



# WPI

## **Venice Without Obstacles: Analyzing Accessibility in Venice For Various Disabilities**

An Interdisciplinary Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in fulfillment of the requirements of the Degree of Bachelor of Science

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## **Abstract**

For this project, data was collected on the accessibility of bridges, water transportation, public establishments, and points of interest in Venice for people with a variety of disabilities, from mobility impairments to sight deficiencies. A website template was created that acts as a data repository for the accessibility data we collected that will be usable for people who have disabilities to plan their activities in Venice. This website includes an interactive map of the accessible islands via bridges and water transportation, as well as several maps of public points of interest and establishments on Giudecca. These deliverables focused on assisting people with disabilities when traveling in Venice and laid the foundation for extending accessibility practices in the city.

## Executive Summary

Venice is considered one of the most beautiful cities in the world with millions of people flocking to the city every year. However, many handicapped individuals may be deterred from visiting Venice because the ancient city of bridges and canals can be a bit daunting to navigate for people with various disabilities. While this may have been true in the past, the municipal government has made significant progress towards making Venice more accessible for people with disabilities. However there is currently no single online source that provides all of the accessibility information for Venice. What information exists is scattered across the internet. The goal of this project was to collect data on the various levels of accessibility in the city and to create a website that would serve as a data repository that can be used by an individual with disabilities to plan a trip to the city.

The team collected and organized accessibility data for a total of 450 bridges in the inner city and surrounding islands of Venice as well as the public water transportation service, which includes the vaporetti and motoscafi. The team updated the Venice Project Center (VPC) database with the collected accessibility data for each bridge. This data was used to create an interactive map that is presented on our [Venice Without Obstacles website](#). This interactive map can be used to search for specific bridges and islands throughout the city and includes filters for accessibility analyses. Using the website, the team was able to highlight the islands that were accessible by land and water transportation, as evident in the maps in Figures A, B, and C below.

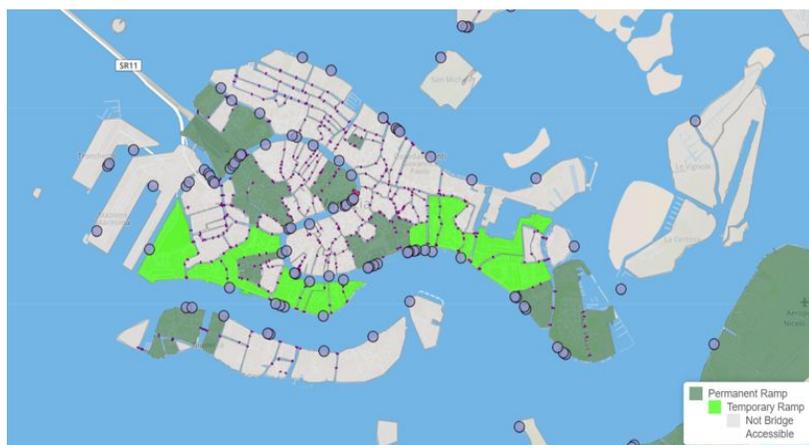


Figure A. Bridge Accessibility



Figure B. Boat Accessibility



Figure C. Total Accessibility

In Figure A, the islands are color-coded based upon the accessibility of bridges, with the darker green representing islands that are accessible by a bridge(s) with a permanent ramp and the lighter green representing islands that are accessible by a bridge(s) with a temporary ramp. In Figure B, the islands are color-coded based upon accessibility of water transportation, with the light blue islands being accessible by the motoscafi and the dark blue islands being accessible by the vaporetti. In Figure C, the total accessibility of the islands, with the combination of boat and bridge accessibility, is displayed.

The second and third objectives of our project focused on the collection and organization of data on public points of interest and establishments on the Giudecca islands. Points of interest comprised four churches, one museum and a number of public establishments including eleven restaurants and five hotels.

After organizing this data in the VPC database, the team generated maps, such as Figure D, to pinpoint the locations of accessible and inaccessible public establishments and points of interest on Giudecca.

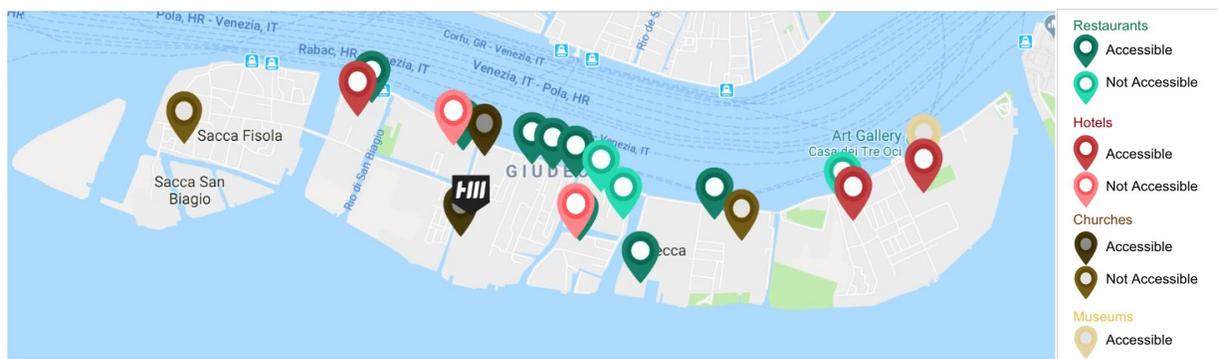


Figure D. Map of Establishments and Points of Interest on Giudecca

The fourth objective focused on developing an accessible website that would serve as a repository for all of the data that was collected and as a tool for people travelling with disabilities who are planning a trip to Venice. The website includes an interactive map with the locations of all of the bridges and vaporetto/motoscafo stops in the city with a filter for the different accessibility accommodations of the bridges, shown in Figure E. The map also contains a search bar where an individual can search for a specific island, bridge, or boat stop, also evident in Figure E. Furthermore, the website also includes maps created to display the locations of the accessible and inaccessible public points of interest and establishments on the Giudecca islands.



Figure E. Interactive Map Filter

Additionally, the website contains several other pages, such as an “Organizations” page which includes a list of all organizations that provide

accommodations for people with disabilities within and around Venice. Each organization has its own page that includes a brief description of the organization and its services, pictures and videos of these services, social media links, and contact information, as shown in Figure F. In addition to the “Organizations” page, there are pages that provide helpful

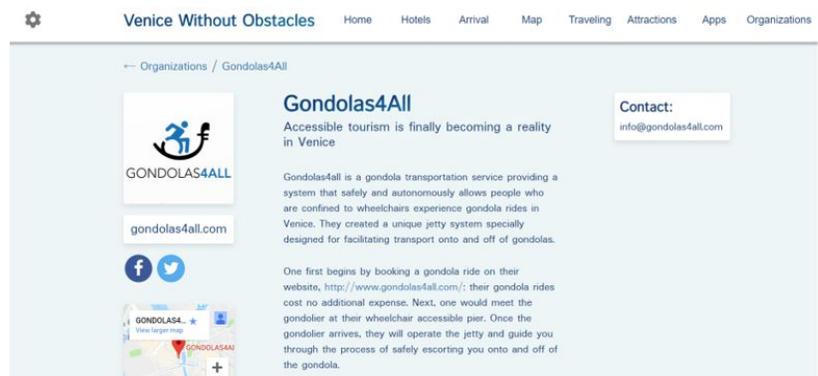


Figure F. Gondolas4All Organization Page

applications for people with sight impairments, arrival information, and additional information on accessible establishments in Venice that can be expanded upon in the future.

Through these objectives, this project produced a one-stop source through the [Venice Without Obstacles website](#) that provides information on accessibility accommodations for people with disabilities in Venice. The foundations have been laid for future teams to build upon the data collection of public establishment and points of interest for the rest of Venice, as well as having the ability to make additions and improvements to the website and interactive map. This project will inspire future teams to fulfill the overall goal of making Venice completely accessible for Venetians and tourists with mobility, sight, and hearing impairments.

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# Authorship Page

This paper was written in a combined group effort with each team member contributing an equal portion to the report. For a detailed breakdown of individual contribution, see below.

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**In Depth Research of Accommodations for Each Disability:** Eliana Abenante and Michael DiStefano

**In Depth Research of Accessibility of Venice Islands:** Eliana Abenante

**In Depth Research of Accessibility of Establishments:** Michael DiStefano

**In Depth Research of Accessibility of Points of Interest:** Stephanie Jones

**Research and Contact with Venice Organizations:** All

**Website Template Development:** Andrew DeRusha

**Maps Created for Public Establishments and Points of Interest:** Stephanie Jones, Eliana Abenante, and Michael DiStefano

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**Design of H3 Permanent Ramp:** Stephanie Jones

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# 1. Introduction

For those living with mobility or sensory impairments, finding fully accessible settings can be a difficult and frustrating task. In Europe, 16 million people suffer from mobility impairments and 3.1 million people possess sensory impairments (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005). Every impairment has a unique set of needs that requires accommodations when traveling and performing daily tasks. For instance, mobility impairments affect an individual's motor functions, people with these disabilities often use wheelchairs, canes, and crutches for assistance ("Module: Mobility Impairments," n.d.). Conversely, sensory impairments hinder one's senses and require walking sticks, braille, and hearing aids to function ("What's a Sensory Impairment," n.d.).

The community of people with disabilities has grown over the years to approximately 25% of the population of Italy. Since these people require more accommodations, it is essential for accessibility information to be readily available online. Currently, there is no single convenient source dedicated to providing information regarding the accessibility of public points of interest and establishments in Venice. Therefore, the team collected knowledge on current accommodations for people with accessibility issues as well as what can be improved throughout the city (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005).

Venetian institutions and private companies have enacted several initiatives to aid people with various disabilities. There are a number of water taxis that include hydraulic lifts in place of steps to assist people who are wheelchair-bound (Wheelchair Accessible Water Taxi Transfers in Venice Italy, n.d.). Installations of ramps on bridges have increased the level of accessibility between islands. While the city of Venice has made significant progress, there is no single source that compiles information on the accessibility of transportation, establishments, and public places of interest.

The goal of this project is to compile data on accessibility for people with mobility or sensory impairments in Venice to create sources that the public can use to locate relevant information on accessibility. The team will accomplish this goal by collecting and analyzing data on the accessibility of points of interest, public establishments, and methods of water transportation in Giudecca as well as the bridges throughout the inner city. The team will use this data to design an accessible website that will present the information in an intuitive, organized and convenient way to the public by implementing a series of static and interactive maps.

## 2. Background

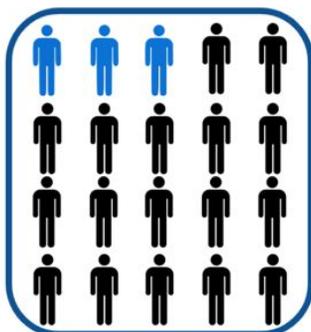


Figure 2.1 Fifteen Percent of the Population is Afflicted with a Disability

About 15% of the world’s population experiences some form of a disability. In Italy, an estimated 25% of the population possesses a form of impairment (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005). The city of Venice, with its ancient architecture, narrow pathways, and canals only passable by boat, can be challenging to navigate for those with physical or sensory impairments. Disabilities impact the lives of those living with them ranging from inconvenient to life changing, therefore, it is imperative that these people receive the required accommodations. However, different types of disabilities require different accommodations depending on the environment one is in. Boats,

bridges, establishments, and public points of interest have particular ways to go about accommodating their guests and patrons. While Venice is implementing initiatives to aid people with disabilities, there are complications in the construction and implementation of accommodations due to the historical significance of the city. All these factors create a complex environment where, if not studied and analyzed properly, people with disabilities could potentially suffer at the hands of stagnation and inactivity.

### 2.1 Disabilities in Italy

In Italy, 25% of the population has a form of a disability with about six and a half percent between the ages of 16 and 64 and 18% over the age of 65. In addition to this population, 61% of families are affected by a relative with a disability (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005). Since disabilities affect such a large portion of the Italian population, this raises the need for research on types of accommodations that are required for people with motor and sensory impairments.

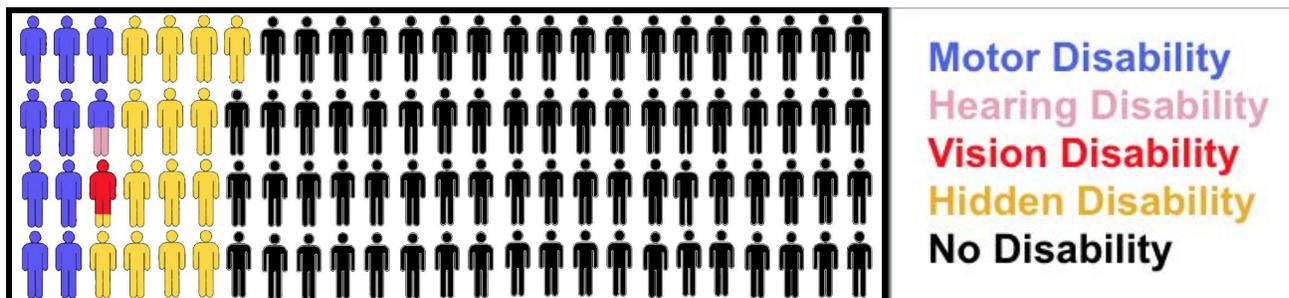


Figure 2.2 Twenty-five Percent of the Italian Population Experiences a Disability

## 2.1.1 Disabilities Affecting Italians

Disabilities are affecting 13.5 million Italians in various levels of severity, and that population is continuing to increase as time progresses. Motor and sensory impairments are types of disabilities that directly impact the lives of those suffering with them.

A motor impairment reduces the functionality of a body part, particularly the limbs. In the year 2005, there were about 981,500 Italian residents who suffered a mobility related impairment, which is equivalent to about 38% of the disabled population aged 16 to 64. Common difficulties of motor impairments include muscle weakness, poor stamina, lack of muscle control, or total paralysis (Disabled World, 2015).

Sensory impairments affect the functionality of one's sight and hearing (What is Sensory Impairment, n.d.). In the year 2005, there were about 89,500 Italian residents who suffered a sight related sensory impairment, which is equivalent to three and a half percent of the disabled population aged 16 to 64. Furthermore, there were about 43,500 Italian residents who suffered a hearing related sensory impairment, which is equivalent to a little under two percent of the disabled population aged 16 to 64. Common difficulties can include complete or partial deafness and blindness (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005).

Out of the 13.5 million Italians with disabilities, 11.3 million of them are over the age of 65 (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005). In Italy, the population of those 65 years and older is projected to increase by 23% by the year 2025 (Buhalis, D., Eichhorn, V., Michopoulou, E., & Miller, G., 2005). According to the United Nations Department of Economic and Social Affairs, "The global trends in aging populations and the higher risk of disability in older people are likely to lead to further increases in the population affected by disability" (Ageing and Disability, 2015). As the elderly population continues to grow, as seen in figure 2.3, the quantity of people with disabilities, both motor and sensory, will also grow. This growing population signifies the need for accommodations to ensure people with impairments receive an equal level of opportunity as though without disabilities ("Accommodations," n.d.).

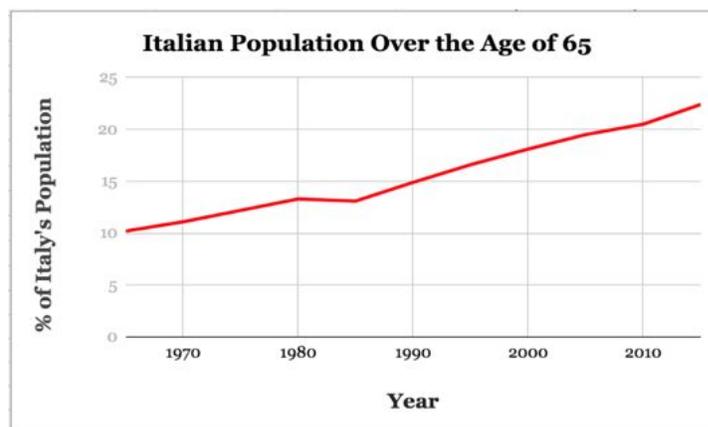


Figure 2.3 The Population of People Over 65 is Growing

## 2.1.2 Accommodating Disabilities

The U.S. Department of Health & Human Services defines accommodations as, “a means or method designed to assist users with disabilities in cases where the application is neither feasible, helpful or, in certain cases, practical” (HHS Office, & Digital Communications Division., 2015). Every disability requires its own set of accommodations to assist those who are afflicted. Motor impairments affect one’s ability to perform typically independent tasks, such as walking and standing. These types of afflictions have the potential of leading to discomfort, pain, and fatigue (“A to Z of Disabilities and Accommodations,” n.d.). Vision impairments affect how one acquires visual information, navigates environments, and uses the internet (“A to Z of Disabilities and Accommodations,” n.d.). Hearing impairments affect how one acquires auditory information, understands videos, and communicates to other people (“A to Z of Disabilities and Accommodations,” n.d.). Appendix A lists accommodations by impairments as defined by the Job Accommodation Network (JAN). While people with motor and sensory impairments require physical accommodations, there is also a need for technological assistance.

## 2.1.3 Designing Websites for People with Disabilities

Disabilities affect one’s ability to use the internet; only 39% of people with disabilities say they can use the internet “very well” compared to 65% of people without disabilities. (Anderson, M., & Perrin, A., 2017). The World Wide Web Consortium defines web accessibility as, “people with disabilities are able to perceive, understand, navigate and interact with the web” (Duverge, G., 2016). The American with Disabilities Act and The A11Y Project provide guidelines on how websites incorporate accessible practices into their design to make them accessible to people with disabilities shown in Figure 2.1 (“Project Civic Access toolkit, Chapter 5: Website Accessibility Under Title II of the ADA,” 2007; “The A11Y Project,” n.d.).

| Type of Disability | Accommodation  |
|--------------------|--|
| Motor impairments  | <ul style="list-style-type: none"><li>● Limit mouse movement</li><li>● Provide alternative ways to navigate a site</li><li>● Use tab button to sequence through elements on a page</li><li>● Use arrow keys to allow scrolling through a page</li><li>● Use enter button to act as a mouse click</li><li>● Items hovered over expand to create a larger area to select</li></ul> |
| Visual impairments | <ul style="list-style-type: none"><li>● Alter the size and contrast of elements to enhance and distinguish one another</li></ul>   |

|                      |   |
|----------------------|---|
|                      | <ul style="list-style-type: none"> <li>● Combine symbols and colors to convey information</li> <li>● Use colorblind friendly layouts</li> <li>● Provide text readers and audio queues for elements on web page</li> </ul> |
| Auditory impairments | <ul style="list-style-type: none"> <li>● Usage of videos are minimized</li> <li>● Include captions and transcripts when using videos</li> <li>● Allow volume and pitch customization through an audio adjuster</li> </ul> |

Figure 2.4 ADA and A11Y Accommodations

User and task analysis aid in identifying these accessible practices and other website accommodations. User and task analysis are common practices used in the field of Human Computer Interaction to gauge the usability and flow of a user interface (Toro, 2018; “Task analysis.” n.d.). The objective of user analysis is to learn about characteristics that influence how people use or interact with an interface. It allows designers to understand the users in order to build solutions to aid them in different scenarios (Toro, 2018). The objective of task analysis is to understand how users accomplish their goals, how they compare to other users, and the solutions that are successful and unsuccessful in practice. Ultimately, task analysis allows designers to design a flow that achieves the user’s end goals (Toro, 2018).

These analyses serve as valuable tools to access services for disabled people by discussing their problems and providing aid (“Task analysis.” n.d.). Together, they improve the accessibility of websites, as well as existing locations, by providing developers with the opportunity to understand user feedback to develop accommodations that improve the user’s experience.

## 2.2 Accessibility to Venice Islands

This section examines the current accessibility of water transportation and bridges throughout the Venetian islands. The inner city of Venice is made up of 126 islands and 435 bridges. These islands are broken up into six *sestieri*, or districts, which are Cannaregio, Castello, San Marco, San Polo, Santa Croce, and Dorsoduro. Central Venice is divided by the largest waterway, the Grand Canal, and all the other islands are split by approximately 170 smaller canals. Since the islands can only be accessed by crossing bridges or using water transportation, it is important to analyze the types of transportation available to determine what is accessible for people with disabilities (“City Layout in Venice,” n.d.).

## 2.2.1 Accessibility by Water

The water buses, including the vaporetti and motoscafi, serve as Venice's main mode of public transportation. The vaporetti and motoscafi are operated by Azienda del Consorzio Trasporti Veneziano (ACTV), which is the public transportation authority in Venice. The fleet consists of 150 boats that operate 24 hours a day and go just about anywhere in Venice and its lagoon (Imboden, D., n.d.). These boats are accessible for people with disabilities as they tend to dock reasonably level with the platform of the boat stop. However, the vaporetti are more suitable for wheelchair-bound passengers because they are larger than the motoscafi. The vaporetti, as seen in Figure 2.5, have designated areas in the passenger cabin for people with wheelchairs to remain during their trip, whereas the motoscafi do not have additional areas for people confounded to wheelchairs because they are smaller in size. Unlike the vaporetti, the motoscafi, as seen in Figure 2.6, have small flights of stairs, leading from their entrances to their passenger cabins, thus making them less accessible for wheelchair-bound passengers, as well.



Figure 2.5 Vaporetto



Figure 2.6 Motoscafo

There are several companies that operate water taxis throughout Venice which provide private transportation for people travelling from place to place around the city. Accessible water taxis have hydraulic lifts in place of steps, as most other taxis would have (“Wheelchair Accessible Water Taxi Transfers in Venice Italy,” n.d.). Getting around Venice can be extremely difficult when wheelchair bound, which makes water taxis an extremely important mode of transportation for disabled passengers since they can fit through several canals that the vaporetti cannot and make more islands accessible.

## 2.2.2 Accessibility by Bridges

Throughout Venice, there are 435 bridges that connect the islands of the inner city (“City Layout in Venice,” n.d.), as well as several bridges on the surrounding islands in the lagoon. There are several types of bridges including ones that are flat, have steps, or have permanent or

temporary ramps. There have been various past Venice projects that have worked on mapping the bridges and logging information on them. The 2013 “Canals, Bridges, and Urban Maintenance” project collected data on the location of every bridge in Venice and mapped them on a web application attached to the Venice Project Center website intended for boat drivers to determine which bridges are impassable. The 2015 “Venice Isles” project created a Geographic Information Systems (GIS), systems that display information through interactive maps, providing information regarding the locations of bridges and information on each bridge, including whether or not it is flat and how many steps it has. Although all the bridges have been mapped and have been detailed, data is missing on the most current state of accessibility of the bridges. This missing data includes whether or not the bridge has facilitated stair edging for people with visual impairments, temporary ramps, or tactile pavement to lead people who cannot see away from the canals and toward the bridges.

## **2.3 Accessibility of Establishments in Giudecca**

An accessible establishment refers to establishments whose information, travel to, entrance, and usage of facilities to their full extent can be performed by any individual (“Services and Facilities for Accessible Tourism in Europe,” 2007). Locating accessible establishments in Europe is an arduous task. The organization Member States of the European Union estimates one and a half percent of restaurants & catering facilities and six and a half percent of accommodation establishments are accessible to people using wheelchairs (“Services and Facilities for Accessible Tourism in Europe,” 2007). While the time and cost of creating a fully accessible establishment varies between establishments, gradually improving establishments’ accessibility can be achieved through site specific accommodations.

### **2.3.1 Restaurant and Bar Services and Accommodations**

Restaurants have a substantial number of accommodations to consider when serving people with mobility and sensory disabilities. To accommodate people with disabilities, restaurants must take into account how information is displayed and presented; menus and signs must be legible for those with poor or altered eyesight. The accessibility of the layout of their buildings, tables, and seating must be wide enough for wheelchairs passing through. Bathrooms must also be accessible to all patrons. Wait staff must also understand how to communicate with guests whose impairments affect their ability to communicate (Chan, W., & Puech, B., 2014; Schenkel, K., 2018; “Accessibility at Scandic,” n.d.; “Customers with Disabilities Mean Business,” n.d.).

Appendix B shows services and accommodations of 55 restaurants in Venice, based on information available online. Out of these restaurants, 34.5% were missing official websites to access the restaurants accessibility and only 16% mention accessibility at all.

The city of Amsterdam is taking steps making their restaurants more accessible. Restaurants in the city have started to requiring and installing accessible toilets, spacious dining areas, wide entrances, ramps, elevators, and platform lift (Prodromiti, S., 2018). Considering, “85 percent of the disability community won’t go out to eat, due to restaurants not being accessible, and the anxiety created when people fear how they’ll be treated or perceived,” Venetian restaurants following those in Amsterdam can not only increase the level of accessibility of their establishment but also gain the potential of creating a welcoming and comforting environment for people with disabilities (Friedman, D., 2016).

### **2.3.2 Hotel Services and Accommodations**

While hotels must enact similar accommodations as restaurants, their list of accommodations spans even greater due to their nature of providing accessible lodging to people this disabilities. Hotels can equip their guests’ rooms with accommodations pertaining to sleeping, bathrooms, showers, private toilets, and other miscellaneous living environments (“*Accessibility at Scandic*,” n.d.). These accommodations include, and are not limited to, “adjustable bed heights, lights able to be switched off from a wheelchair, accessible soap dispensers, towels reachable from a wheelchair, available shower stool, toilet paper holders on arm rest and on walls, wardrobe shelf can be reached from a wheelchair, and wardrobes with sliding doors or without doors” (“*Accessibility at Scandic*,” n.d.).

## **2.4 Accessibility of Points of Interest in Giudecca**

This section discusses the accessibility of public points of interest within Giudecca consisting of churches and one museum.

There are nine churches located on the islands of the Giudecca, only 2 of which have online information regarding accessibility for people with disabilities, evident in Appendix C. The online information for these churches include contact information, tourist reviews, and suggestions for those with cardiovascular and motor disabilities. For example, the website for the “Chiesa di Santa Croce” includes a customer review stating “Unfortunately not accessible” (Martin Kahle, n.d.). Lastly for the “Church of Santa Maria della Presentazione”, their website states “Visitors suffering of cardiovascular and motor diseases are strongly advised not to visit the museum” and “Visitors with disabilities willing to visit the Scala Contarini have to contact the booking office in advance” (“Accessibility and Regulations of the Visit - Hidden Jewels of

Venice,” n.d.). The remaining churches on the islands of Giudecca do not have websites or information on accessibility.

The one museum in the Giudecca, named Casa dei Tre Oci, states on its website that, “People with disabilities and 1 helper” are granted free admission into the museum. Besides ticket pricing, the museum’s website does not provide information regarding additional accommodations the museum offers for people with disabilities (“Tre Oci Information”, n.d.).

## **2.5 Accessibility Laws and Regulations**

Although it is easy for any individual to point out where places could be more accessible by simply adding certain modifications to buildings and other public areas in Venice, there are certain regulations regarding this in the city. In order to develop a clear understanding of accessibility in the city, it was important to explore Italian disability laws on accessibility and the regulations on modifications in Venice.

In 2007, Italy signed the Convention on the Rights of Persons with Disabilities (CRPD) that was created by the Directorate General for Development Cooperation (DGDC) (Directorate General for Development Cooperation, 2015). “The DGDC promotes and protects the rights of persons with disabilities in its initiatives with the aim to enable person with disabilities, on an equal basis with others, to access information, services, and facilities” (Italian Development Cooperation Disability Action Plan).

Italy established the Decree of the President of the Republic in 1996, which is the regulation containing rules for the elimination of architectural barriers in buildings, public spaces and services (“Decreto del Presidente della Repubblica 24 luglio 1996, n. 503,” n.d.). In this decree, Article 1 provides the definition of an architectural barrier, such as physical obstacles that are a source of discomfort or a safety issue for people with motor impairments and the lack of precautions and signals for visually and hearing impaired individuals. These rules apply to newly constructed buildings or public spaces, whether temporary or permanent, and to existing buildings or public spaces that lack accessibility or are being renovated.

In 2007, the Superintendence of Archaeology, Fine Arts and Landscape for the City of Venice and Lagoon became a member of the “Steering Committee” of the UNESCO site of “Venice and its Lagoon” (“Superintendence of Archeology, Fine Arts and Landscape for the City of Venice and Lagoon,” n.d.). This committee is responsible for the protection, enhancement and management of the site’s assets. The Committee has the authority to preserve and protect the site by “controlling building construction activities and territory management (maintenance and restoration of protected buildings – Restrictions – environmental and landscape modifications)” (Superintendence, 2016).

Even though Italian laws and regulations exist for regulating accessibility for newly constructed and existing buildings for people with disabilities, the Superintendence of

Archaeology, Fine Arts and Landscape for the City of Venice and Lagoon has the power to restrict and limit modifications and other construction activities based on the determination of a location's historical or cultural significance. Establishments or points of interest may not be able to improve accessibility, by updating their architecture, due to the preservation policies enforced by the Superintendence of Venice.

## 2.6 Venice Initiatives Implemented

Despite the limitations of increasing the accessibility of Venice, currently several initiatives are working together to create a more accessible Venice. There have been companies dedicated to making water transportation more accessible, city initiatives to make bridges more accessible, and organizations that have implemented accessible options for establishments and points of interest within and outside the city.

Venice has made substantial progress in making their water transportation services more accessible for people with mobility impairments. People who are wheelchair bound can freely use the water buses and can even schedule water taxis with hydraulic lifts to take them through the narrow canals that weave between the islands of the inner city. Furthermore, gondola transportation is now a possibility for people with disabilities in Venice. Gondolas4all is a company that has created a unique jetty for lifting wheelchair-bound people on and off their gondolas. At this time, it is possible for any gondolier to operate and does not have require an extra fee. The machine also has the capabilities of day being adjusted for use by other boats such as water taxis and there is the possibility of there being more systems installed at other locations around the city. Their mission is to make the city more accessible because the degree to which a city is accessible to all people is an indicator of the quality of services provided at that particular location (City Layout in Venice," n.d.).



Figure 2.7 Gondolas4All's Unique Jetty System

In addition to improving water transportation accessibility, the city of Venice has taken measures to make more of the bridges accessible to people with impairments. Città per Tutti collaborated with the EBA Department for the Elimination of Architectural Barriers on the Accessible Venice project, which included the creation of more accessible bridges within the city. Città per tutti is an organization in Venice that provides information for locals and visitors on services provided for people with disabilities and provides updated information on public works implemented to improve accessibility in the city ("Città per tutti," 2018). While only certain bridges have been equipped with permanent ramps, many more, such as the Ponte della

Paglia, have been equipped with temporary ramps which work on bridges with very deep treads. The benefits of these ramps, in terms of accessibility, are they are modular ramps and are made of non slip materials. Other bridges, such as the Ponte dell'Accademia, have had no-slip stair edging added in contrasting colors to make them safer for the visually impaired (“Accessible Venice, Accessible Bridges,” n.d.). There has also been two types of tactile pavement introduced by the city council, blister masegni, or paving slabs, and raised bars. These architectural features warn people, with visual impairments, about their proximity to the water and guide the them to the nearest bridge (Imboden, D., n.d.). Tactile pavement was implemented in certain areas, such as on the end of streets that lead to open canals, as an experiment where it realized it was not needed by sight-impaired people.

The Azienda del Consorzio Trasporti Veneziano (ACTV) offers a one to seven day tourist travel card, allowing unlimited access to the city's water buses and wheelchair bound passengers can purchase a single-fare “disabled ticket,” valid for 75 minutes, with a assistant traveling for free (“Public Works, Tactile Pavements,” n.d.). More importantly, the vaporetto/motoscafo stops are accessible for people with mobility and visual impairments. The vaporetto/motoscafo stops contain ramps that allow entrance onto the stop from the island of departure and float, thus causing them to rise and lower with the changing tides. Since the vaporetto/motoscafo stops float, the vaporetti and motoscafi are accessible for people with mobility and visual impairments because the entrance of the boat is at the same level as the floating stops making for a flat transfer between the boat and the stop. It is also important to note that the vaporetti possess wide entrances to allow wheelchair-bound passengers to enter and exit the boat and offer designated areas where these passengers can remain during the duration of the trip (ACTV, n.d.).

The BlindWiki project was established for the Biennale di Venezia in 2017. It is a Venice audio network designed for use by sight-impaired and blind people to share their findings by posting sound recordings using their smartphones. People using the network can share experiences and stories of what they find that is interesting, but they can also use it to share and find information about difficulties and barriers throughout Venice. For example, someone could share on the network that they have walked to an opening leading to a canal adjacent to a bridge, or if there is a crowded or dangerous intersection in a particular location (BlindWiki, 2017).

Sanitrans is a transportation company that specializes in assisted transport services in Venice. The company offers several services relating to health and social transport and has multiple accessibility organizations within the company. In particular, there is the organization for people with disabilities for transportation from hotels, restaurants, museums, and other social locations within the city. There is also the organization of health services that provides transportation to health centers and the hospital as well as supplies walking aids for people who require them. Sanitrans employees are equipped with specialized training for dealing with emergencies involving unexpected weather impeding travel and medical emergencies (Sanitrans, n.d.).

Sala Blu is an accessibility organization provided by the Rete Ferroviaria Italiana (RFI), which is the company that owns and manages the Italian railway network. Sala Blu's purpose is to facilitate access to facilities and services in railway stations throughout the country for people with disabilities. Sala Blu ensures people with disabilities have access to information on available accessibility services and are able to book these services to accommodate their needs. Sala Blu also provides wheelchairs on demand and guidance in the station and to the customer's desired train. Furthermore, Sala Blu workers welcome their customers on board at arrival and guide them to the next train or to the station exit. Lastly, Sala Blu offers trolleys that can lift wheelchair-bound customers on and off of the train and also provide manual single-baggage trolleys free of charge to transport the customer's baggage to the next train or station exit (Sala Blu, n.d.)

Village for all is a non-profit accessible tourism organization whose objective is to allow everyone to experience the benefits of tourism throughout Italy. Village for all provides accessible tourism guides and operation manuals to inform people of accessible tourist facilities that offer accessible hospitality to their guests. To support their motto and mission of "Holidays for all!", Village for all is motivated to accommodate people with mobility, sensory, and hearing impairments by providing "right" and "reliable" information about accessible holiday destinations that best suit the customer's needs. The purpose of this information is to help the customer understand the extent to which he/she can be independent and autonomous during his/her stay in that accessible tourist destination (Village for all, 2018).

Tooteko is an organization that is making artwork and museums accessible to people who are visually impaired or blind by combining audio data and tactile exploration. Tooteko offers 3D scanning and printing, video mapping, video animations, and interactive media to provide the opportunity for people with visual impairments to experience and interact with artwork like never before. Also offering Augmented Reality, Virtual Reality and Mixed Reality services for museums and cultural institutions, Tooteko combines technology with visual, auditory, and sensory storytelling to transform cultural visits into digital experiences (Tooteko, n.d.).

## **2.7 Summary**

Accessibility is a key concern for anyone possessing a mobility, sensory, mental, or hidden impairment. Venice's geography can make accessing islands, sites, and establishments across Venice difficult for a person living with these forms of impairments. However, city-wide initiatives have implemented improvements to the accessibility and information of bridges, public establishments, points of interest, and methods of water transportation for people with motor, sensory, mental, and hidden impairments.

Another issue arises involving the confusion of keeping track of all the initiatives and existing accommodations Venice contains. There is no single location that provides all the accessibility information regarding accessible bridges, public establishments, points of interest,

and modes of water transportation throughout the city. This leads Venice's residents and guests scavenging a multitude of websites, forums, databases, sites and other resources to gather specific information they're looking for. All these resources can lead to "information overload" – that is presenting so much data that one is left confused and/or unable to accomplish the task they set out to accomplish ("Information Overload, Why it Matters and How to Combat It," 2018).

Due to the issues of the accessibility of Venice and information-overload, the goal of the project is to collect and analyze data on accessibility options for people with mobility, sensory, mental, and hidden impairments in Venice and to then present it in a single, coherent manner that the public can easily access to learn more about disability services and accommodations provided in Venice.

### **3. Methodology**

The goal of this project was to assist Venetians and tourists with disabilities by assessing the availability of information, identifying the accessibility of the islands of Giudecca, and determining other initiatives already in place. The goal was accomplished through the following objectives:

1. To determine which islands are accessible for people with mobility impairments.
2. To analyze the accessibility at public points of interest (churches and museums) on the Giudecca.
3. To analyze the accessibility at public establishments (restaurants and hotels) on the Giudecca.
4. To design an accessible website template that acts as a data repository and displays the data through a series of static and interactive maps.

This project focused on determining which islands were accessible for people with mobility and sensory impairments by analyzing the accessibility of the bridges and water transportation throughout the city of Venice. It also focused on analyzing the accessibility of establishments and public points of interest in Giudecca. By the end of the project, the team will produce an accessible website template for people with mobility, sight, and hearing impairments.

#### **3.1 Collecting and Analyzing Data on Accessibility between Each Island**

This section describes plan for the team to gather information on the accessibility of bridges and water transportation throughout the city. This information allowed the team to determine which islands were accessible for people with motor and sensory impairments.

##### **3.1.1 Gathering Information on Accessibility of Bridges**

The team first collected accessibility data on 450 bridges of the inner city islands and surrounding islands of Venice. The data points that were collected comprised the following:

- Presence of a temporary or permanent ramp
- Presence of no-slip stair edging
- Presence of contrasting stair-edge marking
- Presence of railings on one or both sides of bridge stairs
- Presence of railing on one or both sides of bridge ramps if applicable
- Presence of mooring steps or openings to canals
- Tactile pavement if applicable

- Whether or not the bridge is public or private

The team separated the bridges into the six *sestieri* or “districts” of Venice for organizational purposes. Next, the team utilized a combination of a physical map of the city, Google Maps, and the [Isolario Interattivo](#), an application developed by a 2015 “Venice Isles” IQP team. These tools were used for navigational purposes and allowed the team to determine the exact location of all the bridges.



Figure 3.1 Ponte Ognissanti

Upon arrival at a bridge, each member of the team acquired a specific role that was alternated on a daily basis.

These roles included a photographer, navigator, observer, and recorder. The navigator determined the location of each bridge, guided the team to the bridge, and marked off the location of the bridge on the map to keep track. The photographer took pictures of the bridge from several angles with an emphasis on the above mentioned data points we needed to collect, such as the picture shown in Figure 3.1. The observer made note of the name of the bridge and determined whether or not each bridge had the data points that we were collecting. The recorder wrote down each data point observed in a notebook and then copied all of the data into a Google spreadsheet.

Once the data was collected from all the bridges of the inner city of Venice, the team inputted the coordinates of each bridge, provided by the *Isolario Interattivo* application, into a GeoJSON. This GeoJSON, along with the Google spreadsheet containing the recorded data points of each bridge, was then used to create an interactive map of the bridges. The map possessed filters for each data point to display which bridges had accessibility features, if present, to aid in the analyzation of the islands that are accessible and the islands that are not.

### 3.1.2 Collecting Information on Accessible Water Transportation

To determine the islands that were accessible, the team also compiled data on the main form of public water transportation in Venice: the vaporetti. The team first travelled to one of the vaporetto boat stops to determine its accessibility. Photographs were taken of the ramp leading to the inside of the vaporetto stop as well as the vaporetto docking level with the stop, as evident in Figure 3.2 and Figure 3.3. The team also travelled to the Rialto boat terminal with a local Venetian who is confined to a wheelchair. Videos were taken of him entering the vaporetto stop

as well as him entering and exiting the vaporetto. Through these pictures and videos, it was determined that the boat stops are accessible.



Figure 3.2 Vaporetto/Motoscafo Stop Ramp



Figure 3.3 Entrance/exit of Motoscafo

Using Google Maps, the location of each boat stop was determined and the coordinates were inputted into a GeoJSON for the boat stops to be mapped. Once all of the coordinates were inputted into the GeoJSON, the bridges were mapped out alongside the vaporetto stops on the interactive map. With a visual on both the water transportation terminals and the accessible bridges, the team was able to determine which islands were completely accessible and which were not.

## **3.2 Collecting and Analyzing Data on Accommodations Within Giudecca**

The goal of this section is to outline how the team collected and analyzed data on the accessibility of public points of interest and establishments on the Giudecca.

### **3.2.1 Determining the Current State of Accessibility of Public Points of Interest on Giudecca**

This project focused on public points of interest in Giudecca which consisted of churches and a museum. The team visited four churches and the Casa Dei Tre Oci museum across the

Giudecca to determine the level of accessibility at each location. Data on the accessibility of churches and the museum included determining whether these points of interest had handicap accessible entrances/exits and interior doorways, handicap bathrooms, and elevators or stair lifts in case there were multiple levels. The team collected data on the accessibility of churches and the museum in two different ways. First, the team interviewed employees of these public points of interest, using the questions outlined in Appendix J for staff, on existing accommodations and the feasibility of additional accommodations. The second way the team gained a greater understanding of the accessibility of public points of interest was through observation. The team recorded whether each public point of interest possessed the following accommodations:

- Entrances/exits and interior doorways that are flat, ramped, or have wide doors
- Bathrooms that have grab bars, lower toilets, or wider stalls
- Elevator or stair lift if the point of interest has multiple levels
- Wide aisles and additional seating (churches)

This data was collected from each church and the museum and organized based on accessibility accommodations. The above mentioned accommodations were also photographed if they were present in each church or museum the team visited. In the case that a church did not have an available bathroom or there was not more than one level to the building, the data for that category was recorded as “null”. This collected data was then used for the team website, which includes maps of the accessible churches and museum on Giudecca and also lists and displays the available services and accommodations each church or the museum provides for visitors with disabilities, if applicable.

### **3.2.2 Determining the Current State of Accessibility of Public Establishments on Giudecca**

The public establishments this project focused on were restaurants and hotels. The accommodations the team analyzed at each restaurant included the presence of handicap accessible bathrooms, accessible entrances/exits, and interior doorways, which included the width of the doorways and the presence of a ramp. The accommodations the team analyzed at hotels included accessible entryways, height of the reception desk, the accommodations offered in accessible guest rooms, which includes handicap-accessible bathrooms, and the presence of an elevator or stair lift in the hotel if applicable.

### **3.2.2.1 Analyzing Accessibility of Restaurants**

The team visited restaurants across the Giudecca to determine the level of accessibility at each location. Accessibility data was collected was primarily collected through observation. The team recorded whether each restaurant possessed the following accommodations:

- Entrances/exits and interior doorways that are flat, ramped, or have wide doors
- Bathrooms that have grab bars, lower toilets, or wider stalls
- Wide pathways or seating areas with ample space for movement in a wheelchair

This data was then collected from each restaurant and organized based on accessibility accommodations. The above mentioned accommodations were photographed if they were present in each restaurant the team visited. This collected data was then used for the team website which includes a map of all accessible restaurants on the Giudecca and also lists and displays the available services and accommodations each restaurant provides for customers with disabilities, if applicable.

### **3.2.2.2 Analyzing Accessibility of Hotels**

The team visited hotels across the Giudecca to determine the level of accessibility at each location. Data on accessibility was collected in two different ways. First, the team traveled to the hotels to interview managers and staff members, using IRB approved questions located in Appendix J, to get a clear idea of the location's accessibility options. Collecting this data was crucial for identifying which services and accommodations were being offered for potential customers with disabilities who would like to stay in a hotel on the island. The second way the team gained a greater understanding of the accessibility of each hotel was through observation. For every hotel, not including AirBnBs and bed and breakfasts, the team visited on the Giudecca, the team recorded whether the hotel possessed the following accommodations:

- Entrances/exits and interior doorways that are flat, ramped, or have wide doors
- Bathrooms that have grab bars, lower toilets, or wider stalls
- Elevators or stair lifts
- Handicap accessible rooms

This data was then collected from each hotel and was organized based on accessibility accommodations. The above mentioned accommodations were photographed if they were present in each hotel the team visited. This collected data was then used for the team website which includes a map of all accessible hotels on the Giudecca and lists and displays the services and accommodations each hotel provides for guests with disabilities, if applicable.

### 3.3 Developing an Accessible Website

Once information on the accessibility of the islands was collected, the next step was theorizing, designing, and constructing a way to store and display the data and findings. To accomplish this, the team created the [Venice Without Obstacles website](#). The website serves as an online repository for storing and presenting accessibility data in a organized, detailed manner. The design, flow, and presentation of the website was structured specifically to assist tourists and Venetian residents who are living with disabilities with planning an obstacle free trip to Venice.

#### 3.3.1 Designing Process

Before starting to code the website, the team began by determining the users and beneficiaries of the website and the tasks they would perform while using the website. The identified users and beneficiaries were:

- Venetians and tourists with disabilities
- Family members of Venetians and tourists with disabilities
- Researchers analyzing the accessibility of Venice
- Venice organizations focused on accessibility
- Team sponsors
- Future IQP teams
- The Venice Project Center (VPC)

Each user has their own set of tasks and needs that impacted the design of the website. The website required a modern and visually appealing interface to grab the user’s attention and spark interest in exploring the site. Furthermore, the website must be able to accommodate users with motor, visual, and hearing impairments, and it must be built on a framework and stack to allow the VPC and future IQP teams access the website’s data and code for future updates and expansion.

After determining the needs of the users and beneficiaries listed, the team decided the most efficient method to convey the team’s findings to a user would be through a website focused on aiding a user in creating an obstacle free trip to Venice. Figure 3.4 lists the steps one would take for planning an accessible trip to Venice. The website was divided into pages, each addressing one aspect of planning an accessible trip. These included “Hotel”, “Arrival”, “Map”, “Traveling”, “Attractions”, “Applications”, and “Organizations” pages.

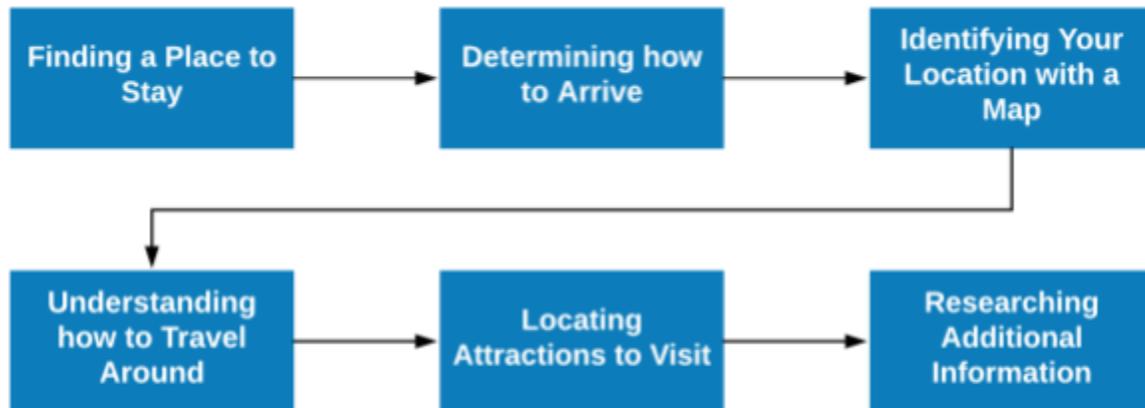


Figure 3.4 Trip Planning Process

The team had time to develop the “Map” and “Organizations” pages. The “Map” page includes an interactive map that provides the user with a geographic understanding of the accessibility of Venice’s islands by bridge and boat accessibility. This page gives a visual understanding of the user’s location and displays the options of accessible routes from where the user is currently located. The “Organizations” page displays the accessibility initiatives that these organizations have enacted to increase the overall accessibility in Venice. This page provides the user with additional people to connect with about further accessibility information and an opportunity to learn about and benefit from their services. The pages the team was not able to complete are sections where futures teams can expand upon and add their own accessibility data.

Once the team came to a consensus on what information belongs on the website, the next step was determining accommodations the website could provide for people with disabilities and developing a UI that was visually appealing that also provided those accommodations. The team decided to focus on accommodations that they believed they could implement given their skill sets. These accommodations included large elements to interact with for those with motor impairments, appropriate fonts and color schemes, and partial text to speech interactions and directions for those with visual impairments. The overall design of the website resulted from a series of prototypes and revisions, critiqued and improved upon, from the advice given by experts in disability accommodations prior to going abroad. The team collaborated with disability accommodation experts in Venice, such as Lucia Baracco, who was a member of Citta per tutti, and Andrea Toffanello, a SerenDPT Digital Designer and independent researcher focusing on information flow and display.

### **3.3.2 Determining Tools and Libraries**

Once the objectives and designs of the website were developed, the team researched tools and libraries which would aid in achieving those objectives and constructing its design. The benefits and drawbacks of application tools were considered, such as the language and language infrastructure, the integrated development environment (IDE), external or internal databases, geographic information systems (GIS), and existing external Javascript libraries. The decision of which tools and libraries to implement were determined by the team's current skill set and knowledge, tools familiar to the VPC and implemented by past IQP teams, and which tools offered the most in terms of helping achieve the website's objectives. Appendix L analyzes the tools and libraries the team decided on utilizing.

### **3.3.3 Constructing the Website**

The construction of the website began by determining the most valued information and functionalities to implement. Due to time limitations and only one team member being able to work on the website, the information and functionalities implemented were a modern and accessible UI providing graphical and verbal accommodations for people with disabilities, web pages detailing organizations working in and with Venice to increase the city's overall accessibility, and an interactive map presenting the team's analysis and findings on the accessibility of Venice.

Javascript, JQuery, HTML, and SCSS were used within a Ruby project to create the UI of the website. These languages ensured the creation of appropriate visuals and basic element functionality. External Javascripts libraries, such as Parallax.js and Bootstrap.js, were utilized to achieve a modern style for the website through motionless background images and carousels to store and present collections of images which provide visual information about the depicted subject. Additional guidance and assistance on more complex website interactions came from Nicola Musolino, a SerenDPT Full Stack Developer.

Impairment accommodations originated from independent team design choices, such as the color scheme, element sizes, and any additional Javascript libraries, such as Font-Awesome.css, Googleapi.css, and Responsivevoice.js. The color scheme of the website, blue and white, was decided based on colors people with color deficiencies view similarly and provide heavy contrast with one another. Figure 3.5 shows how various color impairments affect the way one perceives color. To accommodate people with motor impairments who's impairments make it difficult to select elements, interactive elements which become larger when hovered over with the cursor were appropriately sized and implemented in the website. Font-Awesome.css and Googleapi.css gave the team access to a collection of serif-sans fonts allowing for more readable text for those with vision impairments. Finally, Responsivevoice.js provided text to speech functionality allowing the website to present its information to a user

visually and auditorily; text to speech capabilities benefit those with partial vision loss.

Once the UI and accessibility accommodations were added, the next step was implementing sections dedicated to organizations and detailing their work in increasing the accessibility of Venice. Throughout the project, the team met with several organizations learning about their initiatives and goals for Venice. Once these meetings were completed, the team focused on adding each organization's goals, contact information, and ambitions on the website on individual HTML pages. This provided further exposure to all the organizations and their efforts. Each page contains images and videos displaying the initiatives of each organization. These images and videos were stored in a Bootstrap.js carousel with carousel controls allowing the user to select which image or video to focus on.

Finally, the basis for the website is to store all the data the team collected into the VPC's CK Database and present the data in a map. The map was created using the Leaflet.js Javascript library reading GeoJSON files generated from data stored in the CK database and loaded in the Leaflet map to create an interactive map featuring the accessibility of the geography of Venice.

GeoJSON files were generated for islands, bridges, and boat stop layers. The first step in creating the files was to input all of the data the team collected into spreadsheets for each layer. Data collected on bridges consisted of the bridge's name, district(s) it is located in, and whether or not it has a ramp, railings, slip stair edging, canal openings, tactile pavement, and if it was private or public. Boat stop data consisted of the stop's name and district of location. Island data was gathered from data collected from previous VPC IQP teams. The team added additional fields to the island data indicating the level of accessibility of each island.

These fields, and the data corresponding to them, were used to track whether the island was accessible through bridges, boat stops, neither or both. Each map element was also given geographical coordinates identifying where it is located on the map. The coordinates were gathered from existing data in the VPC's database; any coordinates that were missing were found through online research. Once the data was inputted in the spreadsheets, the team collaborated with other teams to create a Python script to read the spreadsheets converting the data into a GeoJSON format that the Leaflet map could read. From there, the team worked with Nicola to

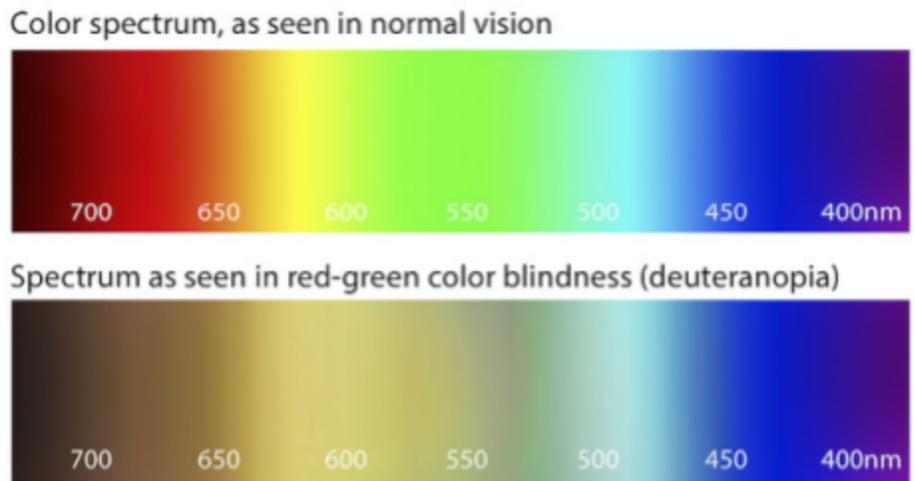


Figure 3.5 Colors affected by Color Blindness

input the files into the CK database and then have the website extract the GeoJSON files and input them into the map. Because the data is pulled from the CK database, rather than having a static file in the website, future teams are able to easily add to the CK database and the website will automatically update the GeoJSON files to include any new data.

When the GeoJSON files were completed, the team added them to the map and began working on additional features to increase the map's interactive functionality. These included manual zooming, auto zooming, element filtering, map coloring, a fuzzy search bar to locate elements, and description box for each bridge on the map. Manual and auto zooming capabilities allow a user to focus on a particular section of the map; these functions were provided by Leaflet.js. Filtering elements of the map gives the user the opportunity to view only the data that applies to what they are looking for. A custom algorithm combining Javascript and Leaflet's built-in filter functions was created to determine which elements should be filtered on the map. Map coloring was added to visually display which islands are accessible by bridges, boat stops, neither or both. A similar algorithm to the filtering feature was created to provide the coloring feature. A fuzzy search bar was implemented so that users can search for any element on the map by typing its name. As the user types, the search bar automatically presents a list of the most likely options the user might be searching for to reduce the amount of time spent on typing. When an option is selected, the map centers to where the element is located and highlights that element by placing a ring around it. This feature was created using Leaflet's search bar functions, Leaflet-search.js, and Fuse.js. Finally, when a user selects an element on the map, a custom description box appears on the right hand side of the screen. Created using dynamic Javascript and HTML, the description box presents images and general information about the selected element as well as the accessibility accommodations it provides. Due to time constraints, this option is only available for bridges.

## 4. Results and Analysis

This section provides a detailed synopsis of the results and methods of analysis for determining the accessibility of the Venice islands and public points of interest and establishments on the Giudecca. This section is organized by the objectives listed in the Methodology section of this report.

### 4.1 Determined Which Islands are Accessible for People with Mobility Impairments

The accessibility data that the team recorded for bridges and boat stops was inputted into the website to create an interactive accessibility map of Venice. The map included filters for the bridges based on the data points collected for each bridge. After filtering the bridges to show only the bridges with

ramps that can be crossed easily using a wheelchair and showing all the vaporetto boat stops, the team was able to determine which islands were accessible by bridge and by boat. Figures 4.1 and 4.2 are maps displaying islands that are color-coded based upon their accessibility by bridges or vaporetti and motoscafi.



Figure 4.1 Bridge Accessibility



Figure 4.2 Boat Accessibility

Once these filters were applied, the team was able to determine the level of total accessibility of each island as shown in Figure 4.3. With this filter, it was concluded that 70 percent of the islands of the inner city and surrounding lagoon islands were accessible by either a boat stop, accessible bridge, or both.



Figure 4.3 Total Accessibility

## 4.2 Analyzed the Accessibility at Public Points of Interest on the Giudecca

The data collected on churches and museums on the Giudecca islands were recorded in a GeoJSON. The locations of each church and museum were mapped and color-coded according to their accessibility as evident in Figures 4.4 and 4.5.



Figure 4.4 Map of Accessible Churches on Giudecca



Figure 4.5 Map of the Accessible Museum on Giudecca

The locations in red are the churches and museums that the team determined to be accessible after analyzing the data collected on the entrances/exits and interior doorways of the buildings, and the presence of elevators or stair lifts, if applicable. The locations in black are the churches and museums determined to be inaccessible. These maps facilitate the process of locating accessible public points of interest on the Giudecca and can be easily used by a traveller requiring additional information on these accessible churches and museums as well.

By using Giudecca as a test case for the collection of this type of accessibility data, the groundwork has been laid for future teams to continue this collection in other parts of Venice. When the data has been collected for public points of interest in other sestieri and then mapped, a more comprehensive analysis can be done on how accessible the attractions in Venice are and how further accessible the city is as a whole.

### 4.3 Analyzed the Accessibility of Public Establishments on the Giudecca

The team analyzed the recorded data to determine the restaurants and hotels that are accessible on the Giudecca. The analysis assisted the team in generating maps, located on the team’s *Venice Without Obstacles* website, to display the locations of accessible restaurants and hotels across the islands of the Giudecca.

#### 4.3.1 Accessible Restaurants on the Giudecca

The data collected on restaurants located on the Giudecca islands was recorded in a GeoJSON. The locations of the restaurants were mapped and color-coded according to their accessibility as evident in Figure 4.6.

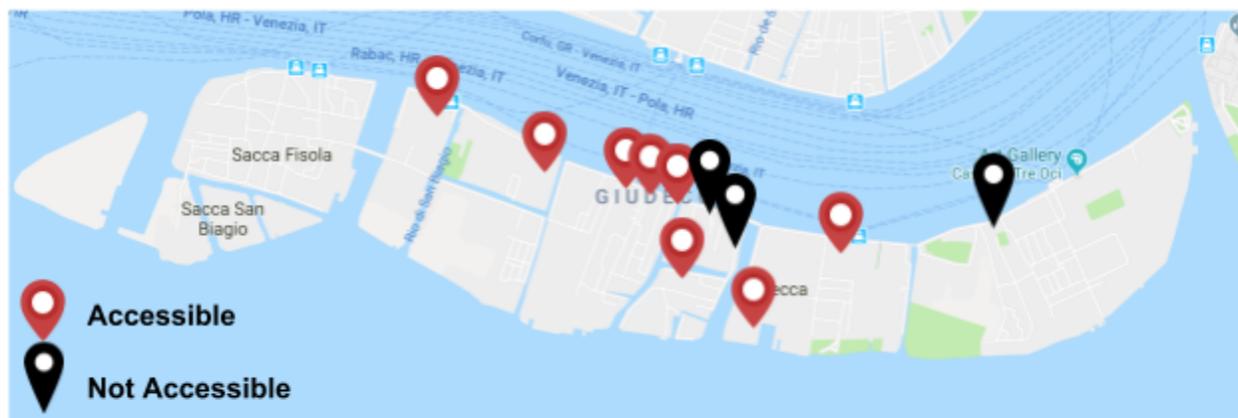


Figure 4.6 Map of Accessible Restaurants on Giudecca

The locations in red are the restaurants that the team determined to be accessible after analyzing the data collected on the entrances/exits and interior doorways, bathrooms, and space inside the restaurant. The locations in black are the restaurants determined to be inaccessible. These maps facilitate the process of locating accessible restaurants on the Giudecca and can be easily used by a traveller requiring additional information about these accessible restaurants as well.

### 4.3.2 Accessible Hotels on the Giudecca

The data collected on hotels located on the Giudecca islands was recorded in a Google spreadsheet. The locations of each hotel were mapped and color-coded according to their accessibility as evident in Figure 4.7.

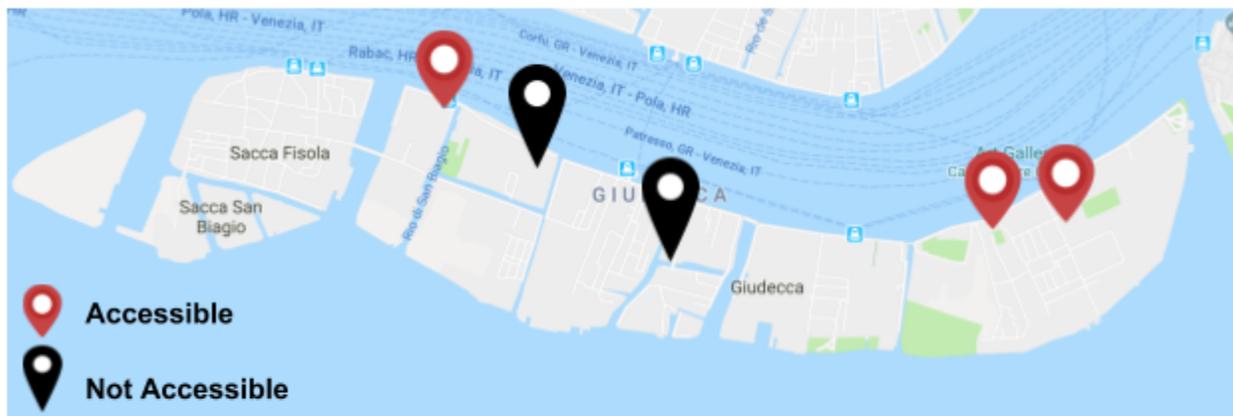


Figure 4.7 Map of Accessible Hotels on Giudecca

The locations in red are the hotels that the team determined to be accessible after analyzing the data collected on the entrances/exits and interior doorways of the buildings, bathrooms, lowered reception desks in the main lobby, and the presence of elevators or stair lifts, if applicable. The locations in black are the hotels determined to be inaccessible. These maps facilitate the process of locating accessible hotels on the Giudecca and can be easily used by a traveller requiring additional information about these accessible hotels as well.

## 4.4 Accessible Website Template

This section highlights the main elements of the [Venice Without Obstacles website](#). More specifically, this section details the features of the interactive map and the website components that provide the user with accessibility information in Venice.

### 4.4.1 Interactive Map

The interactive map serves as a tool for visualizing the accessibility of the islands by the different forms of transportation, with the potential to be expanded with the accessibility of public points within the islands.

### 4.4.1.1 User Features

The interactive map was created to be as user friendly as possible to make navigation simple for anyone to use. The key features of the map are outlined in figure 4.8.



Figure 4.8 Interactive Map Key Features

### Search Bar

The search bar allows the user to search for islands, boat stops, and bridges on the map by name. The search bar has an auto-complete feature which generates the most likely name that the user is searching for based on their inputted text. The search bar provides a drop-down list of the potential names of what the user is looking for, even if the element is not spelled correctly.

### Properties Filter

The properties filter allows a user to show and hide bridges based on their accessibility features. These features include the existence of ramps, additional hand railings, no-slip stair edging, canal openings, tactile pavement, and the ownership of the bridge. Upon deselecting a filter option, the bridge possessing that feature will disappear from the map. Figure 4.9 shows an image of the map when the permanent and temporary ramp filters are deselected.

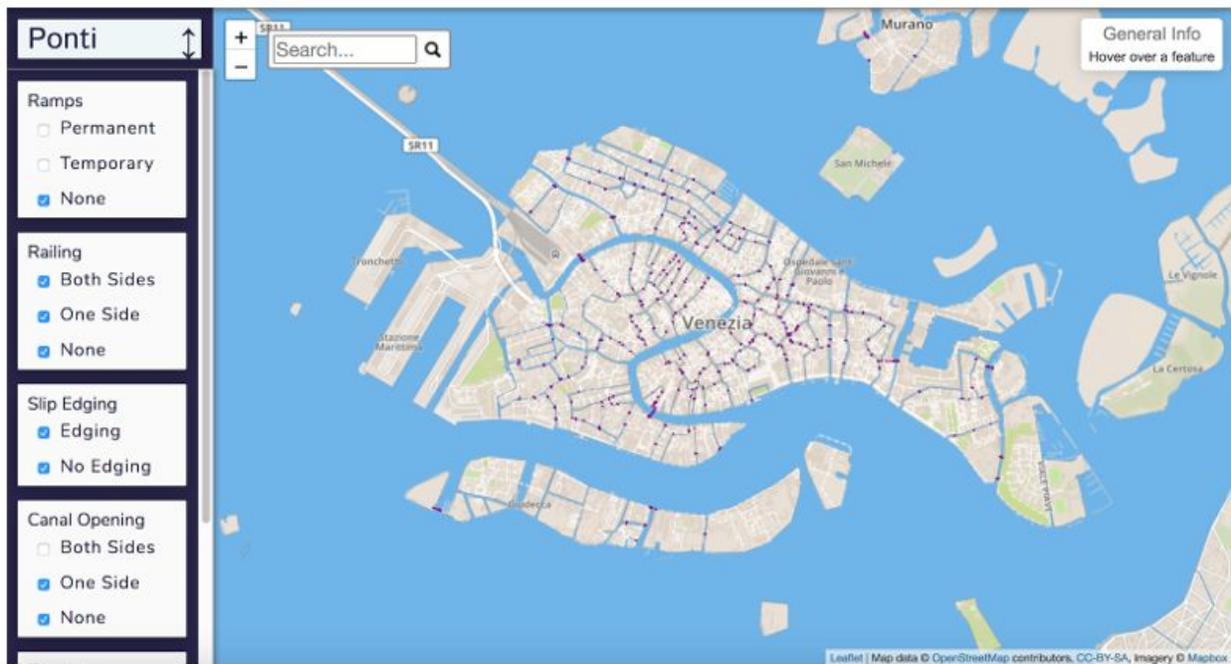


Figure 4.9 Bridges with Ramps Filtered Out

## Features Menu

The features menu allows the user to select different elements to view and filter, as shown in Figure 4.10. These elements include the Isles, the bridges, and the boat stops. After selecting one of these, the user can then use the filter to show the different visual properties of each element. Figure 4.11 shows the map with the Isles selected with the bridge accessibility filter selected.

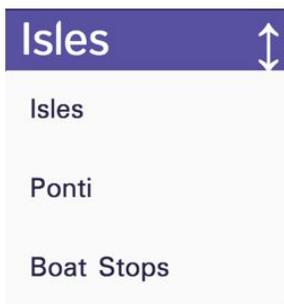


Figure 4.10 Drop-down Features



Figure 4.11 Isles Element with Bridges Feature

## General Information Box

The general information box provides the user with details about a selected element on the map. When a user hovers over an island or a boat stop with their cursor, the box shows the name of that location. The user can also click on a bridge to see additional information including all of its accessibility properties, any cautions to be aware of, and pictures of the bridge, as shown in Figure 4.12.

### 4.4.2 Home Page

The home screen, shown in figure 4.13, serves as the landing page of the website and is the first page a user visits. It is made simple and clear to draw the attention and interest of those entering the website. In the background, there is an active slideshow of images which fade in and out to transition to the next image. These images provide a user a preview of the topics one can learn about while exploring the website. Overlaid on top of the images is a text box containing text explaining the purpose and benefits of the website. There is also a “Getting Started” button which leads the user to the “Arrival” page. This provides guidance on where to start exploring the website.

The user also has the option to scroll down on the home page, or click on the background images which automatically scrolls down, to see additional content. This content, shown in figure 4.14, includes more text explaining the the purpose of the website and accessibility information regarding Venice.

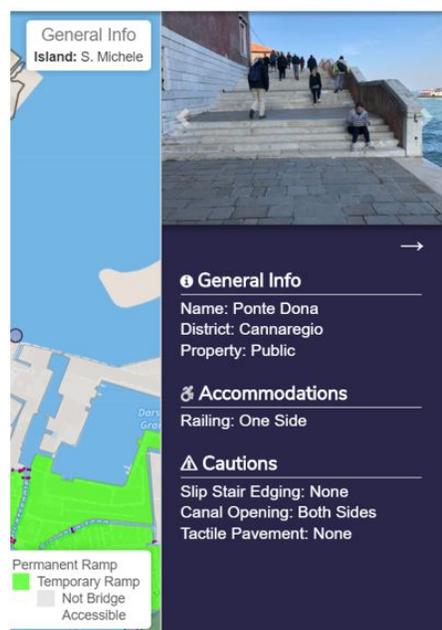


Figure 4.12 General Information for Ponte Dona

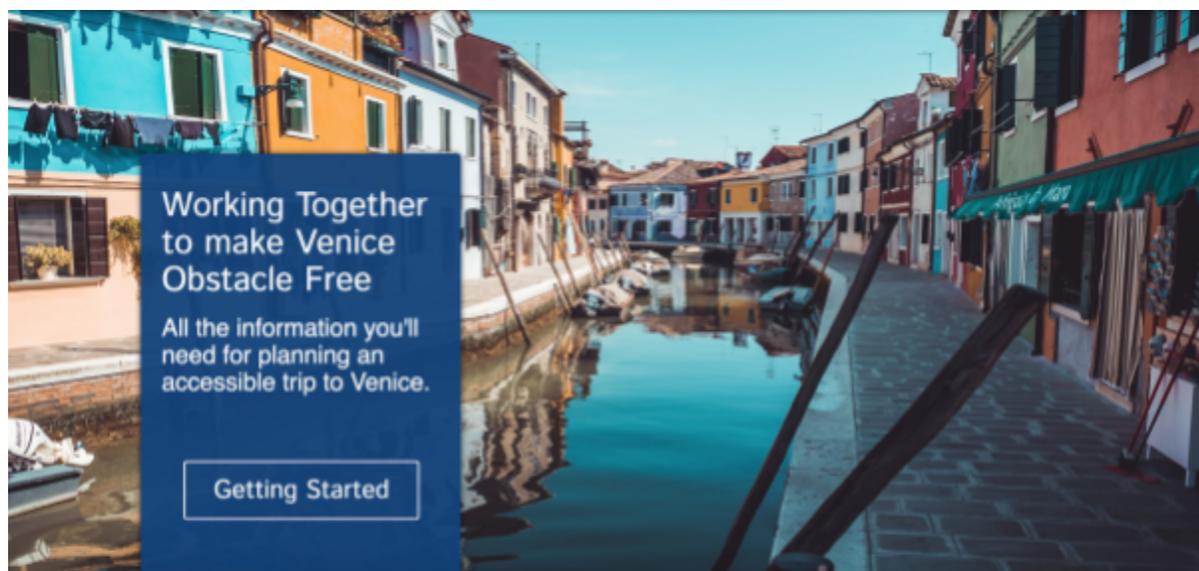


Figure 4.13 Venice Without Obstacles Home Page

With Venice consisting of 121 islands connected by 400+ bridges, it is easy to see how one could consider Venice inaccessible to those living with disabilities, and even easier to see why one living with a disability would be hesitant in planning a vacation there.

On top of that, considering where to stay, where to eat, and what activities to do that are all accessible takes valuable time and energy. Where does one start in finding all this information?




Venice without Obstacles gathers accessible information for creating a single, coherent source of accessibility information highlighting the most accessible aspects of Venice. Saving you all the hassle.

Working together with universities, organizations, and volunteers Venice Without Obstacles is constantly expanding making it easier for you to find exactly what you're looking for. Our mission is helping you locate any and all accessibility information you'll need to plan an accessible, obstacle free trip to Venice.

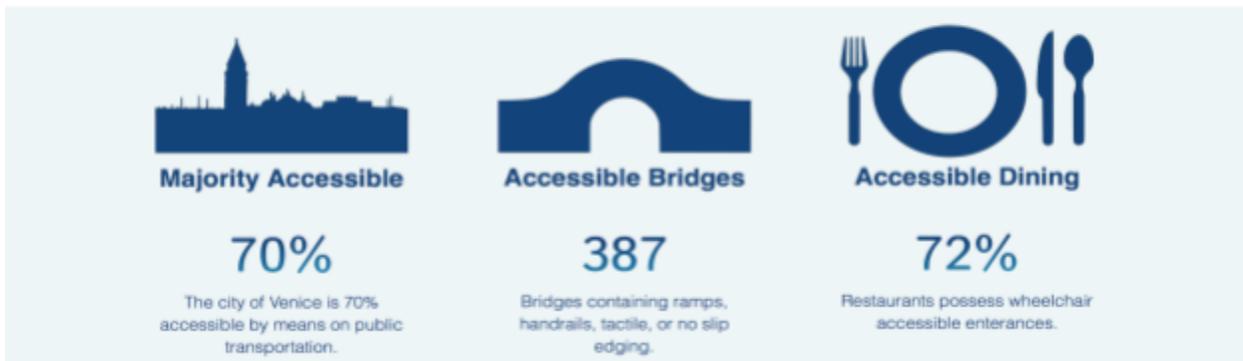


Figure 4.14 *Venice Without Obstacles* Home Page Extended

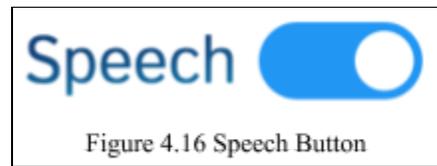
### 4.4.3 Navigation Menu

On the top of every page, there is the navigation menu, shown in figure 4.15. The navigation menu contains links to all the pages one can explore on the website and the settings button. The settings button opens the settings menu which contains the “Speech” option, shown in figure 4.16. The “Speech” option is a toggleable feature that turns on and off text to speech



Figure 4.15 *Venice Without Obstacles* Navigation Menu

capabilities. This text to speech capability allows users to hover over text and images to receive a voice reading the on screen text or a description of the image.



#### 4.4.4 Organizations Page

The Organizations page, shown in figure 4.17, lists all the organizations the team looked at while in Venice. The team examined how the organizations have increased Venice’s overall accessibility, how to get in contact with them, and if they had any additional plans for expand their initiative throughout Venice.

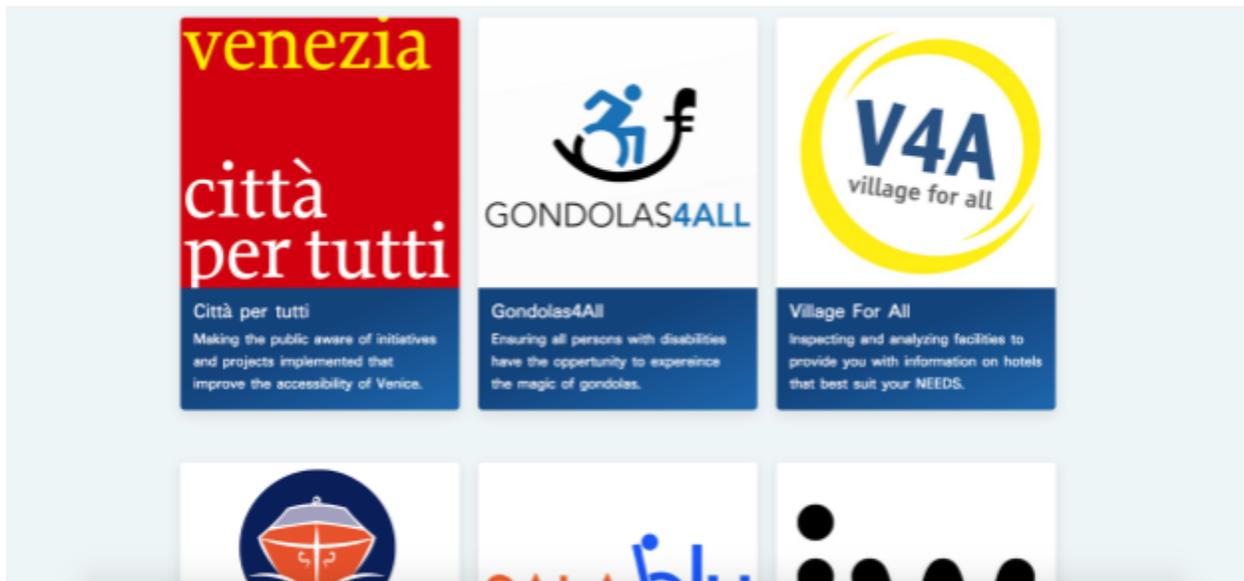
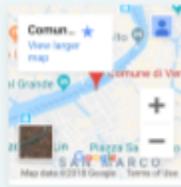


Figure 4.17 Organizations Page

When selecting an organization, the user enters a page highlighting the accessibility initiatives of that specific organization. The page includes a description of the organization, contact information, and a collection of images and videos showing what the organization has done in helping people with disabilities enjoy everything the city of Venice has to offer. An example of a specific organization page is shown in figure 4.18.



[comune.venezia.it](http://comune.venezia.it)



## Città per tutti

Providing citizens the information they need to gain access to council services.

Città per tutti is a city-based organization providing citizens and visitors with information needed to gain access to accessibility services as well as initiatives and projects that have been implemented to improve the accessibility within the city.

Città per tutti completed the Accessible Venice project that was aimed at increasing awareness of accessibility improvements that were established in the city. The Accessible Venice project details the public works and projects involving water transportation and bridges as well as produced "barrier-free itineraries" that provided suggestions for places to visit and the accessible routes people with disabilities could utilize to safely traverse the city.

### Contact:

+39- 041 965 5440  
[cittapertutti@comune.venezia.it](mailto:cittapertutti@comune.venezia.it)

Figure 4.18 Città per tutti Organization Page

## 5. Conclusions and Recommendations

This section details the project's outcomes, by highlighting how each project deliverable helped the team to achieve the goals outlined in the project's mission. This section also provides recommendations that will assist future teams with updating accessibility data the team collected and improving the accessibility features and functionalities of the *Venice Without Obstacles* website.

### 5.1 Project Outcomes

The mission of this project was to assist Venetians and tourists with disabilities by assessing the availability of accessibility information, identifying the accessibility of the islands and bridges of the city, identifying the accessibility of public points of interest and establishments on the Giudecca, and determining other accessibility initiatives that were already in place in Venice. These goals were successfully completed through the collection, organization, and publication of accessibility data and information pertaining to the islands and bridges throughout Venice, public points of interest such as churches and museums on the Giudecca, and public establishments such as restaurants and hotels on the Giudecca.

First, the team visited the bridges throughout the city and made observations, recorded accessibility data points, and analyzed the collected data points of each bridge to determine which bridges were accessible for people with disabilities. This data, along with bridge geographic coordinates obtained from the [Isolario Interattivo application](#), were inputted into a GeoJSON file that was used for the an interactive map. The interactive map displays the accessible features of each bridge using filters for each of the accessibility data points the team recorded, as outlined in our methodology section.

After the bridge data points and coordinates were inputted into our interactive map, the geographic coordinates of the city's boat stops, which were all accessible for people with disabilities, were inputted into our interactive map through the use of an additional GeoJSON file. With the addition of the boat stops to the interactive map, the team was able to display the accessibility of each island by color-coding the islands that were accessible by at least one bridge, vaporetti, motoscafi, or both the vaporetti and motoscafi. The objective of this map is to assist travellers with disabilities with planning routes for traversing Venice's inner city and surrounding islands in the lagoon.

The team also visited public points of interest, which were churches and museums, and public establishments, such as restaurants and hotels, throughout the Giudecca. The team practiced two approaches to collect data on public points of interest and public establishments. First, the team interviewed employees to understand the accessibility accommodations that public points of interest and establishments offered to visitors and customers with disabilities. In

addition to conducting interviews, the team collected data through observation and recorded the accessibility data points, outlined in our methodology, to determine whether each public point of interest and establishment was accessible for people with disabilities. The locations of accessible and inaccessible points of interest and establishments on the Giudecca were displayed using a series of static maps, evident in Figures 4.4 through 4.7.

The main project deliverable was our accessible [Venice Without Obstacles website](#). The purpose of this website is to serve as a central repository and to publicate all of the accessibility data the team collected on bridges throughout the city and public points of interest and establishments on the Giudecca. In order to publish the data, the team used an interactive map and a series of static maps. The interactive map was used to display accessible bridges as well as islands that are accessible by at least one accessible bridge, vaporetti, motoscafi, or both the vaporetti and motoscafi. The static maps were used to present the accessible and inaccessible public points of interest and establishments on the Giudecca. This website will inform people with disabilities about recommended accessible routes to use for travelling throughout the city and public points of interests and establishments they can visit, dine in, or book on the Giudecca, depending on the accommodations needed. This website will eliminate the hassle of performing numerous web searches and additional research to plan accessible travel routes and locate accessible points of interests and establishments in Venice. The website also provides information about organizations that assist people with disabilities throughout Venice. Each organization page contains a brief description of the services the organization provides, pictures and videos of these services, contact information such as a phone number or email, and links to the organization's Facebook, Twitter, or Instagram accounts. In addition to displaying the organization pages, the website informs users of helpful applications for people with visual impairments, information regarding accessible arrival options by plane, boat, car, or train, and additional information on accessible points of interest and establishments in Venice that can be expanded upon in the future.

The following two outcomes were additional mini projects the team brainstormed and accomplished successfully. We believed accomplishing these two projects would only strengthen our effort towards improving accessibility for people with disabilities in Venice, particularly those visiting or working in the H3 building. These projects included the implementation of a tactile map to assist people with visual impairments and the purchase of a temporary ramp to assist people with motor impairments, as well as a design for a permanent ramp. Ultimately, both of these outcomes have further improved the accessibility of the H3 building for people with motor and sensory impairments.

The tactile map, as seen in Figure 5.1, contains braille and QR codes that contain MP3 recordings, in addition to normal text, to help people with visual impairments learn more about the history and significance of the building. The tactile map, also shown in Figure 5.1, contains plans of the H3 building's three floors and the MP3 recordings to provide visitors with information about the history of the H3 building, the history of the Venice Project Center, and

information about SerenDPT. The braille text and recordings are in English and Italian since a majority of the visitors of the H3 building speak at least one of these two languages. The tactile map is an excellent mode of informing people, with or without visual impairments, of how the Venice Project Center and companies such as SerenDPT, both located in the H3 building, are benefiting Venetians and visitors of Venice on a daily basis.



Figure 5.1 Braille and Tactile Maps of H3

The team purchased a temporary ramp to assist people with motor impairments with entering and exiting the H3 building. It is important to note that the interior of the H3 building is accessible for people with motor impairments because it has elevators and wide doorways, however, has at least one step leading to both of its entrances/exits on the exterior of the building. To eliminate this barrier, the team purchased a temporary ramp that is lightweight, durable, and can be easily folded for storage, since the ramp will only be used when a person with a motor impairment would like to enter or exit the building. A permanent ramp was also designed with a six degree incline and steps available to the right for people who are not confined to wheelchairs. Both the temporary ramp and the design of the permanent ramp are shown in Figure 5.2.



Figure 5.2 Purchased Temporary Ramp, Permanent Ramp Drawn in Photoshop, Architectural Drawing of Permanent Ramp

## 5.2 Improvements to the Website

Throughout the project, the team only had one member working on the website. Due to time constraints, the team dedicated its time creating the overall UI of the website, the “Organizations” page, and an interactive map. While templates and areas for other pages were added, there still remained a large amount of the website where additional work is needed. Future teams could create these missing pages and expand upon the ideas and pages that already exist.

### 5.2.1 Fixing Bugs

There remains a few bugs in the website’s code that future teams could correct. One bug is a sizing problem with the navigation menu. When displayed on a projector or when the screen is not at its maximum width, the “Organizations” tab on the navigation menu and the “Settings” button are cut off. This happens because the width and spacing of the box containing all the navigation tabs is determined by the width on the screen. When the dimensions of the screen are not at maximum width or are distorted, which is a potential consequence of using a projector, the “margin-left” acts abnormally. An example of this bug is evident in Figure 5.3.

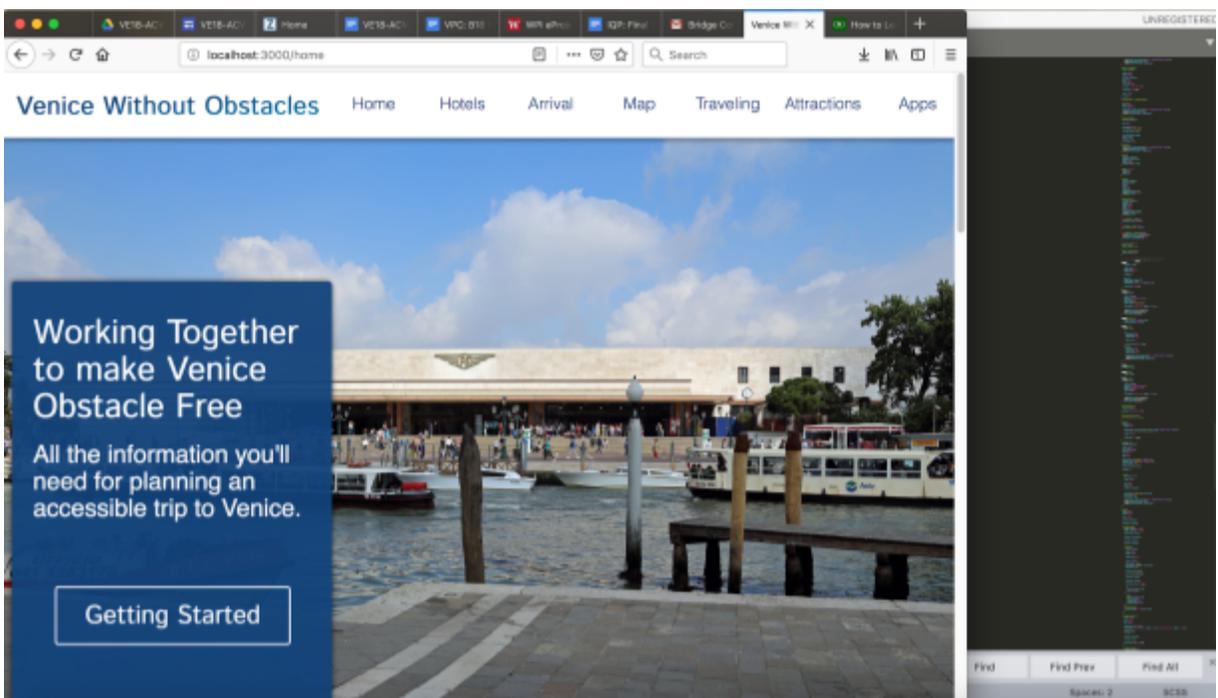


Figure 5.3 Organizations Cut Off and Settings Button Hidden Bug

One temporary method to correct this bug is to edit the class properties in “menu.scss” to create a desired outcome. To permanently solve this issue, and any future sizing issues, the website would need to be refactored and built using the JavaScript library React. This library provides the infrastructure for building UIs and contains built-in sizing features which would automatically fix this bug. Tutorials and examples on how to code in React would have to be researched online. One place to start researching React tutorials is [Learning-React-Roadmap-from-Scratch-to-Advanced](#).

Another bug involves the filter bridges box in the “Interactive Map” page. In Firefox, a portion of the filter box disappears when the page is first loaded, but returns to normal when the filter box is selected. It is unknown what causes this bug, evident in Figure 5.4, meaning further research is needed.

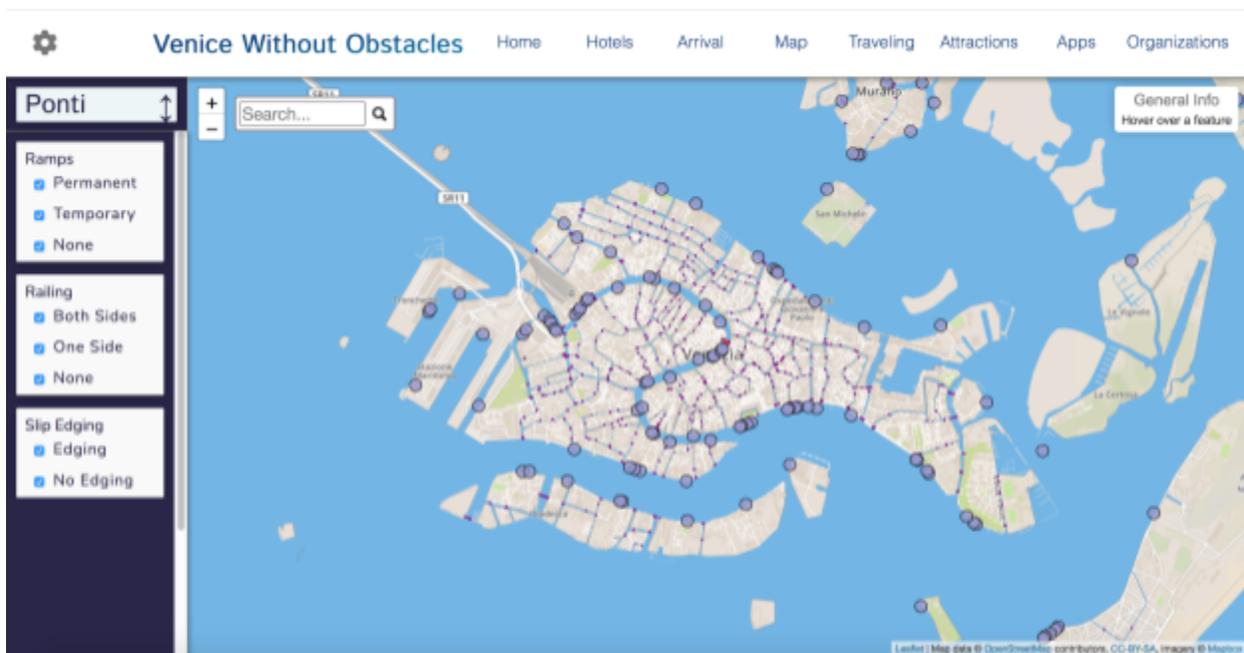


Figure 5.4 Filter Partially Hidden Bug

## 5.2.2 Refactoring Code and Creation of Pages

Currently, all of the pages on the website are individual HTML pages. This is not a sustainable way for page creation if individual pages are created for each organization, application, hotel, restaurant, church, museums, etc. These individual organization pages have their own HTML page, and this method of page generation is a time-consuming and tedious process. Similar to how one would correct the bugs mentioned in the previous section, the way to

this correct this issue is to refactor the code of the website in order for it to work with the JavaScript library React. React provides methods for automatic creation of web pages if they follow a similar template, such as the “Hotels”, “Restaurants”, “Churches”, and “Museums” web pages on our website. For information on where to start researching React tutorials, see previous section.

### **5.2.3 Adding Missing Data and Pages**

Pages that currently do not exist on the website include the “Hotels,” “Arrival by Boat,” “Car,” “Plane,” and “Train,” “Informative Map,” “Traveling by Boat” and by “Walking,” “Attractions of Restaurants,” “Churches,” “Museums,” “Gondola Rides,” and “Shops,” and the individual applications in the “Apps” page. These pages require additional research and data to be properly inputted into the website.

The “Hotels” page and “Attractions” pages, including the “Restaurants”, “Churches”, “Museums”, “Gondola Rides”, and “Shops” pages, require additional accessibility data on their respective establishments. This data would be used to create a list of each establishment that would be filterable by their accessibility accommodations. The filter option would allow people with disabilities to search for establishments that only meet their specific accommodations. A search menu would also be beneficial in searching through the list of establishments.

The “Arrival” pages, including the “Boat”, “Car”, “Plane”, and “Train” pages, require data to inform the user of the modes of transportation that can be utilized to arrive in Venice. Future teams would need to take data on areas where large cruises dock, the areas of Venice that are accessible for cars, the Venice airport and how one gets from the airport to Venice, and the Venice train station.

The informative map and “Traveling” pages, including the “Boat” and “Walking” pages, would analyze the benefits and cautions of Venice’s geography and how it impacts one’s ability to travel throughout the city. Informative maps would discuss this topic as a whole while the “Boat” and “Walking” pages would detail the accommodations and accessibility of the vaporetti, motoscafi, and bridges.

Finally, the individual applications on the “Apps” page would look similar to how the individual organizations appear on the “Organizations” page. They would list the benefits of the applications, how they can be used to assist one during the trip to Venice, and where to download them.

### **5.2.4 Expanding What Already Exists**

A simple way for future teams to expand upon what already exists is to add additional accessibility data to the interactive map. Currently, the interactive map only contains bridges,

islands, and boat stops. Future teams could add hotels, restaurants, churches, and museums to the map by creating GeoJSONs of those establishments. These GeoJSONs would include the geographic coordinates of these public points of interest and establishments and a list of accessibility features such as the width of entrances, presence of handicap accessible bathrooms with grab bars adjacent to the toilet and wider stalls for people who are wheelchair-bound, an elevator when applicable and clearly labeled signs and hazardous areas. To create these GeoJSONs, teams would first need to determine the exact accessibility features they would be searching for. A list of potential accessibility accommodations to look for can be found at [Scandic-Hotels-Special-Needs](#). Once this list is produced, teams would need to create an explanation letter that would be given to owners of establishments who do not speak English; this letter would be written in Italian explaining the purpose of the project and why the team is asking to enter and examine the establishment. After furnishing their accommodation lists and explanation letters, teams would then visit establishments outside of Giudecca to record, in a notebook, spreadsheet, or CK app, whether the accommodation exists or not. Once the data is collected, it can be converted into GeoJSON format which can also be used to input the data into the database. It is recommended that future teams discuss this process with Nicola. Once the data is in the CK Database, a function can be added to the “getLayers” function in the “map.js” file using the CK Database API which extracts the data from the database.

When a team updates the map with these establishments, the side description box would also have to be refactored. Currently, the side description box only appears when a user clicks on a bridge. Future teams could refactor the box so that it appears when a user clicks on any map element. The box would also need to show the accommodations based on the type of element the user selects. For example, a bridge would not have the same accessibility features as a church. This code can be edited in the “map.js” file.

Images would also need to be added to the description box for each element on the map. While all of the bridge images exist in the VE18-ACVE Google Drive the team was unable to develop a way to display the unique images for every bridge. To accomplish this, the images would have to be stored in a database. When a user clicks on the bridge, or other element, the website would communicate with the database to acquire the images needed for that specific element.

### **5.2.5 User Input App**

The interactive map is generated from extracting data from the CK Database. This means that when the data in the CK Database is updated, the map is automatically updated. Future teams could develop an app or an additional page on the website which allows a user to make direct changes or suggestions to the map. The initial data used to generate the interactive map was gathered by the team physically going to areas in Venice and observing accessible

accommodations at that location. This method of data collection does not take into account the constant changes in accessibility around Venice. For example, during different times in the year, temporary ramps are installed and removed which changes the level of accessibility of those bridges. Figure 5.5 displays the Ponte de la Venetia Marina with a temporary ramp in October and the bridge with the temporary ramp removed in December.



Figure 5.5 Difference of the Ponte de la Venetia Marina from October to December

Currently, in order for the map to recognize a change in bridge accessibility, a team would have to visit the bridge, record the change in accessibility of the bridge, and manually enter that change into the database. Creating an app, which updates the database, would allow users across Venice to automatically make changes to the database and thereby update the map. The app would consist of a form the user would have to complete and submit to make any alterations to the accessibility data in the database. This form would be reviewed by whomever is managing the application. Once approved, the user would be able to edit existing data or add additional fields. This application would allow the map to remain up to date at all times due to the constant edits and revisions from Venetians and tourists from all across Venice. Because the ability of adding data to the CK Database exists using the CK app, the team would have to work with Nicola and other members of SereDPT to develop the UI and backend functionality of the app.

## 5.2.6 Accessible Pathfinding

An additional application to assist people with mobility impairments would be an accessible pathfinding application. This application could be built into the interactive map or could exist as a separate application with its own page on the website. The accessible pathfinding application would generate a path(s) from two selected locations on a map of Venice: the starting point and the point of destination. The application would generate potential routes users could follow to reach their destinations. Displaying multiple paths would allow users to select routes that facilitate their travel throughout the city.

This pathfinding application would involve teams creating nodes which represent destination spots, beginnings and ends of roads, and bridges. The properties each node would share would be their name, latitude and longitude, what type of node they are, and an array of nodes that it can connect to. Destination spots and road nodes would be grouped together and would not require any additional fields. The bridge nodes would require additional fields including the number of steps the bridge has and if the bridge contains a permanent ramp.

Each path would use an “A star” (A\*) algorithm, see Appendix M. This algorithm allows the creation of paths to be affected by a variety of sources, such as the total number of steps, the presence of bridges, and the length of the path. This algorithm is what allows for the creation of different paths that have a focus on avoiding specific obstacles during the user’s travel.

There are existing resources that can aid in the creation of the pathfinding application. The Venice Project Center data can help assist in the creation of the nodes. The VPC contains data on streets and bridges which would be used in determining the number of steps a bridge has and if that bridge has a permanent ramp. The VE17-KNOPEN IQP team created a pathfinding application which generates the shortest path between two nodes and informs the user of how many steps they would have to travel to reach their destination. This application can be modified using Javascript to incorporate additional elements. Figure 5.6 shows an image of the VE17-KNOPEN IQP team’s pathfinding application taken from their report. For further information see [VE17-KNOPEN\\_Report](#).

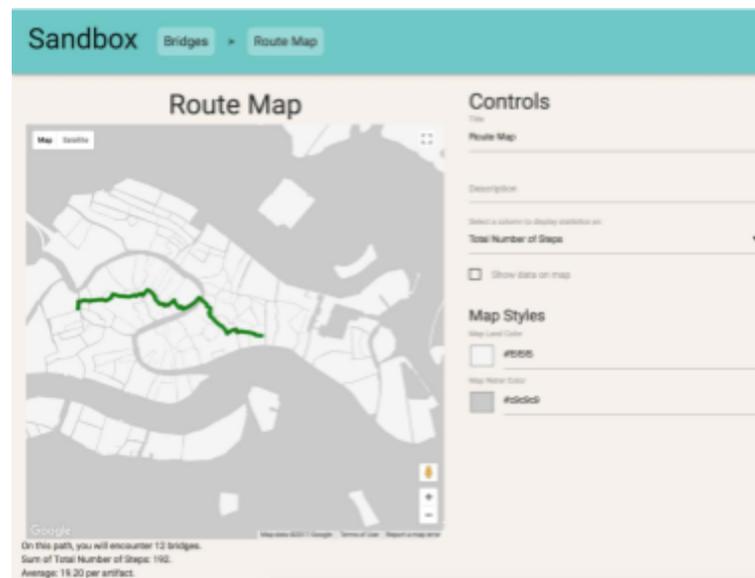


Figure 5.6 KNOPEN’s Pathfinding Application

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## 7. Appendices

### Appendix A: Accommodations by Impairment

<https://docs.google.com/spreadsheets/d/1vDuBGKgKI1gE1zt2BhUM08vxV7VyO5Zyy2ppixW9Pxc/edit?usp=sharing>

### Appendix B: Accessibility of Venice Restaurant Services based on Websites

| Name                         | Accessibility Based on Website          | Link  |
|------------------------------|---|---|
| Ai Mercanti                  | Lacks obvious disability accommodations | <a href="https://www.aimercanti.it/en/bistronomie.html">https://www.aimercanti.it/en/bistronomie.html</a>         |
| Danieli Bistro               | Lacks obvious disability accommodations | <a href="https://www.danielibistro.com/en/home">https://www.danielibistro.com/en/home</a>                         |
| La Colombina                 | Pet Friendly                            | <a href="http://www.ristorantelacolombina.eu/en/">http://www.ristorantelacolombina.eu/en/</a>                     |
|                              | Lacks obvious disability accommodations |   |
| Club del Doge                | Lacks obvious disability accommodations | <a href="https://www.clubdeldoge.com/en/home">https://www.clubdeldoge.com/en/home</a>                             |
| Ristorante Glam              | Lacks obvious disability accommodations | <a href="https://www.palazzovonart.com/en/restaurant-bar/">https://www.palazzovonart.com/en/restaurant-bar/</a>   |
| Alle Corone                  | Lacks obvious disability accommodations | <a href="http://www.ristoranteallicorone.com/">http://www.ristoranteallicorone.com/</a>                           |
| Italian Bistrot Chat Qui Rit | Lacks obvious disability accommodations | <a href="https://chatquirit.it/">https://chatquirit.it/</a>   |
| Osteria Al Squero            | Lacks obvious disability accommodations | <a href="https://osteriaalsquero.wordpress.com/">https://osteriaalsquero.wordpress.com/</a>                       |
| Baci & Pasta                 | Lacks obvious disability accommodations | <a href="http://www.baciepasta.it/">http://www.baciepasta.it/</a>   |
| Restaurant Graspò De Ua      | Lacks obvious disability accommodations | <a href="http://www.ristorantealgraspodeua.it/en/">http://www.ristorantealgraspodeua.it/en/</a>                   |
| Versus Meridianem            | Lacks obvious disability accommodations | <a href="https://www.versusmeridianem.com/">https://www.versusmeridianem.com/</a>                                 |
| Osteria Oliva Nera           | Lacks obvious disability accommodations | <a href="http://www.olivanera.com/en/restaurant-in-venice/">http://www.olivanera.com/en/restaurant-in-venice/</a> |

|   |   |   |
|---|---|---|
| Il Ridotto Restaurant                                   | Lacks obvious disability accommodations | <a href="http://www.ilridotto.com/en/home-en/">http://www.ilridotto.com/en/home-en/</a>   |
| Il Mercante Cocktail Bar                                | Lacks obvious disability accommodations | <a href="http://www.ilmercantevenezia.com/">http://www.ilmercantevenezia.com/</a>   |
| Zanze XVI   | Lacks obvious disability accommodations | <a href="https://zanze.it/?lang=en">https://zanze.it/?lang=en</a>   |
| Osteria Alle Testiere                                   | Lacks obvious disability accommodations | <a href="http://www.osterialletesriere.it/">http://www.osterialletesriere.it/</a>   |
| Osteria Alla Ciuma                                      | NA                                      | No official Website   |
| Taverna La Fenice                                       | NA                                      | No official Website   |
| Nevodi  | NA                                      | No official Website   |
| Bacaro Quebrado   | NA                                      | No official Website   |
| Trattoria Bar Pontini                                   | NA                                      | No official Website   |
| Ristorante Pizzeria Dolfin                              | NA                                      | No official Website   |
| Creperia Artigianale Casteo                             | NA                                      | No official Website   |
| Dopolavoro Dining Room                                  | Lacks obvious disability accommodations | <a href="https://www.jwvenice.com/en/dining-experiences/dopolavoro-dining-room/">https://www.jwvenice.com/en/dining-experiences/dopolavoro-dining-room/</a>             |
| Sagra Rooftop Restaurant                                | Lacks obvious disability accommodations | <a href="https://www.jwvenice.com/en/dining-experiences/sagra-rooftop-restaurant.html">https://www.jwvenice.com/en/dining-experiences/sagra-rooftop-restaurant.html</a> |
| Trattoria Antiche Carampane                             | Lacks obvious disability accommodations | <a href="http://www.antichecarampane.com/en/">http://www.antichecarampane.com/en/</a>   |
| Da Fiore  | Lacks obvious disability accommodations | <a href="http://www.dafiore.net/en/">http://www.dafiore.net/en/</a>   |
| Osteria Enoteca Ai Artisti                              | Lacks obvious disability accommodations | <a href="http://www.enotecaartisti.com/en/visit">http://www.enotecaartisti.com/en/visit</a>   |
| Hostaria OSOTTOOSOPRA                                   | Lacks obvious disability accommodations | <a href="https://osottoosopra.com/">https://osottoosopra.com/</a>   |
| Riviera Ristorante per Onnivori - Omnivorous Restaurant | Lacks obvious disability accommodations | <a href="http://www.ristoranteriviera.it/">http://www.ristoranteriviera.it/</a>   |
| Ai Do Archi   | NA                                      | No official Website   |
| Il Ridotto Restaurant                                   | Lacks obvious disability accommodations | <a href="http://www.ilridotto.com/en/home-en/">http://www.ilridotto.com/en/home-en/</a>   |
| Local   | Lacks obvious disability accommodations | <a href="https://www.ristorantelo">https://www.ristorantelo</a>   |

|                                  |   |   |
|----------------------------------|---|---|
|                                  |   | <a href="http://cal.com/">cal.com/</a>  |
| Pizza 2000                       | Lacks obvious disability accommodations | No official Website   |
|                                  |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d2406924-Reviews-Pizza_2000-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d2406924-Reviews-Pizza_2000-Venice_Veneto.html</a>                         |
| Cip's Club                       | Lacks obvious disability accommodations | <a href="https://www.belmond.com/hotels/europe/italy/venice/belmond-hotel-cipriani/dining">https://www.belmond.com/hotels/europe/italy/venice/belmond-hotel-cipriani/dining</a>   |
| Oro Restaurant                   | Lacks obvious disability accommodations | <a href="https://www.belmond.com/hotels/europe/italy/venice/belmond-hotel-cipriani/dining">https://www.belmond.com/hotels/europe/italy/venice/belmond-hotel-cipriani/dining</a>   |
| L'ULIVO RESTAURANT               | Lacks obvious disability accommodations | <a href="https://www.bauervenezia.com/en/dine-drink/restaurant-l-ulivo/">https://www.bauervenezia.com/en/dine-drink/restaurant-l-ulivo/</a>   |
| ristorante pizzeria ai trescaini | NA                                      | No official Website   |
| I figli delle stelle             | NA                                      | No official Website   |
| In Riva                          | NA                                      | No official Website   |
| Al Pontil Dea Giudecca           | Wheelchair Accessible                   | No official Website   |
|                                  | Lacks obvious disability accommodations | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d4290090-Reviews-Al_Pontil_Dea_Giudecca-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d4290090-Reviews-Al_Pontil_Dea_Giudecca-Venice_Veneto.html</a> |
| Ristorante Al Redentore          | Lacks obvious disability accommodations | <a href="http://alredentor.com/#about">http://alredentor.com/#about</a>   |
| Ristorante Al Storico da Crea    | NA                                      | No official Website   |
|                                  |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d1828952-Reviews-Al_storico_da_Crea-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d1828952-Reviews-Al_storico_da_Crea-Venice_Veneto.html</a>         |
| Food and Art Judecca             | NA                                      | No official Website   |
|                                  |   | <a href="https://www.tripadvisor.com/">https://www.tripadvisor.com/</a>   |

|                             |   |   |
|-----------------------------|---|---|
|                             |   | <a href="http://www.tripadvisor.com/Restaurant_Review-g187870-d10436225-Reviews-Food_Art_Judecca-Venice_Veneto.html">com/Restaurant_Review-g187870-d10436225-Reviews-Food_Art_Judecca-Venice_Veneto.html</a>  |
| Trattoria Altanella         | NA                                      | No official Website   |
|                             |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d696441-Reviews-Altanella-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d696441-Reviews-Altanella-Venice_Veneto.html</a>                                     |
| Trattoria Ai Cacciatori     | Lacks obvious disability accommodations | <a href="http://www.aicacciatori.it/">http://www.aicacciatori.it/</a>   |
| La Foca                     | NA                                      | No official Website   |
|                             |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d11793203-Reviews-Pizzeria_La_Foca-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d11793203-Reviews-Pizzeria_La_Foca-Venice_Veneto.html</a>                   |
| Ristorante Parco Delle Rose | Wheelchair Accessible                   | No Official Website   |
|                             |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g3547567-d1453743-Reviews-Parco_delle_Rose-Lido_di_Venezia_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g3547567-d1453743-Reviews-Parco_delle_Rose-Lido_di_Venezia_Veneto.html</a> |
| La Palanca                  | Wheelchair Accessible                   | No official Website   |
|                             |   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d1087324-Reviews-La_Palanca-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d1087324-Reviews-La_Palanca-Venice_Veneto.html</a>                                 |
|                             |   | <a href="http://www.in-venice.com/restaurant/la-palanca-restaurant-venice/?utm_source=tripadvisor&amp;utm_medium=referral">http://www.in-venice.com/restaurant/la-palanca-restaurant-venice/?utm_source=tripadvisor&amp;utm_medium=referral</a>         |
| Majer Giudecca              | Wheelchair Accessible                   | <a href="http://www.majer.it/">http://www.majer.it/</a>   |
|                             | Lacks obvious disability accommodations | <a href="https://www.facebook.com/MAJERvenezia">https://www.facebook.com/MAJERvenezia</a>   |

|                            |   |   |
|----------------------------|---|---|
| Trattoria Pizzeria Do Mori | Lacks obvious disability accommodations | <a href="https://trattoria-pizzeria-do-mori.business.site/">https://trattoria-pizzeria-do-mori.business.site/</a>   |
|                            | Wheelchair Accessible                   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d3544767-Reviews-Trattoria_Pizzeria_Do_Mori-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d3544767-Reviews-Trattoria_Pizzeria_Do_Mori-Venice_Veneto.html</a>   |
| Ae Botti                   | Lacks obvious disability accommodations | <a href="http://www.osteriaaebotti.com/">http://www.osteriaaebotti.com/</a>   |
|                            | Wheelchair Accessible                   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d1953688-Reviews-Ostaria_Ae_Botti-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d1953688-Reviews-Ostaria_Ae_Botti-Venice_Veneto.html</a>   |
| Harry's Dolci              | Lacks obvious disability accommodations | <a href="http://www.cipriani.com/">http://www.cipriani.com/</a>   |
|                            | Wheelchair Accessible                   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d696573-Reviews-Harry_s_Dolci-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d696573-Reviews-Harry_s_Dolci-Venice_Veneto.html</a>   |
| Aromi Restaurant           | Lacks obvious disability accommodations | <a href="https://www3.hilton.com/en/hotels/italy/hilton-molino-stucky-venice-VCEHIIH/index.html">https://www3.hilton.com/en/hotels/italy/hilton-molino-stucky-venice-VCEHIIH/index.html</a>   |
|                            | Wheelchair Accessible                   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d795275-Reviews-Aromi_Restaurant-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d795275-Reviews-Aromi_Restaurant-Venice_Veneto.html</a>   |
| Bacaromi                   | Lacks obvious disability accommodations | <a href="https://www3.hilton.com/en/hotels/italy/hilton-molino-stucky-venice-VCEHIIH/index.html?WT.mc_id=zRBEC0IT1HI2REP3FriendlyRedir4MicrositeRedirect_Mar5Microsite6VCEHIIH7EN8i1">https://www3.hilton.com/en/hotels/italy/hilton-molino-stucky-venice-VCEHIIH/index.html?WT.mc_id=zRBEC0IT1HI2REP3FriendlyRedir4MicrositeRedirect_Mar5Microsite6VCEHIIH7EN8i1</a> |
|                            | Wheelchair Accessible                   | <a href="https://www.tripadvisor.com/Restaurant_Review-g187870-d795275-Reviews-Aromi_Restaurant-Venice_Veneto.html">https://www.tripadvisor.com/Restaurant_Review-g187870-d795275-Reviews-Aromi_Restaurant-Venice_Veneto.html</a>   |

|  |  |  |
|--|--|--|
|  |  | <a href="https://www.gioiellinascosti.com/Restaurant_Review-g187870-d3197221-Reviews-Bacaromi-Venice_Veneto.html">com/Restaurant_Review-g187870-d3197221-Reviews-Bacaromi-Venice_Veneto.html</a> |
|--|--|--|

## Appendix C: Accessibility of Giudecca Churches Based on Websites

| Name                                      | Region   | Accessibility Accommodations   | Link  |
|---|----------|--|---|
| Church of Santa Maria della Presentazione | Giudecca | "Visitors suffering of cardiovascular and motor diseases are strongly advised not to visit the museum"           | <a href="https://www.gioiellinascosti-divenezia.it/en/accessibility-and-visit-regulations/">https://www.gioiellinascosti-divenezia.it/en/accessibility-and-visit-regulations/</a> |
|   |          | "Visitors with disabilities willing to visit the Scala Contarini have to contact the booking office in advance " |   |
|   |          | Contact Info   |   |
| Church of St. Gerardo Sagredo             | Giudecca | NA   | No Official Website   |
| Chiesa delle Convertite                   | Giudecca | NA   | No Official Website   |
| Church of the Holy Trinity                | Giudecca | NA   | No Official Website   |
| Chiesa dei Santi Cosma e Damiano          | Giudecca | Contact Info   | <a href="https://serendpt.net/h3-venezia/">https://serendpt.net/h3-venezia/</a>   |
| Sant'Eufemia, Venice                      | Giudecca | NA   | No Official Website   |
| Il Redentore                              | Giudecca | NA   | No Official Website   |
| Chiesa di Santa Croce                     | Giudecca | Google Review: "unfortunately not accessible"  | No Official Website   |
| Church of San Giorgio Maggiore            | Giudecca | NA   | No Official Website   |

## **Appendix D: First interview with Jess Szivos**

**Meeting Location:** Office of Disability Services, WPI, Daniels Hall

**Meeting Date:** 9/4/18

**Meeting Time:** 2:00 PM - 3:00 PM

**Meeting Attended By:** Eliana Abenante, Stephanie Jones, Andrew DeRusha, Jess Szivos

\*Michael DiStefano could not attend the meeting because of a BME lab class scheduled at 2pm

**Jess Szivos works for the WPI Office of Disability Services. In this meeting, the team discussed appropriate accommodations for people with physical or sensory disabilities. The team also discussed potential deliverables that could improve accessibility for people with physical or sensory impairments in Venice.**

**Important notes from the interview are listed below:**

Physical Disabilities:

- Have to consider housing and transportation accommodations

Sensory Disabilities:

- Fire alarm and/or bed shakers (those who are deaf)
- If people are giving tours they should be trained
- U shaped audience when speaking on a tour
- Tour guides can wear buttons that show what languages they know
- Transcription for hearing tour
- Capturing for video tours
- Research FM loops

Things to Consider:

- Some countries still have and use institutions
- Educate touring companies
- Always mentioning bathroom locations
- Try to regulate some of this into natural conversations
- Have tour guides use brochures and have them point to where they are talking about
- Research which tours and what kind of tours are most popular in Venice
- Provide visitors information about hotels

- Toilet height
- Grab bars
- Walk-in shower
- Who should they be catering to?
- Are they hiring people with disabilities?
- Research 7 Hills, Abroad with Disabilities, Arch for opportunity, Worcester Art Museum (speak with Adam)
- Find places in Venice where people can decompress
  - Best time to go and day so crowds are to the minimum
- Stick to universal design approach

Other disabilities you may need to consider:

- Epilepsy (prepare for strobes)
- Claustrophobia (prepare for small spaces)

Possible Deliverables:

- Tour guide accommodations manual
- Tour brochure for visitors with disabilities
- Maps that have braille that indicate floor plan and bathroom locations
- Develop a cruise like experience

## **Appendix E: Second Interview with Jess Szivos**

**Meeting Location:** Office of Disability Services, WPI, Daniels Hall

**Meeting Date:** 9/27/18

**Meeting Time:** 4:00 PM - 5:00 PM

**Meeting Attended By:** Eliana Abenante, Michael DiStefano, Stephanie Jones, Andrew DeRusha, Jess Szivos

**The purpose of our second interview with Jess Szivos was to discuss ways in which we can improve certain aspects of our deliverables to make them more effective in accommodating people with various types of disabilities.**

**Important notes from the interview are listed below:**

Project Goals:

- Not gonna hit everything
- Universal design concept
- Saying “This is what’s going to happen” helps with anxiety and depression
- Cite: 20accessible tours in London
  - Wheelchair bus tours
  - Gives cool background for things like if uber is accessible
- If on a tour what to know
  - Why on tour
  - Where are bathrooms
  - Agenda
  - Breaks
  - Identify who can answer questions
  - What are the rules / expectations
  - What to stay together
  - When to break
  - Introduction of who tour guide is
    - Helps with cultural boundaries
  - Is there a sign language interpreter
    - For different languages?
  - Is there a pamphlet to follow
  - Tour guide ask if anyone needs help
  - Tour makes sure they are at the center of everyone when speaking to them

- Make sure tour guides know how to interact with different disabilities
  - Not touch blind
  - Not raise voice hearing
  - Not push wheelchair
- Power of language
- Give info of tours on website
- What is culture on disabilities
- Work on descaling
  - Work on website
  - What are different ways to incorporate universal designs for disabilities
  - Who is paying for ramp
  - Talk to IGSD
  - Find the feasibility of installing a ramp at H3
- Connect with ATC (ETC?)
  - Find out what makes website accessible
- What is culturally accessible
  - What is the culture of Venice for disabilities
- Create page for cultural acceptance in Venice
  - Wiki pages
  - What is and isn't acceptable
  - Create database of accessibility
  - Discover architects who know accessibility architecture
- Interview locals who know what is and isn't acceptable in Venice
  - What is it like to live there
- Disability organizations in Venice - are there communities
- Pamphlets named correctly
  - Financial Benefits of Accessibility

### Buildings

- Different codes in Venice
- Automatic doors
- Save multiple drafts
- **Email Professor Carrera and Professor Michalson** about letter to get from government about entering establishments
  - Ask who is Ruth
  - Know going to be doing surveys, do they need to be approved

### Website

- Color contrast
- Non blinding
- Accessibility of phone
- Scroll instead of button hop
- Pretty pictures
- Who is it catered to - locals or visitors
- Prototypes
  - Invision
  - HTML/JS mockups

#### Interviews

- Clearly display what the interview is for
- IRB approve intro to what interview is about
- Come up with main/ standard questions to ask everyone
  
- Think about the social experience in Venice
- Define the two deliverables - make it clear for paper and presentation
- Advocate for people coming to Venice
- Look up Ireland

#### Past Venice

- Coonp and Co-op stores for food
- Bring rain boots
- Bring boots with you that you plan to ruin
- Get converters
- Get Towels
- Washers are small
- Hard to get stuff while there
- One suitcase
- Basics
- Suit
- Go to store and buy food to make often
- Charge to sit
- Keep some cash on you

## **Appendix F: Professor Lane Harrison Interview**

**Meeting Location:** Fuller 136

**Meeting Date:** 9/4/18

**Meeting Time:** 11:00 AM - 12:00 PM

**Meeting Attended By:** Eliana Abenante, Michael DiStefano, Stephanie Jones, Andrew DeRusha, Jess Szivos

**Lane Harrison is a computer science professor at WPI. The purpose of our interview with Professor Harrison was to discuss an approach to making a website that is accessible for people with disabilities.**

**Important notes from the interview are listed below:**

Things to consider:

- Europe as a whole is not easily accessible for people with disabilities
- Take partial fragments of existing projects
- Fix particular street, building, and bridges
- Take data and use it to make app
- Research application for disabilities
- Research types of disabilities
  - Mobility
  - Blind
    - Accommodating for blind from a technology standpoint is difficult
- VisWis Company
  - Research group for disabilities
  - Famous project
    - Involved AI that learned movement of computer mouse
    - Makes buttons larger based on movement
- IDEO
  - Read everything about them
  - Design processes
  - 1, 2 design activities to design app
  - Think deeply about app
  - Look at iPod accessibility

- iOS accessibility guidelines
- Google only good place for walking algorithm
- Research OpenStreetMap
  - Don't need to have computer science background to use it
  - Getting data out of IQP and into the application
  - Determine whether it is possible to add disability info into OpenStreetMap
- ArchGIS
  - Decide if we want to use it
  - Expensive license
  - Used more for creating product
  - Talk about pros and cons in IQP
- Put data into accessible form
- Geo located query
- Table with latitude and longitude
- App that shows available and accessible bridges
- Research Konigsberg Bridge Problem
- Building App
  - OpenStreetMap can be used to put data into
  - Can do it with ArchGIS, but it does not have good user interface
  - Need full tech skills and computer science background
  - Make OpenStreetMap the priority
  - Gather data and experiment with OpenStreetMap
- Data Format
  - A building has :
    - Entrance
    - Back door
- Use Python to import data from one database to another database

## **Appendix G: Professor Wilson Wong Interview**

**Meeting Date:** 9/6/18

**Meeting Time:** 4:00 - 5:00 PM

**Meeting Attended By:** Eliana Abenante, Stephanie Jones, Andrew DeRusha, Mike DiStefano, Professor Wong

**Wilson Wong is a computer science professor at WPI. The purpose of our interview with Professor Wong was to discuss an approach to making a website that is accessible for people with disabilities.**

**Important notes from the interview are listed below:**

Things to Consider:

- Android Studio - InteleJ and Java
- Write everything in Java FX ports with Glue on Mobile -- recompile to android
- Android SDK
- Take the map, every location on a road convert to pixels, pixel ends up being a point in algorithm
- Getting From island to island
- Each island is one point
- Connect the points and bridges
- Say bridge a is accessible or is not accessible
- Say if an island it accessible or not accessible
- Take 2nd iteration and transfer code to do this
- Start off with 10 islands
- Research top islands
- Do some intro to databases research
- Put everything into a spreadsheet first -- figure out how to put it into the database and avoid any duplicates
- Need research on how to make tables
- Java DB database

## Appendix H: Person with Disability Interview

**Meeting Date:** 9/8/18

**Meeting Time:** 2:00 - 3:00 PM

**Meeting Attended By:** Andrew DeRusha and Katie Varteresian

**Below is a transcript of an interview Andrew conducted with someone who has a motor disability.**

**\*The name and age of the interviewee has been redacted for privacy.**

Hello, my name is Andrew DeRusha. I would like to first say thank you for taking the time to be interviewed by us for our IQP project. I also want you to understand that all the information you provided us will remain confidential between me and my team. The last thing is I want you to keep in mind that there is no wrong answer, and if there is any question you'd like to skip just say so. When you are ready we can begin.

- What is your name?
  - Katie Varteresian
- How old are you?
  - 19
- How long have you lived with your impairment?
  - All life
- What is your impairment?
  - How would you define your impairment?
    - Have a spinal mutation cutting off spinal cord and cant feel below hips
- How does your impairment affect your mobility?
  - Can't walk
  - Upper body fine
  - Inside your house?
    - Accessible shower
    - Elevator
    - Stay on first floor
    - Turning around hard
    - Doorways same
  - When it comes to transportation?

- Airplane
      - Struggle for airplane
      - Buy ticket for chair
      - Put chair in cargo bay
      - Flighting difficult
        - Planes that drive on wheelchair
        - Park chair in isle
      - Don't want to get rid of chair
    - Boat
      - Motor boats
      - Remove chair
    - Car
      - Get self into car
      - Chair in back
      - Ramp in car
  - When it comes to stores, hotels, sites, etc?
    - Hotel
      - ADA makes people comply
    - Store
      - Some stores small
      - Not a big deal
    - Monuments
      - Old and stairs
      -
    - Info
      - Ramp
      - Step that is 6in can't do
      - Parent scouts out store
- What daily tasks that aren't mobility related are a struggle to you?
  - Clothes shopping
    - Struggle
    - Comfortable clothing a struggle
  - Going out to eat
    - Restaurants good
  - Watching movies or plays
    - Theatres really good
    - Special access
    - Special seats
    - Call ahead

- Travel
  - Packs supplies
- How easy is it to find information about locations that accommodate your impairment?
  - Call head for tickets
  - Special tour
  - Places don't say they are handicapped
  - Do you expect all hotels and public sites to have easily accessible information about how they accommodate people with impairments and what impairments they accommodate?
    - Yes
    - Hotels good
    - Privately owned things not good
  - If it is not, what would you do?
    - Call and talk
    - If no info them don't go
- What would you say is the best accommodation or service that you have come across that takes into account your impairment?
  - Ramps to get into every building
  - Elevator
  - Wide enough isles
  - Place to turn around
- What advice would you give to people with your implaiment who are going to Venice?
  - Expect that it's not handicapped accessible
  - Expect difficulty
  - Build with other people in mind

## **Appendix I: Venice Interview Consent Form**

**Below is a consent form that will be distributed to people in Venice prior to interviewing them:**

Hello, my name is [insert name here], and this is [insert other people with you]. We are students at a college located in Massachusetts (United States of America).

We would like to request your participation in a brief interview that will only take about 5 minutes to complete.

The goal of this project is to assess the availability of information, identify the accessibility of the inner city islands of Giudecca, and determine other initiatives already in place for people with disabilities in Venice.

We would like to first say thank you for taking the time to be interviewed by us for our IQP project. We also want you to understand that there will be no identifiable information will be associated with these questions and it is completely voluntary. All responses will be kept confidential. These questions have been reviewed and approved by the WPI Institutional Review Board. The last thing is we want you to keep in mind that there is no wrong answer, and if there is any question you'd like to skip just say so. When you are ready we can begin.

If you have think of any other question please contact the team at the [ve18.acve@gmail.com](mailto:ve18.acve@gmail.com).

## **Appendix J: Venice Interview Questions**

**Below is a comprehensive set of questions that will be used to interview people who have a disability or owners, managers, and employees of public establishments in Venice.**

**\*These questions have been approved by the WPI IRB committee.**

### General

- How old are you?
- Do you have a diagnosed impairment?
- Do you have an undiagnosed impairment?
- Would you mind explaining what your impairment is?
- How long have you had your impairment?
- What are some common obstacles you face on a daily basis?

- Have you used any disability services provided by the city or an outside company? If so, what were they? Did they improve your accessibility?
- Have you lived anywhere else? If so, what was the accessibility like in that country vs. Venice?

### Impairment Specific Questions

- Wheelchair or parent with a stroller
  - What do you do in the event your wheelchair/stroller does not fit through an entrance of a building?
  - When you are in a building, what task do you find annoying?
    - Small hallways or pathways?
    - Not being able to reach something?
    - Traveling on carpet?
  - Do you find it difficult to travel on the pavement in Venice?
- Limp
  - Are crossing bridges challenging?
  - How often do you need assistance when traveling from place to place?
  - What are things that make it difficult to move throughout a building?
    - For example, do you find buildings that have a step to get from one room to the other inconvenient?
- Elderly
  - What did you find difficult about traversing Venice?
- Height impaired
  - What difficulties do you struggle with when traveling or visiting the city?
- Amputee
  - Are there particular tasks you are not able to do?
  - How often do you need assistance when traveling from place to place?
- Hard of hearing
  - How do establishments, restaurants, etc. help accommodate your impairment?
- Deaf
  - How do you communicate with people at restaurants, hotels, and tourist sites that might not speak sign language?
  - How do establishments, restaurants, etc. help accommodate your impairment?
- Color Blind
  - What colors are affected by your type of color blindness?
  - How is the experience of Venice affect by your colorblindness? Is it affected at all?
  - When you go online, what things have you found inconvenient?

- Near sighted
  - What are types of things that you find it difficult to see? Signs, monuments, edges of the canals?
- Blind
  - What is your routing for traveling? What thing do you have to keep mindful of?
  - What do you do when you go out to eat? Have you ever used braille menus?
    - If so, do you find them helpful?
    - If not, would you be willing to use them?
  - How do you go about buying travel tickets in Venice? Do you use the machines?
    - If so or not so, how come?
  - What are the difficulties you experience when you are on a website?
  - What are some things websites could do to make them more accessible to you?
    - Have there been websites that take certian liberties to be more accessible?

#### Location

- When you are on a tour, is there anything you need to inform the tour guide of, either before the tour starts or right before it, or in the moment?
- How do older cities, like Venice, compare to other cities in terms of accessibility?
- What are some common obstacles in restaurants?
  - Are buffets a challenge?
- What are some common obstacles in hotels?
- What are some common obstacles in churches or museums?

#### Transportation

- What form of transportation is the most difficult? What makes it difficult?
- How easy is it for you to use boats on average?
- What has been the most challenging experience on a boat?
- How often did you use a boat in Venice?
- How did you find the boats in Venice? Did they meet your expectations?
  - If not, what did you expect?
- How did boats in Venice compare to boats elsewhere?
- How do you usually approach bridges? Were you able to do that in Venice?

#### Society

- Is there a community for people with disabilities in the area?
- How do others in the community tend to view people with impairments?
- Do you feel that owners of establishments and points of interest are making efforts to accommodate people with disabilities?
- Are you employed?

- What do you feel that the city could do differently to be more inclusive for people of all levels of ability?
- Are you employed?

Employees, Managers, and Owners of Establishments

- What accommodations are offered here for people with disabilities?
  - Motor
  - Vision
  - Hearing
- Would you say that a wheelchair can fit comfortably through the entrance of the building?
- Is there a handicap accessible bathroom?
- If you have a customer walk in with a motor/visual/hearing impairment, in what ways do you try to accommodate him/her?

## Appendix K: Impairments Survey Question

**Below is a public survey our team generated to help collect data on impairments and devise potential solutions for assisting people with impairments in Venice. The survey was posted to the WPI student community on Facebook.**

- Do you have a mental or physical impairment?
  - Yes
  - No
- Do you know someone with a mental or physical impairment?
  - Yes
  - No
- If you or someone you know has an impairment, what impairment do they have?
  - Short Answer Response

- What would you consider to be the most important impairment to consider when thinking about accessibility?
  - Short Answer Response
- Do you expect all hotels and public sites to have easily accessible information about what impairments they accommodate and how they accommodate people with impairments?
  - Yes
  - No
- If this information happened to be missing or unable to be found, and you happened to have an impairment, what would you do?
  - Go to the hotel or site in hopes they can accommodate your impairment
  - Continue to look for this information on the hotel or site's website
  - Call the hotel or site in order to find this information
  - Look at other locations that has this information available
  - Cancel the trip
- What is the most important thing to keep in mind when thinking about creating a solution to help people with physical impairments?
  - Long Answer Response
- What is the most important thing to keep in mind when thinking about creating a solution to help people with mental impairments?
  - Long Answer Response
- Select the top 2 solutions that you believe would be the beneficial in helping people with impairments
  - A website that collects information on stores, restaurants, hotels, monuments, tours, and services that offer accommodations to people with impairments and what impairments they accommodate
  - A mobile app that generates a path to a destination that is accessible to a selected impairment
  - An online or physical layout of floors of a building that displays the floor entrances, exits, rooms, bathrooms, stairs, etc that are handicap accessible
  - Adding additional guardrails and handrails to areas that could be considered dangerous
  - Wiki pages on monuments, public establishments, and bridges that provide information about them and accommodations and services they offer to people with impairments
- What is a solution you would consider that would aid people with physical impairments?
  - Long Answer Response
- Do you think it could be implemented in Venice?
  - Yes
  - No

- Maybe
- What is a solution you would consider that would aid people with mental impairments?
  - Long Answer Response
- Do you think it could be implemented in Venice?
  - Yes
  - No
  - Maybe

## **Appendix L: Tools and Libraries**

### **Appendix L.1 Sublime Text**

Sublime Text is an IDE used for developing web applications. Sublime Text was used as the IDE for the website for a variety of reasons. It is an IDE used by many web developers at SerenDPT meaning SerenDPT developers, such as Nicola, would be able to assist with any questions or concerns regarding the website, it is an IDE that allows the user to edit in HTML, Javascript, SCSS, and JQuery, and it has customizable layouts allowing a user to create similar layouts across HTML pages. It also contains many quality of life features allowing for easy and efficient code editing. These features include the use of colors to convey the different functionality of code snippets and variable, such as the difference between function names and variables, code collapsing to hide unused lines of code, and cross platform compatibility allowing for efficient group collaboration regardless of the operating system each group member is using.

### **Appendix L.2 GitHub**

GitHub is an online code repository service using the Git version control to allow for simultaneous code editing. GitHub provides users with a repository to store and save their code on their site while also acting as a timeline tracking all code changes and alterations. GitHub serves as a backup to any code stored on its repositories and grants the option for users to revert their code to earlier versions to fix any unwanted, accidental, or catastrophic changes. GitHub also gives teams the ability to work on applications simultaneously across multiple computers regardless their platform allowing for fast and efficient application development.

### **Appendix L.3 CK Database**

The CK Database is the database created by the VPC. It stores all the data the VPC has collected throughout the course of its life. The CK database allows one to access entire

categories of data, for example the entire data set in the “Bridges 2018” section, as well as individual pieces of data, for example the data collected on 1 bridge within the “Bridges 2018” section. The CK database allows access to this data through the usage of the CK database API. The API is given a URL leading to the location of the data and converts the data into a JSON string which one can parse to retrieve the necessary data. Upon request, the VPC can grant viewing and editing rights to users allowing them to edit the data from the CK Database’s website rather than having to go directly into the database itself. The CK Database was chosen to be the database used in the creation of the website due to its easy accessibility to future IQP teams.

## Appendix L.4 Leaflet.js

Leaflet.js is a javascript library used to create interactive maps and complex GIS. Leaflet.js was chosen to be the GIS to use as the website’s map because:

- It allows elements on the map to be customized to have unique styles and appearances.
- It provides the team the ability to control how the elements react to different user interactions. The team is able to program the website to react in different ways based on how which elements the user interacts with.
- Leaflet.js possesses many additional plugins and extensions adding further customizations and features to the map, such as search features.
- It is a common tool utilized by past IQP teams. Existing projects which utilize Leaflet.js can be used to speed the process of learning the library rather than starting from scratch. This encourages future teams to use these same libraries, so they may benefit from a standardized GIS format.

Unlike other GIS, such as Google maps, Leaflet.js offers the most potential to be expanded upon by future accessibility teams.

## Appendix L.5 Leaflet-search.js

Leaflet-search.js is a Leaflet library plugin allowing a search bar to be added to maps. It is a simple to install plugin which handles the search bar display and search interactions with the map. The search bar offers autocomplete, expanding and collapsing when being used and unused, and focusing on searched elements. The search bar is used to search for any element on the map, including bridges, islands, and boat stops, and provide a clear marker informing the user where the searched element is located.

## Appendix L.6 Fuse.js

Fuse.js is a Javascript library allowing “fuzzy-searches” to be performed on lists of strings. “Fuzzy-searches” refer to searches of a string that do not need to be the exact word in

order to locate the desired string. The library also provides a dropdown list of potential search results based on how closely they match what the user typed. This library is used to give the search bar on the map a fuzzy search so that a user can easily look up an element on the map even if what they typed in is not the exact name of the element they were searching for or if it was spelled incorrectly.

## Appendix L.7 ResponsiveVoice.js

ResponsiveVoice.js is a Javascript library granting text to speech functionality to applications. The ResponsiveVoice.js library provides simple text to speech integration into existing applications making it easy to integrate into any website. ResponsiveVoice.js offers a wide selections of voices with various sets of accents such as British, Italian, and French. These voices also come with adjustable speed, pitch, and volume making these voices customizable to any user's needs. This library is used to provide the team's website with text to speech functionality to accommodate those with vision impairments who have difficulty reading text or images on screen. The library is free to use for non-commercial websites, like the website the team created, but does require an annual fee for commercial usage.

## Appendix L.8 Bootstrap.js

Bootstrap.js is a Javascript library granting user access to a variety of interacting elements such as image carousels. Images carousels are heavily used of the website because they provide a method of storing and grouping images to convey visual information about the subject the images are depicting. For example, image carousels are used to present images of each bridge allowing a user to see the accessibility accommodations of the bridge rather than simply being told those accommodations exist without visual evidence.

## Appendix L.9 Parallax.js

Parallax.js is a Javascript library which creates fixed image backgrounds with mirror elements creating the illusion of depth to the image. Parallax.js gives a visually pleasing aesthetic to what would normally be a still image background. This gives the team's website a modern feel which catches the attention of those on the website encouraging them to continue exploring all the pages the website has to offer.

## Appendix L.10 Font-Awesome.css

Font-Awesome.css is an online styling sheet providing users access to a wide variety of symbols and icons. These symbols range from basic and simple to detailed and complex giving users the option to choose the symbols that fits their exact needs. These symbols provide the team's websites with alternatives ways to convey information that doesn't rely solely on text.

Alternative ways to convey information are essential for those with vision impairments who may not be able to read small text and for those who may not speak the language the text is written in.

## Appendix L.11 GoogleAPI.css

GoogleAPI.css is an online Google styling sheet allowing users to display customized fonts for web applications. The GoogleAPI.css gives developers the opportunity to choose from a wide collection of fonts to match the aesthetic of their applications'. GoogleAPI.css offers san-serif fonts which serve as an integral element of the team's website due to their simplistic design making them appropriate accommodations for those with vision impairments.

## Appendix L.12 Unsplash

Unsplash is an open source collection of professional images available online. It allows users to search for the exact images they're looking for and integrate them into any application without having to worry about copyright claims. These professional images provide a profession feel and tone to an application while also giving a visually appealing aesthetic.

## Appendix M: Pathfinding

### Appendix M.1 A star (A\*) Algorithm

An A\* algorithm is a type of pathfinding algorithm that generates the shortest path based on the lowest "cost" of how to get from the starting an ending nodes. For an in depth look into the A\* algorithm, look here [A\\*-Search-Algorithm](#).