

Accessibility approaches for thematic web maps



by SAMUEL DARKWAH MANU

Maps, being inherently visual, pose significant challenges for individuals with visual impairments. While tactile [1], audio [2] and acoustic [3] maps offer solutions for physical maps, the rise of web-based thematic maps introduces new accessibility barriers. Individuals who are blind cannot interact with web maps in traditional ways, and those with other visual impairments may find it difficult to interpret detailed map content. This research examines how the Web Content Accessibility Guidelines (WCAG) can be applied to improve the accessibility of thematic web maps, ensuring equitable access for all users.

OBJECTIVES

The objectives of the study are: (1) to investigate the state-of-the-art scientific literature on web accessibility and thematic maps; (2) to explore the extent to which the specifications of the WCAG can be transferred to thematic web maps; (3) to explore accessibility considerations in popular web mapping tools; and (4) to develop a prototype accessible thematic web map for users with visual disabilities.

METHODOLOGY

This study began with a comprehensive review of literature on web accessibility, thematic web maps, and the WCAG. Key insights were gathered on proposed guidelines, best practices, and the common challenges faced in developing accessible web applications. To evaluate current accessibility standards, a selection of popular web mapping libraries was analyzed, identifying both accessible and inaccessible features. Based on these findings, a set of practical guidelines was developed to align thematic web maps with WCAG 2.2 standards. To demonstrate these guidelines, a prototype web map was created as a proof of concept, showcasing how accessibility can be integrated into web map design.

WEB MAPPING TOOLS

Web mapping libraries are essential for creating interactive maps, but accessibility support varies. Some tools offer built-in features or guidelines, while others lack clear documentation. In 2020, Chan and Linder evaluated popular libraries against WCAG 2.1, finding that none fully met accessibility standards [4]. While tools like Leaflet and Google Maps SDK have since improved, many accessibility gaps remain across other libraries.

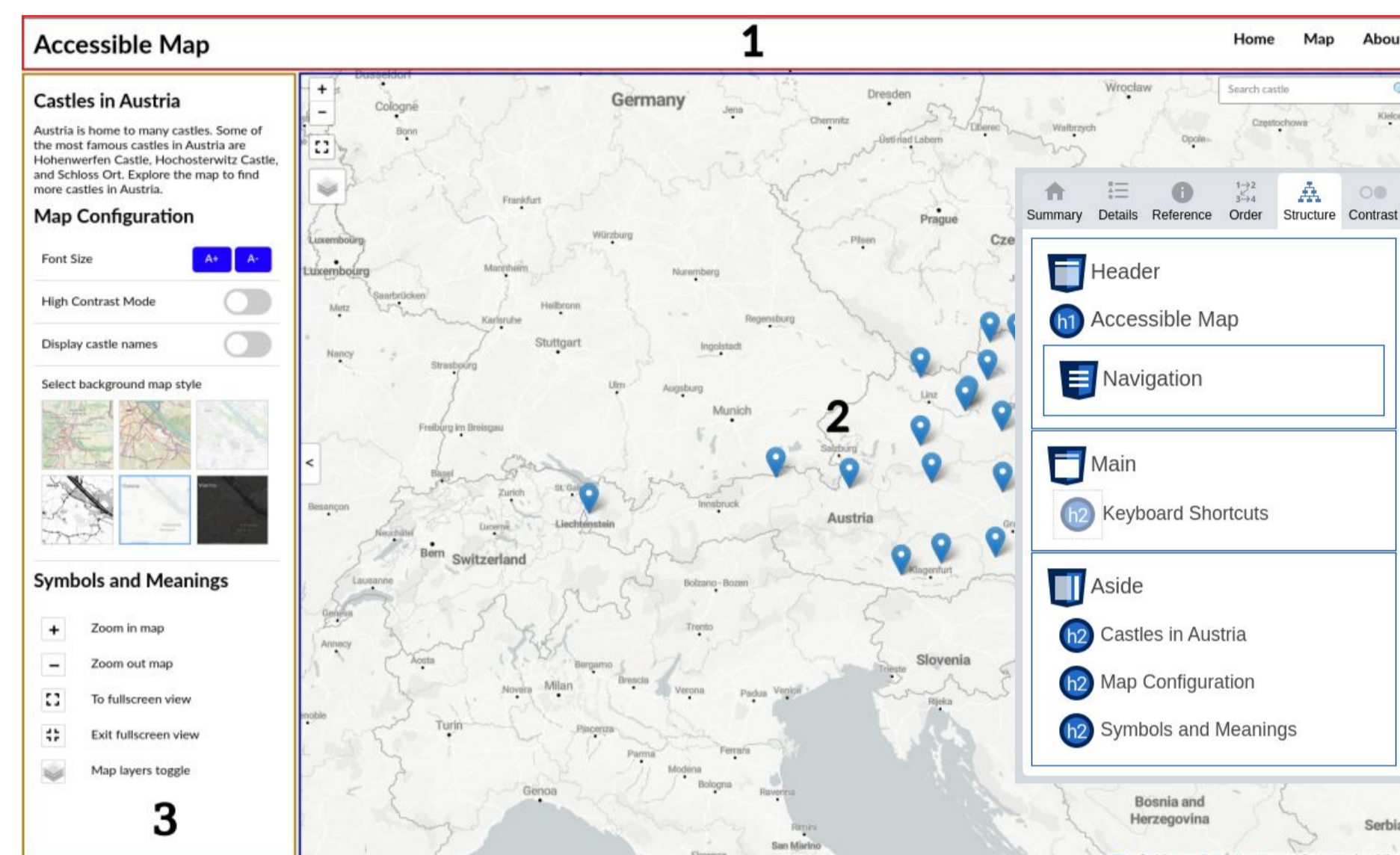


Fig. 1 Interface of the accessible map prototype showing the 3 main sections of the map application

PROTOTYPE DEVELOPMENT

The prototype was developed with Leaflet library using Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and JavaScript.

The map interface was structured using semantic HTML elements <header>, <main>, and <aside> to ensure clear relationships between regions for assistive technologies as seen in Fig. 1. The interface followed a logical sequence in both visual layout and tab order. All interactive elements including

additional background layer switcher. The interface has a skip to map link, and provides visible focus.

PROTOTYPE EVALUATION

The prototype was evaluated with the WebAIM WAVE and Accessibility Insights for Web web accessibility evaluation tools. WAVE reported no errors but highlighted 26 alerts. There was 1 failed test for the evaluation with Accessibility Insights for Web Assessment Tool caused by Leaflet Layer control.

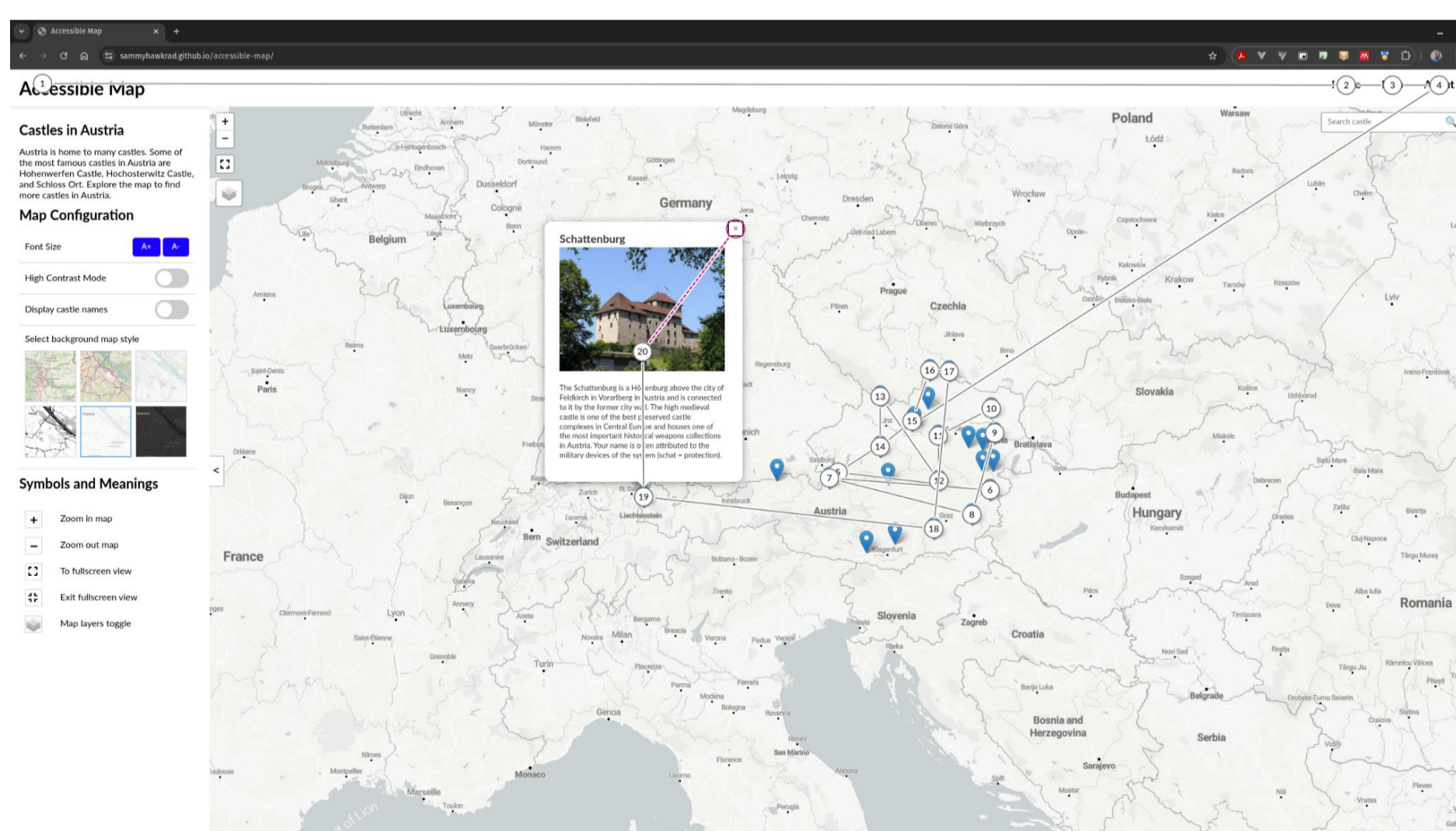


Fig. 2 Tab stops

popup content were accessible by keyboard (see Fig.2). Key elements were labeled with ARIA attributes, such as aria-roledescription and aria-describedby, to provide additional context and keyboard shortcuts. The map configuration section provided options to change the font size of the map interface, toggle a high contrast mode, toggle the display of the castle names and an

CONCLUSION

While much research has addressed accessibility for physical maps, web maps have received less attention. Despite the lack of specific WCAG guidelines for web maps, this study shows that thematic web maps can be made accessible to visually impaired users by applying WCAG principles.

THESIS CONDUCTED AT

Institute of Cartography
Department of Geosciences
Technische Universität Dresden



THESIS ASSESSMENT BOARD

Chair Professor: Prof. Dipl.-Phys. Dr.-Ing. habil. Dirk Burghardt (TUD)

Supervisors: Prof. Dipl.-Phys. Dr.-Ing. habil. Dirk Burghardt (TUD), Dr.-Ing. habil. Eva Hauthal (TUD) & Anni Seifert (Sandstein Neue Medien)

Reviewer: Dipl.-Ing. Dr. Florian Ledermann (TUW)

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