Evaluation of subjective preferences regarding indoor maps: comparison of schematic maps and floor plans

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Abstract

In this study, we investigate subjective preferences regarding floor plans and schematic maps in the use of a map in an indoor environment. To achieve this, we performed a qualitative experiment with a random user sample; the survey was carried out remotely. The survey was conducted in Portuguese and English, and users were asked to answer questions, using two different maps:a floor plan and a schematic map. In the sequence, users were asked questions about their preferences regarding map use in an indoor environment. Users also answered questions about the positive and negative aspects of using a schematic map in an indoor environment. The initial results do not indicate a preference for one kind of map, but show that users found the symbology adopted in the schematic map easier to understand.

Keywords: Indoor maps; schematic maps; subjective preference

1 Introduction

The growth in the size and complexity of public buildings such as universities, airports, and shopping malls has made efficient indoor navigation necessary. Examples of indoor navigation tools are "You Are Here" (YAH) maps. The main objective of YAH maps is to aid navigation, but there are issues concerning their use, such as misalignment [1], object rotation, and self-location [2].

Schematic maps (SMs) are helpful in spatial problem-solving tasks such as way-finding in outdoor environments, or for representing underground railways, surface railways, and tram and bus routes. There has been significant research on methods for obtaining a schematic representation from a topological structure [3, 4, 5, 6]. Research on indoor maps is more recent, and has focused on positioning techniques rather than the representation of such spaces [7].

There is no established knowledge regarding which type of map is best for an indoor environment; therefore this paper presents a study of subjective preferences, comparing an FP and an SM of two different buildings.

2 Methodology

The first step in this research was to understand how to design an SM for an indoor environment. After the map was designed, we developed a survey to compare the preferences of users regarding FPs and SMs.

2.1 Schematic Map Design

We used a floor of the Nottingham Geospatial Building and a floor of the Portland Building, both at the University of Nottingham (UK). For each floor, there were an FP and the proposed SM.

The base map is composed by the building external walls and possible subclasses; the thematic data are as follows: **c**orridors, rooms, interest points. The three classes of objects defined in the map design have specific rules. Thus, rooms are generalized to points, which are linked to paths by lines at the door positions. All interest points are represented by pictorial symbols representing the original objects. Paths are lines between entrance and exit points, connecting the rooms and interest points. Lines connecting adjacent rooms are represented by solid lines, and lines connecting rooms inside other rooms, or restricted access areas, are represented by dashed lines. The FPs and respective SMs are presented in Figures 1 and 2

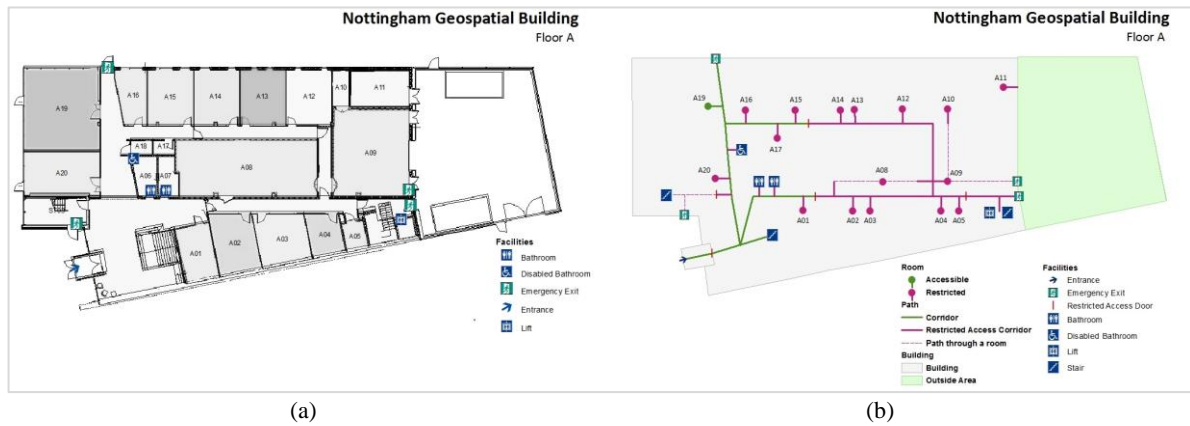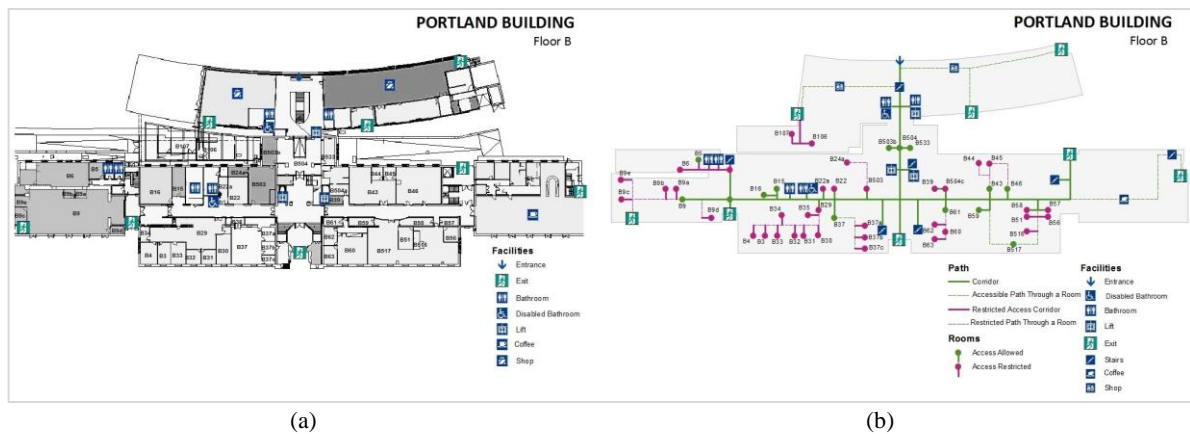Figure 1 - Nottingham Geospatial Building: (a) floor plan; (b) schematic map

(a)   (b)

Figure 2 - Portland Building: (a) floor plan; (b) schematic map

(a)   (b)

2.2 Experiment

The experiment was developed as an online survey in Portuguese and in English (www.cartografia.ufpr.br/indoor_test/survey_indoor.php). The general design of the survey is presented in Figure 3. After the user chose the language, he/she was randomly assigned to Group A or B and, in both cases, had to provide some personal information. If the user was assigned to Group A, the order of map presentation was the FP and then the SM. This order was reverse for Group B. In both cases, the users had to answer two questions about each map. The user was instructed to observe the map carefully before starting the survey. In the sequence, we presented the same map, but some symbols were changed or removed. The questions were as follows:

- NGI Building:

a) Please identify the position of the Lift.
b) You are at the position marked in the map and there is a fire drill. Which is the BEST path from your position to an Emergency Exit?

- Portland Building:

a) You need to inform a person in a wheel chair where there is a Disabled Bathroom. Identify on the map the locations of these bathrooms.
b) You are at the position indicated and there is a fire drill. You have to find one of the emergency exits. Which is the VALID Emergency Exit represented in the map?

Figure 3 - Design of survey experiment:
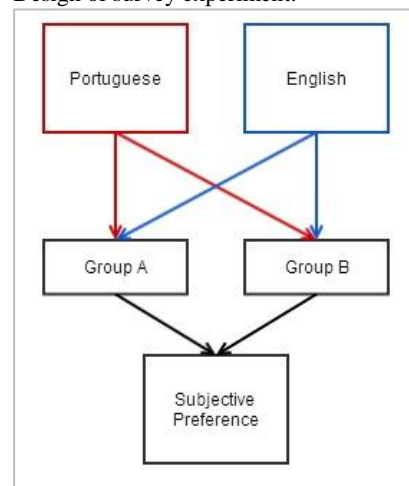
The user answered a set of questions about his/her preferences regarding the use of maps in an indoor environment. The questions were as follow:

P1 Which map did you find easier to use in order to learn about an indoor environment?

P2 Which map did you think was easier to understand?

P3 When comparing Schematic Maps and Floor Plans, which type of map would you prefer to use in an indoor environment?

P4 Please say how difficult or easy you found it to understand the SM map (options: very easy, easy, difficult, and very difficult).

P5 In your opinion, what is a positive point regarding using a Schematic Map to represent an indoor environment (options: easy to understand, symbology, simplicity, and none).

P6 In your opinion, what is a negative point regarding using a Schematic Map to represent an indoor environment compared with a Floor Plan? (options: difficult to understand, symbology, complexity, and none).

P7 Do you think it is important to represent on the map where you have to cross one room to get to another?

P8 What symbology do you prefer to represent Rooms on a Schematic Map? In this case, two SMs were presented; one is the same as in Figure 1, and the other had squares instead circles for representing rooms.

User tests were collected using *HTML* forms, filled in via the web, and stored in a server, using a short *PHP* script. Data were received in text format and inserted into an Excel table. Tables related to the tests were built separately for each language, including a table giving user characteristics. Each user received a random number identifier to remove any possibility of identification.

3   Results and future work

We received 140 answers, divided into 93 Portuguese and 47 English users. In these two groups, most users were female. The Portuguese users were mostly educated to undergraduate level, and English users mostly had master's degrees. In both groups, the majority stated that they often use maps and around 50% of users reported that they sometimes look for indoor maps.

Table 1 presents the answers regarding subjective preferences (questions P1 to P3). Questions P4, P5, and P6 were related to the SM only. In these questions, users were asked to rank how easy or difficult they found it to understand the map, and to state positive and negative points regarding using an SM to represent an indoor environment compared with an FP. Finally, there were two questions about the map symbology (P7 and P8). The results for these questions are presented in Table 2.

Based on these initial results it is not possible to state that one type of map is preferred by users, but this is an important step in helping understand the usage of schematic maps in indoor environments. With regard to the questions about the SM only, both groups found it easy to understand and pointed out the simplicity as a positive point. The percentage of users that said that they preferred the FP is too small for us to report

that FP are better for representing an indoor environment. Furthermore, there are preference differences when analyzing the groups separately. Further investigations will consider both groups in order to confirm this preference.

Future work will be done by testing users in real situations to determine whether Schematic Maps can be useful tools for helping with way-finding tasks.

Table 1: Results for questions about use preferences (in %)

	Portuguese		English		Total	
	FP	SM	FP	SM	FP	SM
P1	48.4	51.6	67.4	32.6	54.7	45.3
P2	52.7	47.3	67.4	32.6	57.6	42.4
P3	47.3	52.7	67.4	32.6	54.0	46.0

Table 2: Results for questions related to schematic map (in %)

	Port.	**English**	**Total**
P4			
Very easy	10.8	10.9	10.8
Easy	64.5	54.3	59.4
Difficult	24.7	26.1	25.4
Very difficult	-	8.7	4.3
P5			
Easy	6.5	6.5	6.5
Simplicity	55.9	45.7	50.8
Symbology	21.5	30.4	26.0
None	16.1	17.4	16.8
P6			
Complexity	35.5	41.3	38.4
Difficulty	8.6	30.4	19.5
Symbology	20.4	15.2	17.8
None	35.5	13.0	24.3
P7			
No	29.0	23.9	26.5
Yes	71.0	76.1	73.5
P8			
A	49.5	47.8	48.6
B	50.5	52.2	51.4

4   Acknowledgement

5   References

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