Wayfinding Navigation System at the University of Virginia

Improving Accessibility through Wayfinding Applications

(STS Paper)

A Thesis Prospectus
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Accessibility, in its simplest form, is the practice of making activities, goods, and services easily available to all people, especially to those with disabilities. Many times, what we consider to be routine and simple day-to-day tasks are not always as easy as we believe them to be for individuals with disabilities. For such individuals, these tasks may be particularly demanding and require a considerable amount of effort and adaptation. Therefore, prioritizing accessibility in the design process of these activities, goods, and services with accessibility in mind is essential to ensure that there are no significant barriers to a certain group of people, and that everyone has equal access to the same opportunities (Gilbert, 2019).

The purpose of my technical project is to provide the University of Virginia with a better system of navigation and wayfinding throughout the grounds. Currently, there is no accessibility signage or a user-friendly navigation map to help individuals travel around campus. In addition to this, the accessible routes that the University of Virginia does have are often blocked by the unpredictable, constantly changing construction. Therefore, I will design a wayfinding application (specifically for those with disabilities) to help them feel more comfortable in navigating their environment. More about the structure of the technical project will be discussed later on.

My STS project will be diving deeper into existing wayfinding applications and how they can be improved to enhance accessibility, as well as exploring some specific technologies, such as iBeacon. As a broad overview, iBeacon is a product manufactured by Apple, and is a Bluetooth communication protocol. This protocol allows Bluetooth enabled devices to trigger certain actions once they are within the range of a “beacon”. There are certain accessibility

wayfinding applications which are attempting to utilize this tool, which will be discussed in depth later on.

This prospectus will delve deeper into the proposed steps and timeline of the technical project, and then go further into how the frameworks of technological determinism, social constructionism, and disability studies may have impacted the development of these applications and technologies. Additionally, the larger timeline of the technical project will also be mentioned.

Technical Project

As discussed previously, navigation is very difficult for people with visual and mobility disabilities. Specifically at the University of Virginia, the hilly terrain, lack of signage, and constantly changing construction make it particularly challenging for individuals with mobility disabilities. Wayfinding, more than just simple navigation, is an essential skill that gives independence and a strong sense of security within your surrounding environment. The ultimate goal is to improve the accessibility of the current campus and improve how easily individuals are able to travel the grounds using a wayfinding application specific to the University of Virginia. The larger timeline of the technical capstone project is as follows:

1. Research and collect background information on the history of wayfinding applications, what features they have, and how they have benefited or impacted the community.
2. Design a process to collect information about the existing accessibility features and barriers of designated spaces, and how that information can be used to design the current accessibility on UVA's campus.

3. Collect information about what barriers and features current students, faculty and staff with mobility disabilities would like to be informed of when traveling around campus.
4. Create wireframes and design a tool or application to improve wayfinding based on survey results and feedback.
5. Build the application (preferably integrating iBeacon technology) and improve the application design accordingly.

Note: For the purposes of this technical capstone project and given time constraints, the project will only cover the first three parts of the outlined steps.

University of Virginia's Student Disability Access Center is devoted to promoting access and inclusion for all students with disabilities across all the existing academic programs and the University's services (SDAC, 2023). The department has world hard to install accessibility ramps, buttons, etc. to automatically open large, heavy doors and is currently working on installing signings in both indoor and outdoor spaces to indicate where these ramps and automatic buttons are located. UVA's Geospatial Engineering Services has also provided and established maps of different parts of the University of Virginia's grounds to help users navigate and find accessible locations around grounds.

However, the map provided by the Geospatial Engineering Services only presents information that already exists on the University's website, such as accessible building entrances, accessible parking locations, barrier free routes, partial accessible routes, and some ADA buildings; it is not an interactive navigation system. Additionally, the current terminology used

is not clear; for example, routes can be ‘accessible’ or ‘partially accessible’, but there is no measure or clarification as to what the difference between the two levels is.

The project will require working closely with the Student Disability Access Center (SDAC), Geospatial Engineering Services, the UVA Provost Office, as well as UVA Facilities Management in order to design the wayfinding application and go beyond ADA accessibility standards. ADA simply provides a baseline for accessibility, but there is no guarantee that it covers all aspects of accessibility. Since accessibility requirements are always changing; striving for higher and better accessibility will improve overall user experience and attempt to innovate in anticipation of future changes, increasing inclusivity in the long term.

STS Topic

This STS paper will aim to find how existing wayfinding applications have helped to show clear, accessible routes for navigation, as well as how they can be improved to enhance accessibility. To do this, I will examine currently existing wayfinding and navigation apps and technologies, and then I will research the applications’ unique features, functionalities, and impact to determine which seem to be the most effective, and which can be improved. However, it is essential to understand why this topic is important.

Navigation is exceptionally difficult for people with certain visual or mobility disabilities. Many places in suburbs and cities do have many elevators, ramps, etc. both inside and outside buildings to help people get around. However, they sometimes lack physical signage or such to point them in the right direction. Wayfinding is incredibly important in order to allow people to get to know their surroundings, as well as to build a good sense of comfort and familiarity with their environment for all pedestrians, regardless of the level of disability. There already exist

some wayfinding applications that provide accessibility guidance on regular pathways and public transit routes. However, accessibility applications, tools, and data are not always available to the public and easy-to-use (Wheeler, 2020).

The STS frameworks I wish to include in this paper are technological determinism and social construction: the ideology that society grows and progresses because of technology and the ideology that society is what determines the growth and progression of technology, respectively (Mlblevins, 2015). This paper will show that, although technological determinism and social construction are ideologically opposing, they in fact co-exist in a sort of mutual, positive feedback loop; in other words, new technologies change society, and society gives 'feedback' on the technology, which is constantly being adapted based on what is more appropriate for the current state of society. Along with these frameworks, I will discuss disability studies, seeing as this study deals directly with building tools specifically for individuals who are disabled.

Some people believe that technology shapes the way society, while others say that society shapes what technology is developed. There are many historians that support both sides of this argument. By considering technology within a larger context, some historians try to understand how it is connected to society, economics, culture, and how it fits into our already existing system. Thinking about the cycle in this way implies that studying technology is not just about looking at the individual intentions of the technological invention itself, but rather understanding the entire system and relationships between us and existing technology. Other historians, however, consider this approach of a 'systematic view' to be inadmissible. Many historians and scholars say that each technology should be 'deterministic' or considered separately, as

introducing a new technology and adopting it sometimes can cause society to change entirely (i.e. introduction of interstate highways), rather than seamlessly fitting into existing society.

As my STS topic deals with building tools for a specific group, my research methods will consist of ethnography, as well as finding, reading, and synthesizing previous literature on this topic. I will be using ethnography as my main research method, as much of the technical project is a data collection process– the research method will involve identifying stakeholders, designing and conducting surveys, etc. My project will focus on individuals with mobility disabilities. Although there are individuals with visual and/or auditory impairments, wayfinding applications focus on navigation; therefore, mobility impairment is the most affected group.

Conclusion

This STS research paper will investigate how wayfinding applications improve accessibility and navigation. Through this investigation, there will be an increased awareness of the importance of accessibility in navigation and how to improve it. Additionally, this paper will also detail how society and technology simultaneously shape each other through specific examples related to accessibility. Specifically, phenomena such as the curb cut effect will be researched and applied to the proposed solution so that the solution may be applicable to a broader audience (Blackwell, 2023). Furthermore, I will explore existing solutions, the benefits and drawbacks of current features, and what features should be included in the proposed solution based on their impact.

Key Texts

There are several articles and texts that I will use to further research the question "How can existing wayfinding applications be improved to enhance accessibility?". The following are four examples of the texts that I will use:

Title: Wayfinding Tools for People With Visual Impairments in Real-World Settings: A Literature Review of Recent Studies

Author(s): Parker, Amy T.

Summary & Significance: This resource provides an overview of wayfinding applications in general. Out of the 35 studies reviewed, 33 were found to use 'smart devices' for the solutions; many of the successful studies used bluetooth low-energy beacon, LIDAR scannings, and other sensors. The article will provide insight into what specific functionalities and features of these apps are beneficial and what they lack, which will then be evaluated and discussed in the STS paper (Parker, 2021).

Title: Towards More Universal Wayfinding Technologies: Navigation Preferences Across Disabilities

Author(s): Gupta, Maya

Summary & Significance: This article goes into depth about how many of the existing wayfinding solutions are tailored towards one specific population, even though one person may be part of multiple different divisions of populations. For example, many elderly people may have both visual and auditory impairments, so navigational needs may be different for those in multiple populations. This will provide more information and guide the design of the technical

project to include features that are more inclusive of more populations, similar to the Curb Cut Effect (Gupta, 2020).

Title: Accessible Wayfinding and Navigation: A Systematic Mapping Study

Author: Prandi, Catia

Summary & Significance: This paper, as mentioned in the title, presents a systematic mapping study that aims to show various solutions to wayfinding navigation over the last decade and identify the challenges that must be addressed. It also discusses the accessibility features of these applications, as well as how accessible the applications themselves truly are, which will help identify how the technical project's proposed design can be electronically accessible as well (Prandi, 2021).

Title: A Mobile Indoor Positioning System Based on iBeacon Technology

Author: Fang, Cheng-Chung; Lai, Taipei; Lin, Xin-Yu; Ho, Te-Wei; Yen, Zui-Shen; Yang, Bey-Jing

Summary & Significance: This resource outlines how iBeacon specifically is used to create an indoor navigation system. Although it is not a navigation system, learning more about the setup and design of this positioning system may provide some valuable insight on how to integrate iBeacon technology into the technical project, as well as how it can be used to improve overall wayfinding applications as part of the STS paper (Xin-Yu, 2015).

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