The layout and screen area of GUI elements in mobile map applications

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Abstract:

Modern mobile map applications play a pivotal role in everyday navigation and spatial exploration. Investigating the layout and screen area of graphical user interface (GUI) elements in these applications is crucial from the perspective of ergonomics and effective management of screen space (Roth et al. 2017). The aim of this study is to identify the layout and screen surface patterns of selected graphical user interface elements in mobile mapping applications, with particular emphasis on their adaptation to the ergonomic touch zone of mobile device screens.

The methods used in this study include: application selection and identification of recurring GUI elements; measurement of screen area occupied by these elements; visualization of button overlap surfaces to highlight density patterns; photographic documentation of smartphone handling to analyze ergonomic thumb range; and comparative analysis of layout and screen area across applications, supported by a review of relevant literature. The research workflow diagram is presented in Figure 1.

We have selected six widely used mobile map applications for analysis: Google Maps, HERE WeGo, MAPS.ME, Mapy.cz (currently Mapy.com), OsmAnd and Yandex Maps. These applications were selected due to their worldwide popularity and their frequent mention in the cartographic and geoinformatics literature. They are designed for general use and support everyday spatial tasks such as browsing maps, searching for locations and navigating different modes of transportation. Applications designed exclusively for specific purposes — such as dedicated car navigation tools — were excluded from the study to ensure that the focus was on versatile, multifunctional map interfaces for a broad user base.
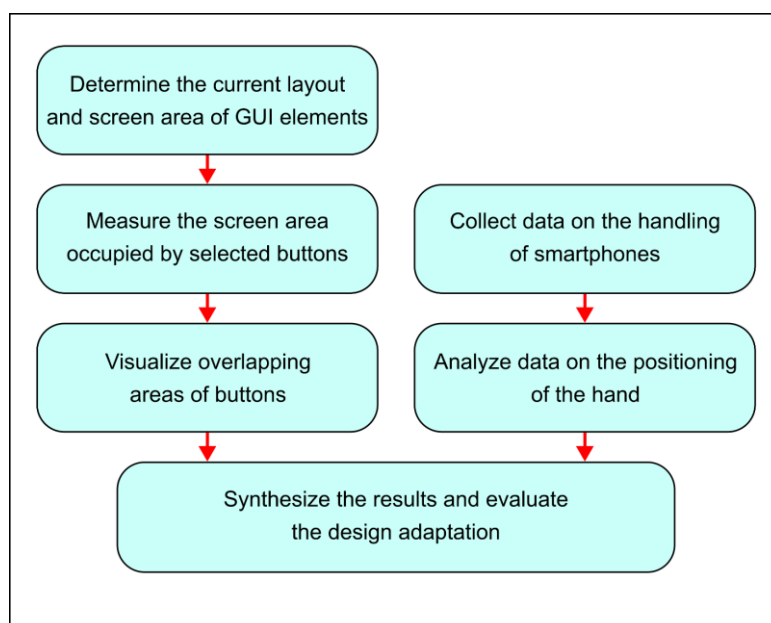
Figure 1. Workflow diagram.

This study focuses on four recurring buttons that appear in all applications: Search, Change Layers, Geolocation, and Compass. Detailed measurements of the screen area occupied by these elements were made, as well as visualizations of the areas with the highest frequency of button overlap. The analysis also examined the alignment of these elements with the ergonomic area of touchscreens. The data from the literature was supplemented by photographic documentation of hand positioning during smartphone use.

Although the study has not yet been completed, initial observations show that the analyzed GUI elements tend to be concentrated in the upper corners and lower right area of the screen. This spatial distribution partially corresponds to the ergonomic reach of the thumb for right-handed users (Xiong & Muraki, 2016). However, elements positioned in the upper corners may be outside the natural reach, which could affect the accessibility of the user interface and the efficiency of interaction. Although some agreement with the optimal touch zone is evident, these findings highlight the need for further research into interface design that takes into account the different ways users hold and operate mobile devices (Bartling et al., 2022).

This study may provide valuable insights into the design of mobile user interfaces and the ergonomics of touchscreens, offering perspectives on usability and functionality for different user groups. It may also highlight the challenge of balancing interface functionality with minimizing the obscuring of cartographic content.

References

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