

Can naive and expert users spot the difference between AI vs. human-generalized maps?

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Abstract:

As it is evident to the trained cartographers, the decision making process leading to designing a legible map at a smaller scale is called *cartographic generalization*.

Through various operators, cartographic generalization seeks e.g., the *selection* and *simplification* of the spatial data to adapt it to the target detail level, specific application and user requirements (Kraak et al., 2020). Researchers have used a variety of artificial intelligence (AI) methods to automate cartographic generalization throughout decades, with a marked amplification in such efforts in recent years, including expert systems, multi-agent systems and machine learning approaches (Touya et al., 2019; Courtial et al., 2022; Karsznia 2023; Karsznia et al., 2024a; Harrie et al., 2024; Kang et al., 2024). However, the usefulness, correctness and reliability of maps generated with the support of AI has not yet been thoroughly verified. To address this knowledge gap, we designed a between-subjects user experiment with two user groups and collected data from naive users with no professional cartographic knowledge (n=17) and expert users who are trained cartographers (n=16) through April 2024 to January 2025. The tasks included comparing maps manually designed by human cartographers and the maps automatically generalized with the use of AI, specifically machine learning (ML) models. The experiment was conducted using a dedicated web application (Fig. 1). One of the stimuli used in one of the tasks was presented in figure 1. The task concerned the comparison between source (ungeneralized) data (Source data) and one of the generalization results (Gen5). This task was the last one in the user experiment. The user task was to evaluate if the generalization was performed by humans or by ML. Likert scale was used with the possible answers from 1 (definitely human) to 5 (definitely machine learning algorithm).

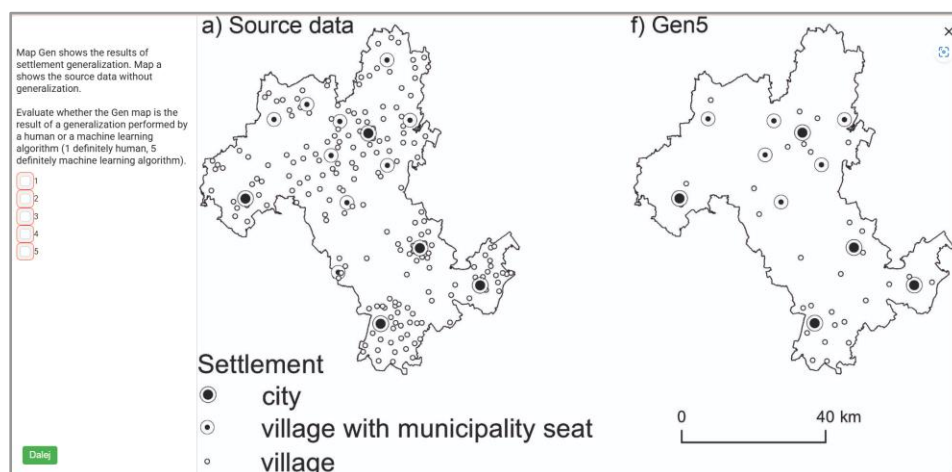


Figure 1. Example stimuli used for one of the tasks in the user study

Additionally, we gathered eye movement data and recorded the sessions with a Tobii eye tracker. This research extends the previous studies separately conducted with six naive users (Karsznia et al., 2024b) and six expert users (Karsznia et

al. 2024c). Our primary research contributions are as follows: 1) analysing if participants can distinguish the differences between machine and human design, 2) verifying if the above-mentioned judgment depends on their prior cartographic knowledge in map design, 3) checking if the collected eye-tracking data constitute complementary in-depth input for the performance comparison between naive and expert users. The first results show that neither naive nor expert participants can spot the difference between AI vs. human generalized maps. Interestingly, both participant groups consider AI generalized maps *as good* or even *more relevant* than human generalized ones. In an open question we have also gathered interesting comments from the users concerning the experiment as well as strategies applied for solving the tasks.

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