Do authors look at their maps in different way than common readers? An eye-tracking study

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Abstract:

In the 1950s, Arthur Robinson raised the level of interest in thematic maps and map design. Cartographic research based on the systematic empirical investigation was replaced by a theoretical approach, which led to the establishment of cartographic communication models. Later, these models became the paradigm of cartographic communication.

The contribution aims to reveal the differences in map reading between map authors, users with cartographic education and novices without deeper cartographic knowledge. The comparison of map reading between map authors and common readers might serve for the verification of cartographic models, where the communication between map author and map reader through a map is described.

To achieve this goal, we placed the authors of the maps in the role of the users of their maps. Then, we performed an eye-tracking experiment to reveal their map reading strategies and compared them with the strategies of other cartographers. A total of twenty-two cartographers participated in the experiment. Each of them was the author of two of the maps presented during the experiment. Moreover, seventeen novices without any cartographic knowledge participated in the experiment. The experiment contained 44 maps and was divided into two parts. In the first one, participants freely observed the maps for 12 seconds, whereas in the second one, they were completed tasks above the maps.

The results showed that the authors correctly performed all tasks for their own maps. Two other groups were less successful. Eye movement data pointed to the source of the errors in participant's answers.

Analysis of eye-tracking metrics revealed that novices needed a greater number of fixations to accomplish the tasks than both the cartographers and map authors. In contrast, in the free viewing part, the lowest number of fixations was observed for novices.

Subsequently, Areas of Interest (AOIs) were marked on the maps, and the time spent in each of them was analysed. In our case, these Areas of Interest corresponded to the map composition elements of the studied maps. Cartographers, in general, inspected maps more systematically. They started with the reading of the map title and then focused their attention on all other compositional elements. In contrast, novices did not focus their attention on the scale or imprint.

The most important part of the data analysis was the Scanpath Comparison, which helped quantify the overlap of the author's reality with cartographers' and novices' reality in the model of Koláčný. For the Scanpath Comparison, the String-Edit-Distance measure was employed via the online tool ScanGraph (Doležalová and Popelka, 2016). ScanGraph calculates the similarity in map reading strategy based on the order of visited AOIs.

The average similarity for the whole group of cartographers was calculated as well as the average similarity between the author and all other cartographers. Then, these two averages were subtracted to find the similarity of the map reading strategy between the author and cartographers. Subsequently, the same approach was applied to the author and novices.

The eye-movement experiment helped us to quantify the overlap of author's, cartographer's and novice's realities according to Koláčný's (1969) cartographic communication model. The overlap was considerable in most cases; however, our method of Scanpath Comparison helped us to identify the exceptions where authors used a unique strategy, and the overlap was lower.

References

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