Accessible Navigation Mapping: Supporting People with Mobility Disabilities for Wayfinding
(Technical Project)

Evaluating Campus Infrastructure: Assessing Prioritization of Disabled Communities in Universities Through Architecture
(STS Project)

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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

Although defined as the cognitive and physical process of navigating, wayfinding is more than just simply following a directional route. It is an essential skill that is interconnected with independence, quality of life, mental health, and economic prosperity (Parker et al., 2021). However, wayfinding is incredibly difficult when the terrain and infrastructures around you are not built to accommodate your wayfinding needs, especially for those with different forms of disabilities.

In 1990, the Americans with Disabilities Act (ADA) was passed, but the Standard of Accessible Design (SAD) wasn't added until a year later in 1991, which "set minimum requirements for state and local government, public, and commercial facilities," to be more accessible (Terndrup, 2021). However, the requirements in the original 1991 SAD had very limited requirements, such as requiring only one accessible door and route in the entire building. SAD continued to have updates on their requirements until the last update in 2010 (ADA Standards for Accessible Design Title III Regulation 28 CFR Part 36 (1991), 2014). Although all public buildings must comply with these newer ADA requirements, these standards do not create a truly accessible building for those with different forms of disabilities, specifically those with visual and/or mobility disabilities. In a survey of 554 participants, 20% said that they experience an accessibility barrier at least once a day (Piekarski, 2017). With more than 328 million Americans facing various forms of disability, these infrastructures in America are unacceptable, given that wayfinding is such an indispensable skill.

Wayfinding at college campuses can be particularly challenging for disabled students, faculty, and staff; campuses are often characterized by ongoing construction, heavy foot traffic on congested roads, and a majority of buildings constructed well before ADA regulations came

into effect. The University of Virginia is particularly inaccessible. UVA is a historical university with many buildings, such as the Academical Village, initially built between the 19th and early 20th centuries, long before the creation of the ADA (Brandt, 2020).

In hopes of creating a more accessible campus for those with mobility disabilities, my technical project will help create a wayfinding application to help students, faculty, and staff with mobility disabilities travel along certain areas at the University of Virginia. To create a truly accessible campus, we should look at other universities that fit this standard. My STS project will compare how the University of Virginia and the University of California Berkeley, two universities with similar terrain, can have vastly different accessible infrastructures. I plan to explore how infrastructure at colleges can represent the various prioritizations of their disabled students and faculty, and as a result, how these affect the visually and/or mobility disabled population at these schools. Although my technical project aims to solve the barriers of wayfinding at UVA, my STS project will delve into how infrastructure creates these barriers, how these barriers could be better addressed, and the impact of inaccessible infrastructure. Ultimately, my goal for both of these projects is to create a more accessible campus at the UVA for those with mobility disabilities.

Technical Topic

UVA's topography, lack of adequate signage, and constant construction present a challenge for individuals with mobility disabilities. The University of Virginia campus is constructed at the base of the Blue Ridge Mountains, resulting in the campus paths being mountainous with intricate, steep, and often confusing pathways. These steep and curvy paths are especially challenging for those who rely on manual or power wheelchairs, such roads require

more energy or labor to traverse. The size of these mobility devices also makes it difficult to clear these turns and curves, especially if there are other pedestrians on the same path.

The majority of the UVA campus lacks comprehensive mapping, directional guidance, and signage, making it challenging for all students and visitors, especially those with mobility impairments, to orient themselves and locate their destinations safely. In a study conducted by UC Irvine and the University of Maryland Baltimore County, 24 of 27 individuals of varying disabilities interviewed "emphasized landmarks as imperative aspects of navigation. In fact, many relied mainly on landmarks for orientation since effective navigation can be hindered by inaccessible signage and maps… rendering them unnavigable," (Gupta et al., 2020, p. 1). UVA's constant construction also creates a potential hazard for those with mobility disabilities. Construction typically results in roads and paths being blocked or redirected, which "causes the need to backtrack and find another accessible route, thus creating an extra burden," (Gupta et al., 2020, p. 6). All of these factors at the University of Virginia create a hostile environment for those with mobility disabilities to travel through.

To create an accessible campus that exceeds ADA standards for students, faculty, staff, and visitors, my team's goal is to help create a navigational app that will provide information about accessibility features in different buildings. This app will guide people with mobility disabilities along accessible routes indoors and outdoors by using iBeacon (low-energy Bluetooth) technology to provide real-time information and navigation to the users. However, in order to build an application that truly aims to be a resource for those with mobility disabilities at UVA, we need to designate what features we want to include. We then need to map the location of these features and routes. Therefore, my team's capstone project will focus on two parts within building this application:

1. Collecting information about what barriers and features current students, faculty, and staff with mobility disabilities would like to be informed of when traveling around campus in order to fit each individual's accessibility needs.
2. Designing a process to collect information about the existing accessibility features and barriers of designated spaces, and how that information can be used to design and improve current accessibility around grounds.

We intend to build upon the existing efforts and methodologies originally developed by Geospatial Engineering Services. UVA currently has a GES Interactive Visitor Map that was created to provide information about accessible routes on campus. However, this map was created with the intention of providing accessible route directions to visitors, thereby catering to visitor needs. Additionally, it does not provide real-time information and only shows paths for outdoor navigation. The current GES map is not comprehensive of the specific needs of students, faculty, and staff at the University. However, we hope to build off the GES Interactive Visitor Map's current technology in our barrier determination and mapping process.

One of our initial steps, following in-depth literature research, involves collaborating with Barbra Zunder, M.A., the director of UVA's Student Disability Access Center (SDAC) to survey the specific barriers and features that those with mobility disabilities at UVA would like to have information about. When designing for people with disabilities, it is essential we go beyond ADA accessibility standards to be more inclusive of individuals. Additionally, accessibility requirements are always changing; striving for higher and better accessibility can improve overall user experience and attempt to innovate to cover all aspects of accessibility.

Although our team is not creating the wayfinding app from start to finish, our work is foundational to this end product. Furthermore, our work will hopefully be adopted by the

Geospatial Engineering Services and expanded. Our team is solely focusing our mapping process on the buildings within the Engineering School, given our greater familiarity with these infrastructures. However, we hope that our work within the Engineering School's buildings can be expanded throughout the UVA campus in the future to create a truly accessible campus.

STS Topic

MY STS project will research how the infrastructures at college campuses in America, built in relatively hilly/ steep terrains, reflect the prioritization of the disabled populations at these institutions as either a priority or a secondary consideration. While most architects at these institutions may not intentionally design inaccessible buildings, the lack of mindfulness regarding accessibility and merely adhering to ADA regulations can inevitably lead to inaccessible structures. These infrastructures will without a doubt create challenges for students and faculty with mobility disabilities that have harmful impacts. In an interview with NBC News, Kyle Cox, a graduate student at Texas A&M who uses a wheelchair to travel through campus, stated that he "was trapped outside with sleet pelting him on an unseasonably frigid day in College Station. Building staff draped him in blankets and coats while they worked to free him from the handicap accessible lift designed to help disabled students access the building with ease." Cox then stated that this was not a standalone situation and that "problems like this do happen on campus and I end up missing class or getting there late even when I leave sometimes up to an hour before class to give myself enough time to make it," (Ali, 2020). Although the campus of Texas A&M complies with all ADA regulations, the campus still has many accessibility barriers that leave students like Kyle, to suffer its consequences (Texas A&M, n.d.).

While 13% of the United States population consists of people with disabilities, this population continues to be one of the most underrepresented populations in the country, especially in roles that require secondary education (Leppert, 2023). Wayfinding and accessible infrastructures is just one of "many systemic barriers and challenges for those with certain disabilities to obtain a degree," and enter different careers (Shasteen, 2022). As Winner states, "the technological deck has been stacked long in advance to favor certain social interests, and that some people were bound to receive a better hand than others," therefore, accessibility must be an intentional and prioritized part of the design process. These buildings therefore, are political in nature. Without prioritizing accessibility, the infrastructures colleges build are vastly catered to those without any disabilities, neglecting people with disabilities and enforcing this societal power dynamic.

Although the vast majority of colleges and universities do not have truly accessible infrastructure for those with mobility disabilities, there are colleges that do go above and beyond. It is clear these institutions are mindful of the needs of their disabled students and faculty and prioritize them, which is reflected in the designs and infrastructure in the campuses. UC Berkeley is widely recognized as one of the most accessible college campuses in America and the birthplace of the Disabilities Rights Movement (Where We Came From, n.d.). Although the campus has a similar terrain as the University of Virginia, the campus goes "beyond the government's baseline requisites regarding the physical accessibility of campuses," and provides many programs and resources for students with any form of disabilities (Najmabadi, 2012).

To begin researching the ways infrastructure at mountainous universities across America is political and reflects the prioritization of the disabled community, I will compare the University of Virginia to the University of California Berkeley. I plan on researching the

buildings that were built prior to the enactment of the ADA and those after to determine if these newer buildings only meet or exceed the standards of the ADA. I will also research how these older buildings are redesigned to meet current ADA requirements. To gain a better understanding of the accessibility within the architecture of these schools, I will conduct multiple interviews. First, I plan to contact both the UVA Office of the Architect and the Student Disability Access Center at UVA. Afterward, I will contact the Physical Access Compliance Manager at UC Berkeley. These interviews will allow me to gain a better understanding of how these schools design their campuses that reflect their prioritization of the disabled community at these schools.

Conclusion

Overall, the goal of both my technical and STS projects is to enhance accessibility at the University of Virginia for those with mobility disabilities through two different methods. One of these methods is forming a wayfinding resource/ application at UVA. My team will be creating a comprehensive list of current barriers and features/information for those with mobility disabilities at UVA. We will use that information to create a napping process that the subsequent capstone team and the Grounds and Environmental Services (GES) department can adopt for future expansion. In addition, my STS project findings will offer insights into how infrastructure reflects the prioritization of disabled populations at these institutions. These findings will hopefully inform future construction at UVA, providing a framework for buildings to be more accessible. Both of my technical and STS projects will present an opportunity for UVA to achieve more comprehensive accessibility.

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