test are presented difficulties for those sites that are unknown and in some ways.

The entire population attending the test said that the information contained in the tactile plane was enough to designate it as very good and relevant.

From the first contact with the high relief plane, people participating in the test were able to identify sites that were previously unknown to them, thus increasing the numbers of elements of their mental image, this deals with the extension of cognitive map is the university campus.

Although some errors were founded by three of the four blinds, related to the new spaces assimilation and the ratio of distances, but the errors are in the continuous interaction with those new spaces, both at the plane and in the field.

With respect to the results obtained in this test, we can conclude that the tactile plane of the university is a didactic tool that allows the recognition of the urban university space from people in visual disability situations, making in this way an appropriation place by this population.

5. CONCLUSIONS

Tactile cartography plays a main role into cognitive development that a blind individual can to have of the immediate space, because on first place as already was mentioned, the map is the graphical representation of a part of terrestrial surface. Therefore it's an ideal tool at the time of get close and give to know the particularities of a determined space representing it with mayor exactitude.

Other important aspect of tactile map is that it's a channel of spatial information becoming on an equaling tool of the opportunities at allowing the access to the spatial information about university campus. Giving that the previous reasons this process of information catching enhance the cognitive or mental map that the blind individual has of the university, enlarging the "view" of university campus permitting recognize space elements

by tact that are impossible to recognize from their other senses, improving and enhancing the input of information as well advancing process, making more autonomous and effective the mobility of blind population, achieving other important process like the appropriation of different university spaces both physicals and social ones. The previous points provide reliance and safety into the university campus improving the life quality of benefited individual. Furthermore, as a didactic innovation, the tactile map is important by using as tool in the induction process for the new student giving the opportunity of knowing anticipately the university campus.

An awareness of importance of this work for both the beneficiary and the whole of university community in general term is required. Therefore only the continue use of this material by blind population of university specially; can to make that goals of this project to be achieved at all. Is important to undertake studies or possible alternatives with regard to elimination of both physical and social barriers being latter which are the most affecting to people with some kind of limitation and which finally are causing of incapacity situations.

This paper powers the search of news ways to do knowing the space to persons visually limited making the cartography a useful tool, not only for geographers and related but also the common people. In addition, it explores new domains within cartography showing it as a powering tool for individuals with loss of vision at being an instrument of rehabilitation thus allowing the recognition of immediate spaces to the blind individual, giving him safety and reliance. Finally, is proposed a new look into space at sensitizing to people on the importance of another sense apart of sight for approaching the surrounding world.

6. REFERENCES

BARTON, Len; TORRES SANTOMÉ, Jurjo. Discapacidad y sociedad. Compiled by Len BARTON,. Madrid, Ediciones Morata, S.L. 1998. 283 pages

CLARK, J. y CLARK, D.D. (1994) Creating tactile maps for the blind using a GIS. ASPRSI ACSM Annual Convention and Exposition. ASPRS Technical Papers, Reno, Nevada. Citado por Maestro Cano Ignacio Carlos en http://www.mappinginteractivo.com/plantilla-ante.asp?id_articulo=397, 2004

EDMAN, P.K. (1992) Tactile graphics. American Foundation for the Blind. New York.

Citado por: Maestro Cano, Ignacio Carlos. En

http://www.mappinginteractivo.com/plantilla-ante.asp?id_articulo=397, 2004

GARDINER, A., PERKINS, C. (1996) Feel the bunkers: tactile maps for blind golfers. Proceedings of the Maps and Diagrams for Blind and Visually-Impaired People: Needs, solutions, developments (International Cartographic Association), Liubliana.

HURTADO León, Iván; y Toro Garrido, Josefina. Paradigmas y Métodos de investigación en tiempos de cambio. Valencia, Venezuela. Episteme Consultores Asociados C.A, 2001. P89,117-119

MAESTRO CANO, Ignacio Carlos. Fomento de la movilidad de invidentes mediante cartografía táctil I: Criterios de partida. 2004, accessed date august 2006. En http://www.mappinginteractivo.com/plantilla-ante.asp?id_articulo=397