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A comparative analysis of visualization methods of travel time for schematic road map

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Abstract:

Schematic map has higher recognition efficiency due to its simplified shape, thus it is widely used in the repesentation of transportation (such as metro map). Because manual design of schematic map is time consuming, many researchers have focused on automatic generation of schematic map. Existing automatic generation methods mainly focus on the development of methods of simplification of road maps. In practice, time information is also important for map users. Several methods on the visualization of time information on schematic maps have been proposed, such as TimeCoutours method (Nicholas et al. 2006) and adding time cues to schematic maps (Haverkort 2014). However, these methods have not been compared and evaluated, which is the aim of this study.

Existing methods mainly use the " hue, lightness, shape, size, style" and their combinations for map foreground and background. This study evaluates the existing methods from three aspects: usability, efficiency and aesthetic. For example, 1) " With the representation of time information, whether it reduces the clarity of road presentation" evaluates usability, 2) " Is it visually clear for the differences of the time information among roads? " evaluates the validity of the methods aiming at map foreground, 3） " Is it visually clear for the differences of the time information among area? " evaluates the effectiveness of methods for map background, " 4) " After adding time information, compare the beauty with figure a. " evaluates aesthetic. There are 30 questions in this questionnaire. 20 volunteers with different majors and educational background are requested to give scores for these questions. A 5-score system is used in this questionnaire and contains " very hard or disturbing, hard or disturbing, commonly, good, very good".

The experimental results indicate that: 1) for the usability, the scores of color, size, color-brightness-size and lightness-size are higher than 3, and the usability is high, size-style variable is less than 2.5. 2) for the efficiency, the average score of the method of visualizing map foreground is higher than that of the method of map background. However, the score of background color-brightness-size method is higher than that of foreground style method, and both of them are higher than 3. 3) for the aesthetic, color-brightness-size, color-size and size are more than 3. Style method score less than 2. According the experiment results, it can be concluded that the color-brightness-size method and foreground-size method have higher effects for the visualization of time information. Next, this study will evaluate the applicability of each method and conduct eye-tracking experiment to evaluate the effectiveness of these methods.

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