Findby: An Application for Accessibility and Inclusive Exploration

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Abstract. Inclusion and accessibility are essential human rights that should be upheld in all aspects of life, including access to both public and private spaces. Unfortunately, in Colombia, the rights of people with disabilities are often marginalized and neglected, with only 7 out of 100 Colombians having disabilities in 2022. Furthermore, despite 36.9% of people with disabilities in Colombia living with reduced mobility, however, the cities remain largely inaccessible for them. This paper introduces Findby, a web application designed for users with reduced mobility, aiming to provide information on the accessibility of places and promote inclusive exploration through challenges and a reward system. The app utilizes user-centered design and leverages technology to improve access to both public and private spaces. Findby's key features include accessibility markers, user-generated content, review comments, ratings, and customized route-based challenges, making the application engaging and user-friendly. Findby has the potential to contribute significantly to improving accessibility and inclusion for individuals with reduced mobility. Future work includes expanding the user community, improving the accuracy of accessibility information, incorporating accessibility information for private spaces, integrating additional features, and expanding globally to promote inclusivity and accessibility worldwide.

Keywords: Accessibility · Reduced mobility · Web application · Inclusion · User community · Accessibility bookmarks · Personalized routes · Inclusive exploration · User-centered design

1 Introduction

1.1 A Subsection Sample

Inclusion and accessibility are fundamental human rights that should be upheld in all aspects of life, including access to public and private spaces. Regrettably, in Colombia, the rights of people with disabilities are violated in approximately

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7 out of every 100 cases as of 2022 [1]. This highlights the urgent need to address this issue and ensure equal participation in society for all individuals, regardless of their physical abilities. Notably, 36.9% of people with disabilities in Colombia face reduced mobility, yet the country's cities largely remain inaccessible to them [2]. While several mobile applications on the market provide accessibility information, they were not specifically designed for individuals with reduced mobility; as a result, lack relevant information for this audience. In contrast, Findby stands out due to its user-centered participatory design. It actively involves the community of people with reduced mobility in its development process. In response to this problem, Findby is presented, a web application designed specifically for users with reduced mobility. Its primary objective is to offer comprehensive accessibility information about places and to foster inclusive exploration through challenges and a reward system. This innovative app uses user-centered design and leverages technology to improve access to public and private spaces, thus making life easier for people with reduced mobility. The app also includes custom route-based challenges, encouraging users to explore and discover new accessible places. This promotes social inclusion, encourages individuals to step out of their comfort zones, and broadens their horizons. Findby has the potential to significantly contribute to improving accessibility and inclusion of people with reduced mobility in Colombia. However, future work does not stop here. Additional steps must be taken to expand the user community, ensuring that the app reaches a more significant number of people who would benefit from it. In addition, it is essential to enhance the accuracy of the accessibility information provided by the application. This implies a constant update and verification of the data to ensure that the information is reliable and useful for users. The article is structured as follows: the next section provides the conceptual framework and background information. The methodology is discussed, and the proposed solution is presented afterward. Next, we present the results obtained from the acceptance tests, followed by the conclusions drawn from the findings. Finally, we discuss future work and possible areas for improvement.

2 Background

2.1 Conceptual Framework

There are different types of disabilities, each with its characteristics and challenges: visual, hearing, intellectual, physical, or motor. The solution presented in this report is designed for the latter. Motor disability refers to limitations in mobility or control of the body. It can be caused by spinal cord injuries, birth defects, amputations, or other conditions that affect the musculoskeletal system [2].

The term accessibility refers to the ability of all people, regardless of their physical or mental condition, to access and use the services and environments around them autonomously. Universal accessibility is a condition that guarantees equal opportunities for all, especially for people with disabilities [3].

The Findby app's scope is centered around promoting accessibility and inclusion for people with reduced mobility. The app seeks to leverage technology and user-centered design to improve access to public and private places and to encourage more people to explore these spaces in an inclusive and accessible way.

2.2   Related Work

Several mobile applications on the market provide information on the accessibility of public and private places [4]. Some of the most popular apps are a) Wheelmap: a global map for finding and marking wheelchair-accessible places. Similar to the Findby app; it puts efforts to get as many markers as possible, the difference lies in Wheelmap's mapping events, meanwhile, Findby app utilizes events and rewards to motivate users. b) Access Earth: a travel app that allows users to find accessible accommodations and attractions worldwide. It doesn't encourage users to mark locations. c) AXS Map: a crowdsourced tool that allows users to rate and review the accessibility of various locations. d) AccessNow: an app that lets users find and rate accessible places nearby. It doesn't encourage the users to mark locations. Similar to wheelmap, it encourages users to create Mapathons (mapping marathons) and to participate in them. e) Be My Eyes: a free app that connects blind and low-vision people with sighted volunteers for visual assistance. f) Club2g by MATT: a crowdsourced tool that allows users to rate and review the accessibility of various locations oriented to MATT users in Medellín.

However, many apps are not specifically designed for people with reduced mobility or do not contain detailed and accurate information. In response to this problem, Findby is presented, a web application designed specifically for users with reduced mobility. In addition, the app features an accessibility marker system and customized route-based challenges designed to encourage inclusive exploration of the maps.

3   Method

The development of Findby has been carried out using an agile methodology based on the SCRUM framework. This methodology allows for close collaboration between the development team members and the users of the application, which has allowed for user-centered design and the incorporation of user feedback throughout the development process. The user-centered approach was realized through consistent communication with wheelchair users through chat, periodically presenting them with functional mockups and progress videos of the app, and incorporating the changes they suggested. In the final stages of development, when FindBy had become a functional product, the team presented the Minimum Viable Product to potential end users and experts in the field of disability.

During the development process, the Nesquik team (a group of 6 students of the course integrative project 2 of systems engineering at EAFIT) used four-week sprint cycles to work on the different functionalities of the application. Daily

follow-up meetings have been held, where pending tasks have been reviewed, obstacles have been discussed, and work for the next day has been planned. Although the hours of work weren't constant most of the time, the media of hours work per week was of 10 h

The SCRUM framework has allowed the Nesquik team to develop the application iteratively and incrementally, which has allowed it to adjust and improve the application throughout the development process according to the needs of the users and the feedback received.

4   Proposed Solution

After collaborating with the Gobernación de Antioquia (Department of People with Disabilities) and Matt, Nesquik identified the need for a tool that not only inform users about accessible places in Medellín but also kept them engaged with the app. The main distinguishing factor of the Nesquik app compared to other accessibility mapping apps is its focus on gamification and motivation, rather than simply offering the option to use it. To address the challenges faced by people with reduced mobility and promote inclusive exploration, we propose the development of Findby: an open source web application designed specifically for users with reduced mobility. Findby aims to provide information on the accessibility of places and create an inclusive environment through challenges and a reward system. By leveraging user-centered design principles and innovative technologies, Findby offers a comprehensive solution to improve access to public and private spaces. This software is designed with a model-view-controller architecture (see Fig. 1). The view layer is a map with which the user can interact, programmed in HTML, and it is developed in JavaScript. In addition, the presented map is executed with a Google Maps API. This API provides a set of tools and services for working with maps and location data. This includes displaying maps, adding markers, searching for places, and more. The controller layer is in charge of taking the data from the users, their ratings, and the reviews they make. It is programmed in TypeScript and JavaScript. In this layer, the information on the accessible points and their specifications are also created. Finally, in the model layer, user data, points, and reviews are stored in each place, and database systems are used and stored on servers. As an architecture, the user connects through the cell phone to the application, which connects to the servers where the user's information, the map, the ranking, the points of interest, and the treasure hunts are located. All this information is stored in a database server. In terms of technology, Findby is developed using JavaScript, CSS, and a pure HTML architecture. These technologies were chosen for their versatility and widespread use in web development. JavaScript provides the necessary interactivity and functionality, CSS handles visual styling, while HTML structures the content. This architecture ensures a solid foundation for the application's development. The app provides information on the accessibility of these places through a system of accessibility markers. These markers also include information on the location's accessibility level, including details about features
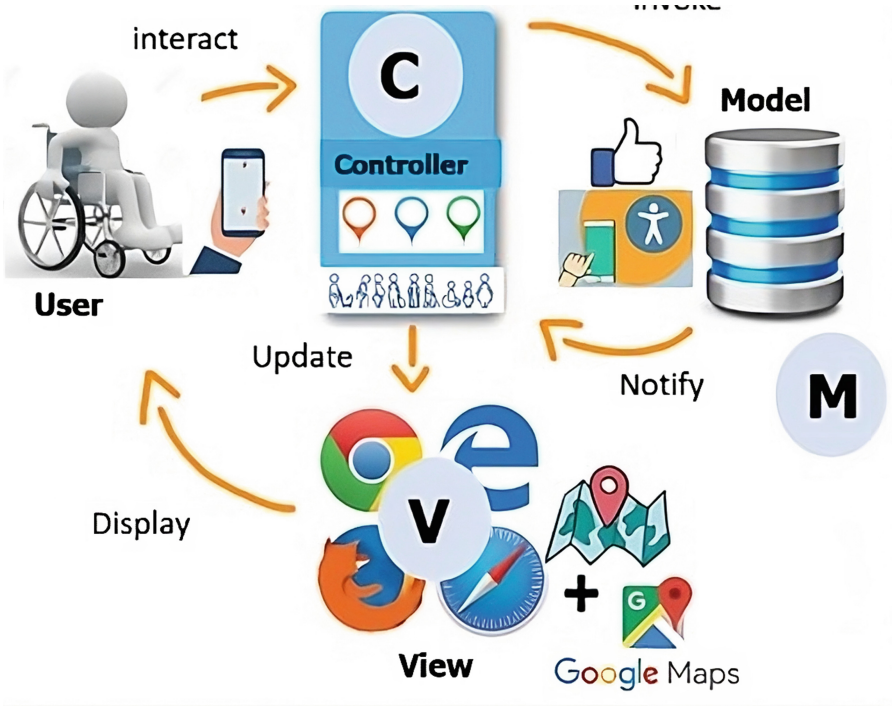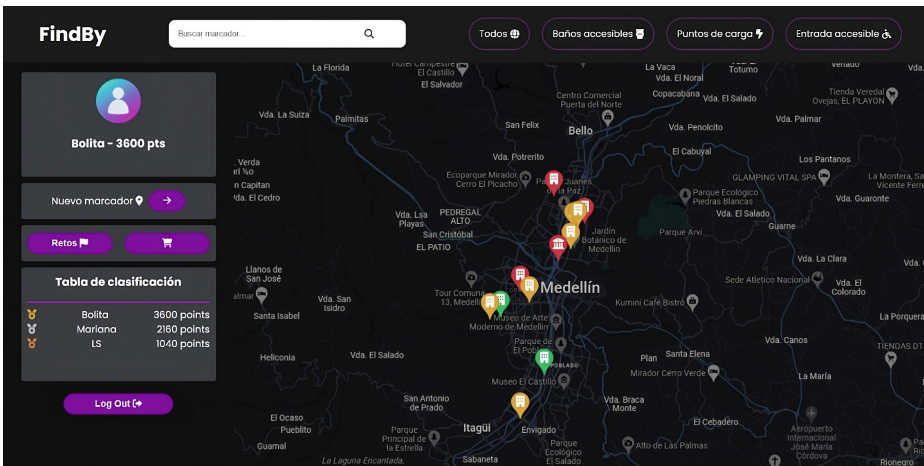
Fig. 1. Findy architecture

Fig. 2. Map example and accessibility markers

such as ramps, elevators, or accessible restrooms (see Fig. 2). Findby has accessibility markers, which allow users to quickly identify places that are accessible to them. In addition, the app includes user-generated content, which means that

people can share their experiences and offer recommendations about the accessibility of different places. This allows other users to make informed decisions and also fosters a collaborative community where people can support each other. The inclusion of accessibility markers allows users to assess the accessibility level of a particular location. These markers are displayed with a color code, representing different accessibility levels as determined by users (green: very accessible, yellow: medium accessible, red: not very accessible). Figure 3 shows the interface to add sites to the map and how the information is recorded. Integration with the Google Maps API is a key feature of Findby. This integration allows the application to display accessibility marker information and create custom routes. By leveraging the power of the Google Maps API, Findby provides users with detailed information about the accessibility of locations, empowering them to plan their routes accordingly and make informed decisions about their mobility. To ensure reliable data storage and efficient data management, Findby utilizes Firebase, a cloud-based solution. Firebase offers a secure platform for storing and retrieving application data, including accessibility markers, user-generated content, and other relevant data points. By leveraging Firebase's capabilities, Findby guarantees a seamless user experience and streamlined data handling.

The availability of customized route-based challenges (see Fig. 4) adds an engaging element to Findby. These challenges motivate users to explore maps inclusively, add an element and unlock rewards or achievements, enhancing their interaction with the application and encouraging the discovery of new accessible places.

5   Results

After the development, acceptance tests were carried out with 2 wheelchair users in the city of Medellín. There wasn't a questionnaire to measure their opinion, instead, the users were asked about their opinion on various aspects of the app. When asked to rate the intuitiveness of the website on a scale of 1 to 10, participants gave it an average rating of 8.75. The layout, buttons, and color scheme were noted as factors that contributed to easy navigation and interaction with the website. Feedback on the aesthetics of the page was mixed. Participants expressed concerns about the disproportionate placement of the magnifying glass icon in the search bar and the potential security implications of automatically setting the password during the login process, and one of the participants mentioned that the pop-ups felt like errors, even if they were only messages of confirmation from the page, because of the different look on these. On the positive side, participants appreciated the responsive design when viewing five-star ratings for locations. However, they found the comments section aesthetics to be somewhat imbalanced. Participants regarded the website as highly useful, particularly in terms of providing precise information about locations that match specific criteria, however, one of the suggestions that was received was that if it were possible to see in the marker for one place, if that place has some kind of "helping item", like a wheelchair. The creation of points on the map was generally deemed to be executed correctly, with no major improvements or concerns

Fig. 3. Interfaces to add sites

raised. They made very valuable suggestions: a) carry out a study on the accessibility filters that we have (charging point, ramp, elevator) if they are types of accessibility (for example, charging point is not an accessibility element); b) it can be dangerous for wheelchair users to use conventional routes where vehicles pass. They suggest that the routing of the challenges be done on bike paths or roads with low traffic flow, to protect users; c) there are accessibility filters that must be met simultaneously. For example, it doesn't help much if a place has an accessible bathroom and a charging point but is located on a second floor where you can only go up by elevator. d) allow the visualization of the map with the accessible points without prior registration.
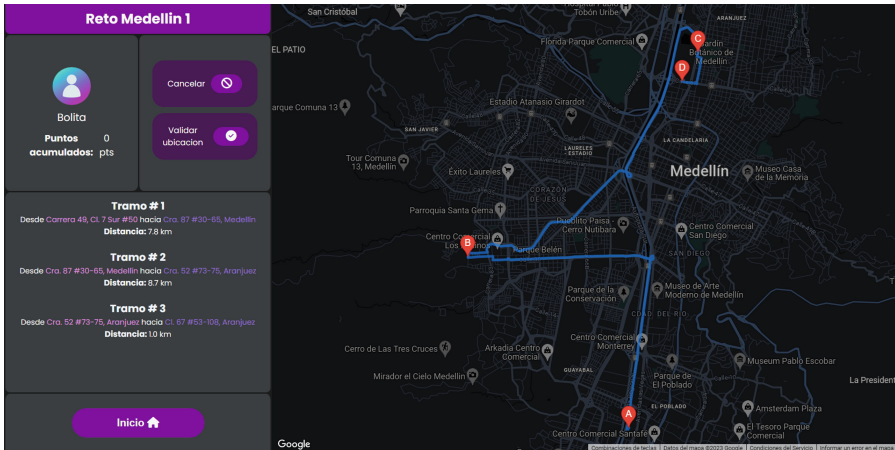
Fig. 4. Customized route-based challenges

6   Conclusions and Future Work

In this paper we presented Findby, an innovative web application that prioritizes accessibility and mobility for individuals with reduced mobility. The application adopts a user-centered design approach, actively involving the community of individuals with reduced mobility in its development. This collaborative process enables continuous feedback and facilitates ongoing improvements. The application's development has been streamlined through the implementation of an agile methodology based on SCRUM. This iterative and incremental approach has allowed for adjustments and enhancements based on user feedback and needs. Findby stands out from other similar applications due to its participatory approach and customized route-based challenges designed to encourage inclusive exploration of maps. The application also includes accessibility markers that allow users to view and add information about the accessibility of different locations, making it a valuable tool for improving accessibility in public spaces. Findby's key features include accessibility bookmarks, user-generated content, review comments, ratings, and custom path-based challenges, making the app engaging and easy to use. In short, Findby represents an important step towards creating more inclusive and accessible environments for people with reduced mobility in Colombia and beyond. This app demonstrates how technology and a user-centered approach can make a difference in the lives of people with disabilities, empowering them to fully enjoy public and private spaces. By continuing to develop and improve Findby, we can move towards a more inclusive society where all individuals have equal opportunity and access. Here are some of the future work areas for the application:

– The Nsquik team should focus on expanding the user community to increase the number of markers and accessibility information available on

the application. This could be done through targeted marketing campaigns and collaborations with organizations focused on disability rights and accessibility.

– The accuracy of the accessibility information provided by users needs to be improved to ensure that it is reliable and useful. The Nsquik team could consider implementing a verification process for user-generated information to ensure that it meets certain quality standards.

– Findby currently focuses on public spaces, but the application could be expanded to include accessibility information for private spaces such as offices, stores, and restaurants.

– Findby must consider integrating additional features such as real-time updates on accessibility issues, integration with other accessibility-related services, and the development of a mobile application.

– The most urgent work to be done is to expand acceptance testing and incorporate feedback from end users.

7   Related Links

– Link to FindBy
– User Manual for FindBy
– Wheelmap
– Access Earth
– AXS Map
– AccessNow
– Be My Eyes
– Club2G.

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