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Evaluation of automated orienteering map design possibilities for Czechia

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Abstract:

Orienteering maps are traditionally produced through detailed field mapping combined with manual selection of features and appropriate cartographic generalization based on standartised methodology (International Orienteering Federation, 2024). While this approach ensures high positional accuracy and thematic detail, it is also time-consuming and, therefore, also expensive process. Therefore, such approach limits the rapid creation of maps for new areas, especially for training purposes and low-cost events. In several European countries, initiatives framed by *MapAnt* project demonstrated the potential of semi-automated workflows for generating preliminary orienteering maps from existing geospatial data sources (Alonso et al., 2021). These systems typically integrate high-resolution elevation models, LiDAR-derived products, land cover data, and other open geospatial datasets to automatically derive map features compliant with the International Specification for Orienteering Maps (International Orienteering Federation, 2024). Despite the fact that such outputs cannot be used directly for race purposes, they can serve for unformal training and may become a valuable initial input data source for the subsequent manual production process.

This paper presents a pilot study presenting possibilities of implementation of such an approach for the territory of Czechia. The study first reviews the methodological principles used in existing MapAnt implementations in countries such as Estonia, Switzerland, and Finland. Following this review, the availability and suitability of relevant geospatial datasets in Czechia are analysed, including national LiDAR data, digital terrain models, land cover datasets, and vector topographic databases. Particular attention is given to the source datasets available for the whole area of Czechia, especially those available in an open-data licence, their comparison in terms of geometry precision and category classification. Special focus is given to the new DMP OK digital terrain model based on photogrammetry (Horák et al., 2026), providing suitable source for estimating vegetation height.

Subsequently, an adapted processing workflow is proposed for semi-automated map generation using these datasets. This includes automated feature extraction procedure, and cartographic visualisation rendering relevant features to produce usable orienteering maps. This workflow is algorithmised within a software tool (Fig. 1). The workflow focuses on extracting key terrain and vegetation features and transforming them into a cartographic representation compatible with the standardized symbol system used in orienteering mapping.

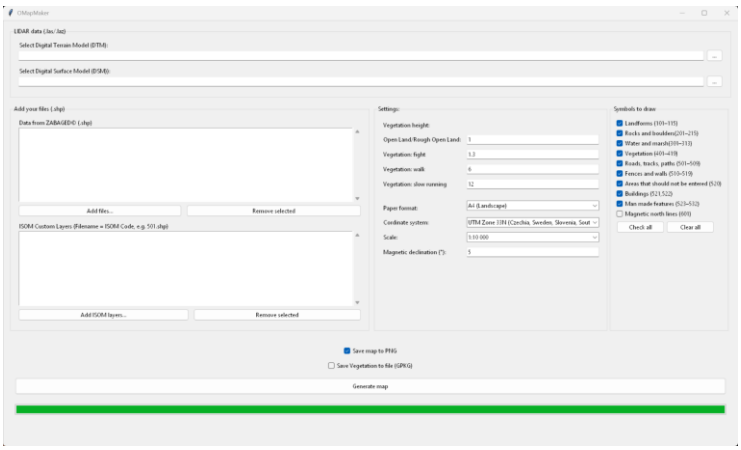

Figure 1. Graphic user interface of the develop software tool for processing the data.

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The proposed methodology is tested in several pilot areas of varying landscape character. For each locality, prototype orienteering maps are generated (Fig. 2) and evaluated through comparison with existing conventionally mapped orienteering maps. The results assess positional accuracy, and thematic categorisation evaluated randomly within the study areas by expert choice based on a defined scale. The study demonstrates the potential and current limitations of semi-automated orienteering map production in current Czech context. It also outlines possible improvements in data processing and workflow design that could support the wider adoption of automated mapping approaches for orienteering, particularly for rapid preliminary mapping, training areas, and regions lacking existing maps.

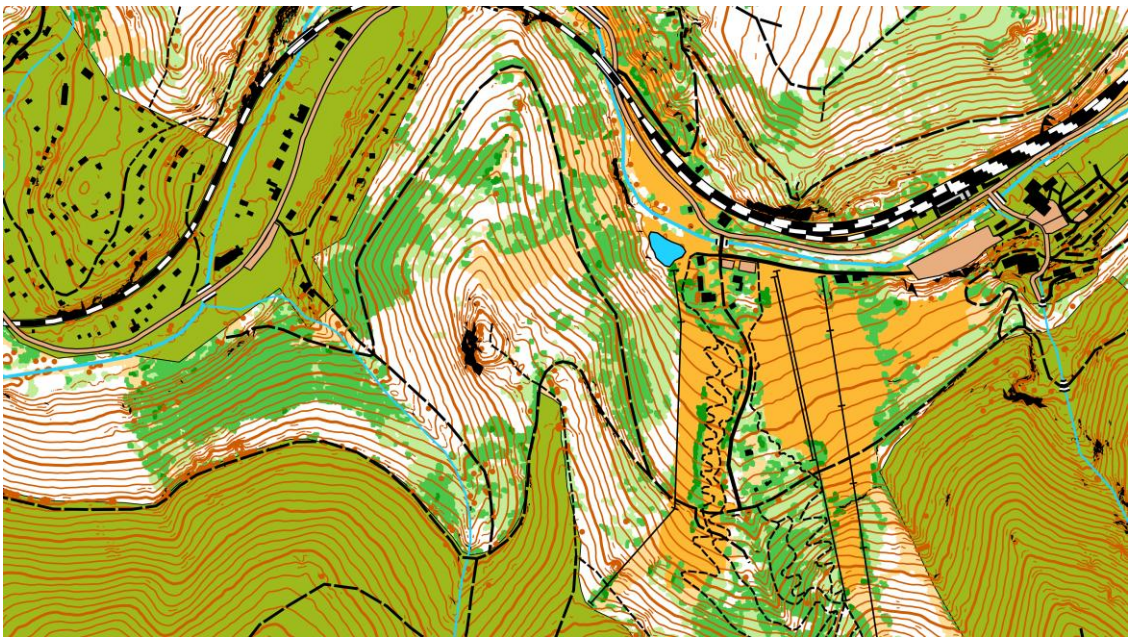

Figure 2. Generated map example capturing a section of the valley of Bystřice river based on LiDAR terrain data and selected OpenStreetMap features.

References

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