Find My Way: Indoor Navigation for Campus

Princess Kachhadiya
B00969786

Vishesh Patel
B00965836

Kruti Panchal
B00930563

ABSTRACT

This paper presents the "Find my Way - Dal" project, an initiative to enhance campus navigation at Dalhousie University through a user-centered design approach. This initiative aims to improve campus navigation through a user-centered app, combining mobile and large-screen interfaces with existing landmarks and cutting-edge technologies like augmented reality (AR). Addressing the challenge of indoor navigation, the project incorporated techniques such as landmark identification, audio assistance, and augmented reality (AR) to create an intuitive and accessible application. This paper discusses the design and development process, emphasizing the importance of user-centered design and technological innovation in educational settings.

Author Keywords
User-centered design, Campus navigation, Augmented reality, Indoor navigation.

INTRODUCTION

The rapid evolution of digital technology has significantly influenced how individuals interact with physical spaces, especially within educational institutions. Despite these advancements, navigating the indoor environments of university campuses remains a daunting task for many. As easy it is to get aid in outdoor navigation, it is entirely dependent on the user himself for indoor navigation. This paper delves into the "Find my Way - Dal" project, an initiative aimed at revolutionizing the way Dalhousie University students navigate through the complexities of their campus. Focused primarily on enhancing the indoor navigation experience, this project seeks to mitigate familiar challenges encountered by students, such as locating specific rooms, facilities, and events within the vast and sometimes labyrinthine campus buildings.

The purpose of this project is twofold: firstly, to identify and understand the key navigation challenges faced by students, particularly in indoor settings; and secondly, to develop a user-centered navigation solution that integrates innovative technology with the existing campus infrastructure. This involves a comprehensive process of gathering insights through surveys and interviews with students, analyzing their navigation behaviours and preferences, and exploring potential technological interventions such as augmented reality (AR), mobile applications, and large-screen interfaces. By leveraging landmarks and other familiar aspects of the campus environment, the project aims to create a seamless and intuitive navigation experience that is both accessible and informative.

The methodology adopted in this project is inherently user-centric, prioritizing the needs and feedback of the student body in every phase of development. The challenges associated with the existing approach are drawn out and then worked upon to improve them. The features to be improved are also known through user evaluation. This approach ensures that the solutions devised are not only practical but also aligned with the actual usage patterns and expectations of the end-users. Thus, by doing interviews and affinity diagrams, we decided to develop three features. The features we decided to work on were Visual Aid, Audio Aid in Indoor Navigation and AR Sign navigation for indoors. After the low-fidelity prototypes were developed, users were asked to evaluate for further improvements.

The culmination of this project is a navigation system that not only simplifies the task of finding one's way around the Dalhousie University campus but also makes the process more engaging and accessible for all users. By integrating user feedback and applying user-centered design principles throughout the development process, "Find my Way - Dal" stands as a testament to the power of technology and design in enhancing campus life. This paper outlines the journey from concept to realization, detailing the methodologies employed, the challenges overcome, and the key outcomes of the project.

BACKGROUND

The development of the "Find my Way - Dal" project is deeply rooted in the examination of prior research focused on enhancing navigation within university environments. This project draws upon the insights and methodologies from seminal works in the domain of mobile pedestrian navigation systems, indoor navigation design, and augmented reality applications to address the unique challenges of campus navigation at Dalhousie University.

The goal of our project aligns directly with the purpose of the paper "A recommendation for designing mobile pedestrian navigation system in university campuses" which underscores the importance of creating navigation solutions specifically for university campuses [1]. The recommendations regarding the use of visible landmarks and the importance of UI consistency with the real world have been particularly influential in shaping our approach to integrating visual aids into our navigation system. Furthermore, the exploration of novel location sensing techniques presented in this paper has inspired our endeavors to incorporate audio navigation aids, ensuring accuracy and user-friendliness in campus navigation.

The insights from the paper “Toward signing better maps for indoor navigation” into making indoor navigation more effective using visible landmarks, UI consistency, and simplified vertical navigation have been instrumental in the design of our indoor navigation system for Dalhousie University [2]. It explores the adaptation of outdoor navigation principles to indoor environments. The involvement of participants in their research process provided valuable lessons on engaging users for effective requirement gathering, an approach we adopted to better understand and meet the navigation needs of our target audience.

Profound perspectives on the role of audio assistance in enhancing navigation within complex indoor settings have been offered in the m paper “An Exploratory Study on the Usability and Features of Indoor Navigation Apps for the Blind and Visually Impaired” [3]. By illustrating how voice-guided navigation and auditory cues can simplify wayfinding in spaces like campus buildings, this work has significantly influenced our project. The emphasis on integrating contextual information and the adaptability of audio settings underscores the importance of creating a navigation system that is not only efficient but also customizable to fit the diverse needs of users. These principles have been fundamental in developing "Find My Way," ensuring that our navigation solution is both accessible and user-centered.

Together, these papers form the backbone of our research, providing a solid theoretical framework from which our project was conceived and developed. By leveraging the findings and recommendations from these studies, "Find My Way - Dal" aims to offer an innovative and comprehensive navigation system that addresses the multifaceted navigation challenges faced by university students, making campus navigation intuitive, efficient, and inclusive.

THE OBJECTIVES

The primary goal of the "Find My Way - Dal" project is to revolutionize the navigation experience within Dalhousie University's campus, making it more intuitive, accessible, and efficient for all users. Navigating the expansive and often complex indoor environments of university buildings poses a significant challenge for students, faculty, and visitors alike. Traditional navigation methods, such as static maps or basic digital guides, frequently fall short in addressing the dynamic nature of campus life and the diverse needs of the campus community. In response to this challenge, our project seeks to leverage advanced technologies and user-centered design principles to create a comprehensive navigation solution.

The project’s main objective is to develop a system where indoor navigation is enhanced which simplifies the process of finding one’s way inside university buildings facilitating multi-story navigation. To prioritize the needs, preferences, and behaviours of the end-users in every phase is the end goal. This involves engaging with the target audience through interviews and surveys to gather insights and feedback. Moreover, accessibility and inclusivity are other important aspects. The system must be accessible to users with diverse needs which involves designing interfaces and navigation aids which are universally usable, promoting inclusivity within the campus community.

By enhancing the way individuals interact with their physical environment, the project not only aims to reduce the frustration and time wasted in searching for destinations but also seeks to create a more welcoming and inclusive campus atmosphere. Furthermore, the adoption of advanced technologies and a user-centered design approach sets a precedent for future developments in campus navigation and facilities management, potentially influencing broader applications in urban and complex indoor environments. Through this project, we aim to demonstrate that thoughtful application of technology and design can significantly improve everyday experiences, contributing to the well-being and satisfaction of the campus community.

THE DESIGN PROCESS - CONTEXTUAL INQUIRY PROCESS AND RESULTS

The design process for this project was iterative and user-centered, with a strong emphasis on understanding the actual needs of campus users. This approach was essential to developing a navigation system that is not only technologically advanced but also deeply aligned with the users it aims to serve, meet their needs and expectations, and solve the problems they currently face.

The Process

The process began with a contextual inquiry to gather detailed insights into the navigation challenges faced by individuals on the Dalhousie University campus. The contextual inquiry was designed to capture the nuanced experiences of students, faculty, and visitors as they navigate the campus, especially indoors. This qualitative research phase involved structured interviews and observations, focusing on how users interact with the physical environment and existing navigation aids. Interview participants were asked to imagine themselves in the scenarios developed and asked to relate them to similar kinds of situations they have been in such as finding a specific room in a building unfamiliar to the participant. Key themes for exploration included Landmark Identification and Markings, Indoor Navigation Challenges, and the Potential for Routing Preview. Scenarios were crafted around these themes to prompt discussion and reflection among participants. A group of 4 participants was selected to ensure a broad range of perspectives. The structured interview format allowed participants to share their experiences in a detailed and open-ended manner, focusing on specific scenarios that were

familiar to them. This approach ensured that the data collected was rich with insights into the real-world navigation challenges encountered on campus. This yielded several critical areas for design consideration:

Navigational Signs: Participants frequently relied on physical signage to navigate complex buildings but noted issues with visibility and consistency.

Audio Assistance: The inquiry revealed a strong interest in audio navigation aids, particularly for situations where visual attention is compromised (e.g., carrying heavy items) or for users with visual impairments.

Visual Aids: Participants expressed a preference for visual navigation aids, such as maps and directional signs, that are easily interpretable and accurately represent the physical environment. The design of the app's UI, therefore, focused on clarity, simplicity, and real-time updates to mirror the dynamic nature of campus life.

The inquiry not only informed the feature set of the app but also emphasized the need for a flexible, adaptive design capable of meeting diverse user needs. The insights led to the prioritization of features such as time-based highlighting in visual guides, personalized route planning, and the incorporation of AR for an enhanced navigation experience.

These design decisions can be justified as well. The app was designed to offer personalized navigation experiences, including time-based facility highlights, responding directly to the users' context and preferences identified during the inquiry. The decision to incorporate AR technology was justified by its potential to seamlessly integrate digital information with the physical world, making navigation more interactive and engaging. Developing a comprehensive audio guidance feature was driven by the need for accessibility and convenience, catering to users' preferences for hands-free navigation and supporting inclusivity.

RESULTS AND DISCUSSIONS

The application of these design decisions led to the development of a prototype that was tested with users, receiving positive feedback for its intuitive interface, the effectiveness of audio and AR features, and the personalized navigation experience. The contextual inquiry proved instrumental in aligning the design with user needs, the application offers a meaningful solution to campus navigation challenges. This process underscored the value of user-centered design in creating technology solutions that are both innovative and deeply relevant to the target user base.

The results from our contextual inquiry were meticulously analyzed using the Affinity Diagramming technique. Each interview response was considered for its relevance to designing a campus navigation app and was labeled on sticky notes. These labeled responses were then grouped based on common themes and characteristics. Through iterative discussions, the team organized these labels into coherent groups, eventually identifying nine major themes that were critical to understanding the campus navigation experience.

The main themes identified from the affinity diagram were Navigational Signs, Navigating with Google Maps, Application Usability, Personalized App Interface, Audio Assistance in Navigation, Visual Aids in Navigation, Issues in Traditional Methods, Accessible Navigation for Blind and Visually Impaired (BVI) Users, and Traditional Navigation Approach. Among these, three themes were prioritized for further investigation based on their direct relevance to enhancing indoor navigation: Navigational Signs, Audio Assistance in Navigation, and Visual Aids in Navigation.

The decision to focus on these three features was informed by a brainstorming session where the team sketched various ideas on how each feature could be implemented. For each theme, ten different sketches were drawn, reflecting diverse conceptualizations of how the feature could improve the navigation experience. After reviewing these sketches, the team selected the most promising concept for each theme and developed five variations of that concept. A final selection was made based on feasibility, potential impact on the user experience, and alignment with the project's goals.

Feature 1: Visual Guide (Time-based Highlighting) was chosen for its ability to dynamically highlight relevant locations based on the time of day, offering personalized guidance that aligns with users' immediate needs.

Feature 2: Indoor Navigation Using Audio Assistance was selected for its potential to provide clear, hands-free directions, making navigation more accessible, especially for users with visual impairments or when multitasking.

Feature 3: AR Campus Navigation via Signage Scanning was identified for its innovative use of AR technology to enhance traditional signage, providing an immersive navigation experience that leverages the physical environment.

The selection and refinement of these features underscore the project's commitment to a user-centered design approach. By grounding our design decisions in the real-world experiences and preferences of campus users, "Find my Way" aims to deliver a navigation solution that is not only technologically advanced but also deeply aligned with the needs of the community it serves.

PROTOTYPE EVALUATION

The Design Process

The development of the "Find my Way - Dal" application was meticulously guided by the principles of user-centered design, focusing specifically on the unique navigation challenges encountered by students at Dalhousie University. This journey began with the creation of a detailed persona, Abby, whose characteristics, and daily campus experiences

informed the core of our design decisions. Abby, a 21-year-old Mechanical Engineering student, embodies the diverse needs and frustrations of the campus community, from managing a tight schedule to dealing with the apprehension of adopting recent technologies.

Visual Guide (Time-Based Highlighting): Abby's task to find a quiet study room during her lunch break at the Killam Library was illustrated in a storyboard, highlighting how the time-based highlighting feature streamlines the search for an ideal study space.

Audio Guide (Audio Assistance): A scenario where Abby needs to find a hall while carrying refreshments for an event demonstrated the practicality of audio navigation assistance, emphasizing the feature's value in multitasking situations.

AR Navigation (Scanning Navigation Signs): Abby's rush to locate a workshop in the Goldberg Engineering Building, a scenario unfamiliar to her, highlighted the AR navigation feature's ability to guide users efficiently through complex indoor spaces.

These narrative tools, centered around Abby's persona, were instrumental in refining the design of the prototype. They ensured the features developed were technically innovative and responsive to the user base's needs.

The iterative design process, informed by Abby's persona and the scenarios crafted around her daily campus life, led to the creation of a prototype that was both innovative and closely aligned with user needs. Feedback from initial user tests and consultations with teaching assistants provided valuable insights, enabling further refinement of the application. This user-centric approach ensured the final design decisions—embodied in the features of Visual Guide, Audio Guide, and AR Navigation—were well-justified and grounded in enhancing the user experience for campus navigation.

By integrating advanced technologies in a manner that directly responds to the real-world challenges faced by students, the "Find my Way - Dal" project represents a significant step forward in the design of navigation systems, offering a model for how user-centered design can lead to meaningful technological solutions.

This comprehensive overview encapsulates the essence of our design process, from the inception of user-focused features to the realization of a prototype designed to make campus navigation an intuitive, efficient, and inclusive experience for all users.

THE PROTOTYPE

Our prototype for the "Find my Way - Dal" application was developed as a low-fidelity prototype (LFP) using the using Figma, a powerful design tool that supports collaborative creation of interactive and high-fidelity user interfaces. Our team harnessed Figma's capabilities to simulate the user experience of the app and to design the low-fidelity prototypes (LFP) for each feature, focusing on clarity, usability, and intuitive interaction. The LFP was structured to demonstrate the functionality of our three selected features, aiming to validate their efficacy in improving the navigation experience within Dalhousie University's campus.

The landing page is the user's first point of contact with the "Find my Way - Dal" app, presenting a clear and concise menu of the navigation features available (see Figure 1). This page is designed to quickly orient users like Abby, offering her a choice of navigation methods based on her current needs. This page presents three key features: Visual Guide, Audio Guide, and AR Sign Navigation, each accompanied by an informational icon for quick understanding.

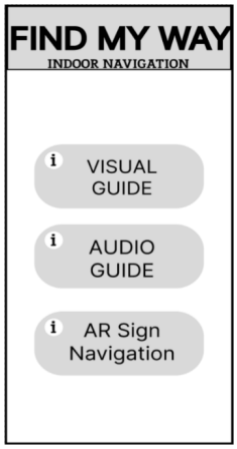

Figure 1: Landing page of Find My Way – Dal Application [4]

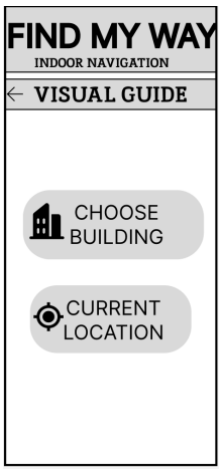

Figure 2: Feature 1 – Initiation step of indoor navigation [4]

Following the selection of a feature from the main landing page, the user is directed to an interface that furthers the navigation process (see Figure 2). This interface consists of

two prominent buttons: "Choose Building" and "Current Location."

The "Choose Building" option invites users to specify their navigation by selecting from a list of buildings on the Dalhousie University campus. It caters to users who are planning to visit a particular location and need precise directions. In contrast, the "Current Location" button caters to users seeking immediate information on their surroundings. When selected, it provides a real-time map view pinpointing the user's current location and highlighting facilities and points of interest in their immediate vicinity.

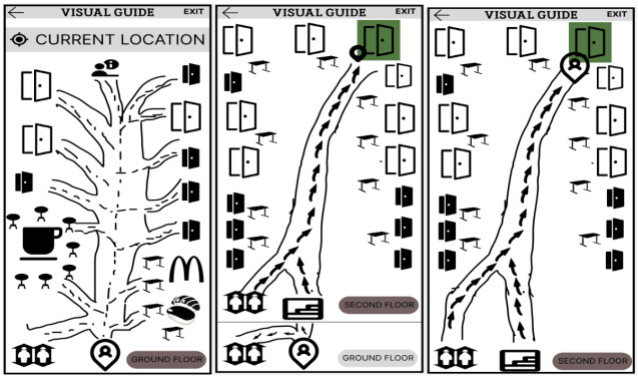

Figure 3: Feature 1- LFP Screens of Visual Guide Feature [4]

Visual Guide Feature the Visual Guide feature is designed to help users locate available study spaces in real time (see Figure 3). The sequence of screens demonstrates Abby's task to find a study room, highlighting the pathway and the rooms with the availability corresponding to the current time, making her search process straightforward and efficient. This feature employs time-based highlighting to provide users with real-time information on available study spaces, ensuring a seamless search experience.

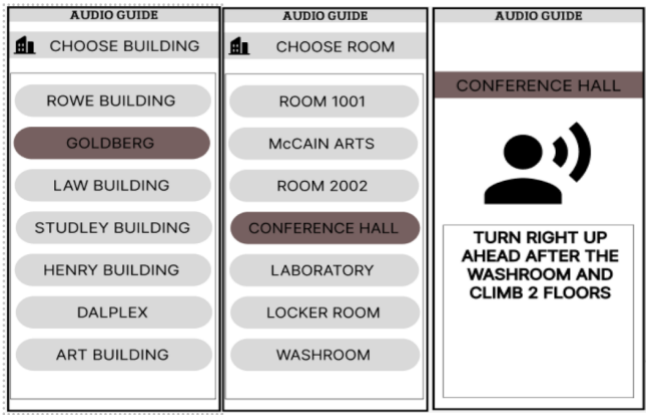

Figure 4: Feature 2- LFP Screens of Audio Guide Feature [4]

The Audio Guide feature provides a simple and accessible means for users to receive auditory navigation instructions. The Audio Guide feature offers a selection of campus locations through an easily navigable interface (see Figure 4). This set of screens highlights the flow from Once a destination like the "Conference Hall" is selected, Abby receives spoken directions that guide her to her target while allowing her hands to remain free, as depicted in the series of screens illustrating the feature.

The AR Sign Navigation feature introduces an augmented reality component, where users can scan physical navigation signs to receive overlaid directional cues on their device (see Figure 5). The AR Sign Navigation feature (see Figure 5) initiates with a simple interaction - scanning a navigation sign. The subsequent screens demonstrate the process where Abby enters her workshop destination and follows the AR overlays, which guide her through the physical environment to her destination with intuitive visual cues.

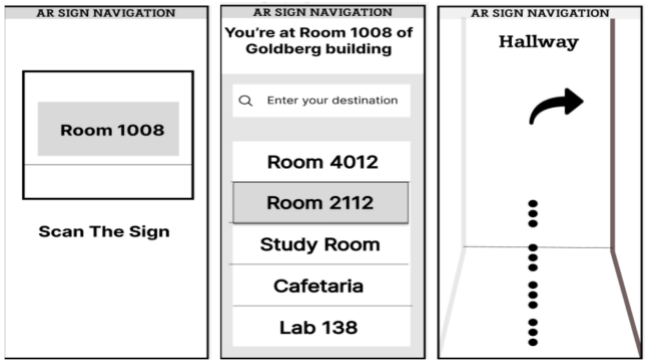

Figure 5: Feature 3- LFP Screens of Visual Guide Feature [4]

EVALUATION PROCESS – COGNITIVE WALKTHROUGH

To evaluate our prototype, we chose the cognitive walkthrough process, a method focused on stepping through the app's tasks to evaluate its usability from a new user's perspective.

The cognitive walkthrough for the "Find my Way -- Dal" app was carefully organized to assess its user-friendliness and intuitiveness. For this evaluation, we prepared a detailed Word document outlining each feature's task title and scenario, complemented by images of all low-fidelity prototype (LFP) screens relevant to the scenarios. Accompanying each image was a thorough description step of the actions a user would take on that specific screen, followed by a table (see Figure 6) for evaluators to record their insights. This setup aimed to closely simulate user interaction with the prototype, providing a clear sequence of actions and decisions through guided steps and evaluative questions.

Before beginning the evaluation, our team provided an informative introduction to the app, outlining its objectives, the functionality of each feature, and the context within which the app would operate. This preamble set the stage for a comprehensive understanding of the application's goals and the specific scenarios for each feature, thus ensuring that evaluators could simulate the user experience effectively.

Question	Yes (reason/s)	No (reason/s)	Maybe (reason/s)	Severity Rating (1-5)
Will the correct action be sufficiently evident to Abby? ("Know what to do?" -Will the Abby know what to do to achieve the task?)				
Will the Abby notice that the correct action is available? ("See how to do it" - Can users see the button or menu item that they should use for the next action? Is it apparent when needed?)				
Will the Abby associate and interpret the response from the action correctly ("Understand correct action/not correction" - will users know from the feedback that they have made a correct or incorrect choice of action?)				

Figure 6: Cognitive Walkthrough table

Our evaluators, taking on the role of a user named Abby, were tasked with navigating through the app's features based on the provided scenarios. They interacted with soft copies of the LFP screens and documented their actions and decisions in the provided tables. Each step required the evaluators to consider whether the correct action was evident, they could find the right options when they needed them and if the app's responses were clear and associated correctly with their actions.

Evaluators recorded their responses to questions on the app's clarity and findability by filling in the 'Yes,' 'No,' or 'Maybe' columns for each question in the table. The evaluators were asked to explain their reasoning for each response, detailing why they agreed or disagreed. For responses marked as 'No' or 'Maybe,' they provided reasons and suggested improvements. Additionally, they were asked to rate the severity column of each issue on a scale of 1 to 5, with 1 being the least critical and 5 indicating the most critical issue.

In our study, we had four evaluators who initially examined the app individually to provide unbiased feedback. Afterwards, they paired up, forming two teams, to discuss and agree on the most pressing issues. These significant issues were marked as 'must-fix' in the severity column – essential changes necessary to enhance the app's usability, not merely optional suggestions.

This structured approach allowed evaluators to thoroughly assess the user experience from the perspective of a typical user. The feedback gathered was instrumental in identifying any usability issues and informing the subsequent iterations of the app design. The cognitive walkthrough not only highlighted areas of success but also pinpointed aspects of the user interface that required enhancement, ensuring that the final product would meet the real-world needs of users like Abby.

RESULTS AND DISCUSSION

In our research, we carried out a cognitive walkthrough that helped us to see where users might have trouble with the "Find My Way - Dal" application. This process gave us clear feedback and resulted in a list of issues that users faced while interacting with the app. The main problems that came up are represented in a bar chart (Figure 7), which shows us the number of issues reported with respect to their frequency.

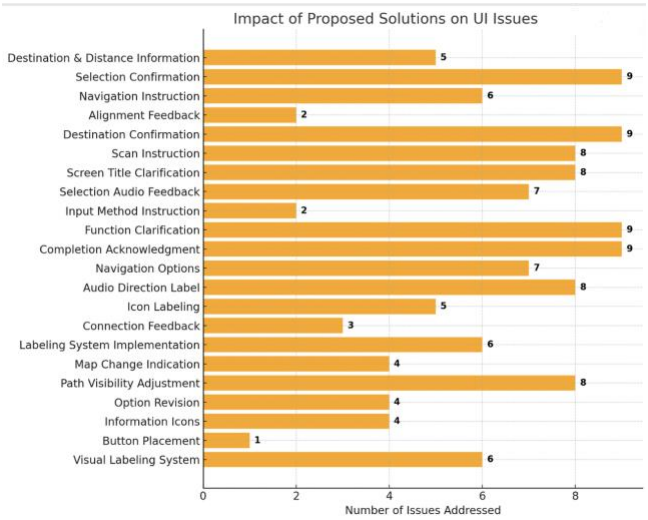

Figure 7: The Bar chart represents the issues in the application concerning their frequency [5]

Looking at this chart, we noticed that some solutions could make a significant difference. For instance, clearly labelling icons to show they can be clicked on or changing the placement of buttons to make them more visible are solutions that address several problems users were having. This is useful because it helps us decide which improvements to work on first to make the app better for users.

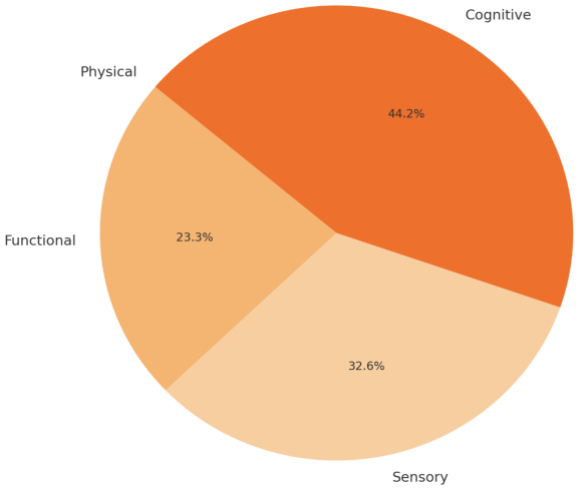

Figure 8: Pie chart showing the violation of affordances in the application [5]

Alongside this, we have a pie chart (see Figure 8) that illustrates the types of problems users encountered. From this chart, most issues were related to understanding how to use the app—these are called cognitive issues—and being able to see or hear cues in the app, which are sensory issues. So, we need to focus on making the app more straightforward and providing better visual and audio clues.

From there, we created a list of solutions for these problems. Some solutions include using boxes or highlighting to show what parts of the app can be clicked, adding messages to confirm when a user has done something like connect their phone, and making sure that when a user chooses a destination, the app lets them know they have selected the right place.

The information we got from this study, especially from the cost-importance table, helps us figure out the best way to fix these problems. It tells us how much it might cost to make these changes and how important each change is for making the app easier to use.

By considering the problems, the impact each one has, and how our solutions can make the app better, we can write a detailed plan for improving the app. The goal is to make it easier for everyone at Dalhousie University to find their way around.

CONCLUSIONS AND FUTURE WORK

In conclusion, this paper has presented the "Find My Way - Dal" project, which aims to revolutionize campus navigation through a user-centered design approach. Through iterative design iterations and user feedback, we have developed a prototype application equipped with innovative features tailored to address the specific navigation challenges faced by students.

Moving forward, several avenues for future work and improvement are worth considering. Firstly, continuous user testing and feedback collection will be essential to iteratively refine the app's usability and address emerging user needs. Additionally, exploring advanced technologies such as machine learning algorithms for personalized route recommendations and indoor positioning systems can further enhance the app's functionality and accuracy.

Furthermore, expanding the app's accessibility features to cater to users with diverse needs, such as those with visual or auditory impairments, is a crucial area for future development. By ensuring inclusivity and accessibility, the app can better serve the entire campus community and foster a more welcoming and accommodating environment.

Lastly, collaboration with campus stakeholders, including faculty, staff, and administration, can provide valuable insights and support for the integration of the app into campus operations and facilities management. By fostering partnerships and engagement across campus, we can maximize the impact of the "Find My Way - Dal" project and contribute to a more navigable and connected campus environment.

REFERENCES

1. T. S.-H. Wang, D. Tjondronegoro, M. Docherty, W. Song, and J. Fuglsang, “A recommendation for designing mobile pedestrian navigation system in university campuses,” in Proceedings of the 25th Australian Computer-Human Interaction Conference: Augmentation, Application, Innovation, Collaboration, 2013. https://doi.org/10.1145/2541016.2541039
2. A. Puikkonen, A.-H. Sarjanoja, M. Haveri, J. Huhtala, and J. Häkkilä, “Towards designing better maps for indoor navigation: Experiences from a case study,” in Proceedings of the 8th International Conference on Mobile and Ubiquitous Multimedia, 2009. https://doi.org/10.1145/1658550.1658566
3. P. K. Chelladurai, R. Milallos, R. Mathew, A. Nair, R. L. Peiris, and T. Oh, “An exploratory study on the usability and features of indoor navigation apps for the blind and visually impaired,” in Proceedings of the 2nd International Conference of the ACM Greek SIGCHI Chapter, 2023. https://dl.acm.org/doi/10.1145/3609987.3609998
4. “Figma: The Collaborative Interface Design Tool,” Figma. [Online]. Available: https://www.figma.com/.
5. Canva.com. [Online]. Available: https://www.canva.com/

PLAGIARISM STATEMENT - PERSONAL DECLARATION

"This paper constitutes original work by done by us. The paper consists entirely of ideas, observations, information, and conclusions composed by the group, except for statements contained within quotation marks and attributed to the best of the group's knowledge to their proper source in footnotes or references. Direct quotations make up a very small proportion of the text and are appropriately cited. Material paraphrased from a source (e.g., print sources, multimedia sources, web-based sources, course notes or personal interviews) has been clearly identified by a numerical reference citation (ACM or IEEE). All sources consulted and/or included in the report have been listed in the paper's Reference section. All drawings, diagrams, photos, maps, or other visual items derived from other sources have been identified by numerical reference citations in the caption. No part of the document has been submitted for any other course."

Names and Student Numbers of the group:
Kruti Panchal – B00930563
Princess Kachhadiya – B00969786
Vishesh Patel – B00965836

Date: 7th April, 2024.

Final Report Work Breakdown

	Name [add]	Lead	Reviews	Admin
M1	Vishesh Patel	• Abstract, Keywords, Introduction, Objectives, and Background (~2-2.5 page) • Overall Discussion, Conclusions + Future work (~1 page).	M2 section	Paper Merger [PM]
M2	Kruti Panchal	• Data Processing (contextual inquiry/interviews) Description (including process/methodology and results/ discussions) (~2 pages) • References - ensure references are included, are all correct and properly formatted (in the reference section and when citing in the paper)	M3 section	Paper Formatter [PM] Paper Editor 2 (PE2)
M3	Princess Kachhadiya	• Prototype Description (design process and prototype + Cognitive Walkthrough Methodology and results (~3-3.5 page)	M1 section	Paper Editor 1 (PE1)