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Accessibility for Everyone

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Accessibility for Everyone: A Framework for Teaching Accessibility to Web Developers

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The signatures of the individuals below indicate that they have read and approved the project of Daniel Newell in partial fulfillment of the requirements for the degree of Master of Science in Applied Computer Science.

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Abstract

Computer accessibility is defined in this context as the accessibility of a computer system to all people, regardless of disability type or severity of impairment. As developers we are taught how to build a table for any styling, but not taught how to make sure that table could be used by an individual with a visual impairment. Naively, we are sometimes under the impression that we don't need to or even can't solve the needs of all individuals when it came to common software, and boy are we wrong.

It is our responsibility and privilege as developers to create software that works for all individuals and in all situations to the best of our ability. This application's primary focus is to further the education for designers and developers alike in the accessibility needs of our users. This application goes through a brief history of accessibility, includes many resources for implementors, and includes a series of lessons intended to increase the knowledge of the accessibility needs of users and give tips and tricks of how we can solve them. It by no means is a comprehensive guide of all that pertains to accessibility but an excellent starting point for individuals who are looking to see how they can better support all of their users through technology.

Introduction

The web is an everyday tool that is more and more becoming an essential part of modern life. It is our responsibility as developers to ensure we are making the web an inclusive place for all of its users regardless of how those users interact with it. Accessibility allows us the opportunity to bring in new customers, and to comply with legal and international standards for web experiences. The World Wide Web Consortium (W3C) has defined a specific set of requirements that need to be followed when creating web applications.

Contrast

Contrast is defined as the state of being strikingly different from something else in juxtaposition or close association. Which means that in order to have good contrast we need to have different colors placed close to each other when designing and developing our applications. This is important for a wide variety of impairments such as color blindness, visual deficiencies and even screens with poor color resolution.

Color Usage

Color usage is extremely important when it comes to accessibility. It can be used to differentiate boundaries as well as convey messages. But as with every accessible feature the goal is to ensure that all users can access whatever information is being conveyed by the color choices.

When we think about color, we often think about supporting people who experience “Color Blindness” but there are many other types of individuals that need to be considered, like the following:

- Users with partial sight often experience limited color vision
- Some older users may not be able to see color well
- People using text-only, limited color, or monochrome displays may be unable to access color-dependent information
- Users who have problems distinguishing between colors can look or listen for text cues
- People using Braille displays or other tactile interfaces can detect text cues by touch

Interactive Elements

The most important feature when it comes to interactive elements is to make them easily identifiable. Developers need to make sure that whatever disability the user is working with, they understand that a button is a button, and a link is a link, and a form element is a form element. There are an infinite number of ways to accomplish this and there are new designs coming out daily that make it easier and easier for a user to identify these elements.

Navigation

Navigation is one of the most imperative elements when it comes to creating an accessible site. Navigation elements are the main capability that allow users to traverse and navigate a web experience. Even users without accessibility needs have experienced how difficult it is to navigate a web experience if they can't understand how to move around. It can be off putting and frustrating and can cause users to abandon the experience all together. Navigation is also something that can change drastically between different screen sizes. Often time how you navigate a desktop experience can be very different then how you navigate a tablet experience and how you navigate a tablet experience can often be very different then how you navigate a mobile experience.

User Feedback

There are many ways in which we can provide user feedback, such as confirming form submission, alerting the user when something goes wrong, or notifying the user of changes on the page. Applications should clearly identify important feedback that requires user action and should be present it in a prominent style. It is important that we are offering multiple feedback cues to our users as well as offing those feedback cues in a consistent manner. A quick example of this is would be having a common error messaging system.

Spacing

When it comes to spacing, we want to make sure that we have sufficient spacing around elements that need to be identified. One easy example is the text of a button. A button presumably has an outline, and we want to make sure that the button outline does not interfere with the user's ability to read the text of that button. As a developer we accomplish this using padding in the element to unsure a sufficient amount of space between the text and the border. We also want to make that the button is spaced properly from its neighboring elements which gives the user not only a good view, but also a large enough of a clickable area to make the button easier to use.

ARIA (Accessible Rich Internet Applications)

The acronym ARIA stands for Accessible Rich Internet Applications, and it is set of HTML attributes that developers can use to give their users a more accessible experience. It supplements HTML so that interactions and widgets commonly used in applications can be passed to assistive technologies when there is not otherwise a mechanism. For example, ARIA enables accessible navigation landmarks in HTML4, JavaScript widgets, form hints and error messages, live content updates, and more.

Accessibility for Everyone

Web accessibility as a topic and a set of standards has been around for quite some time now, but many developers are still unaware of the standards in general and are vastly unaware of how to make their application comply. This capstone project consists of a web

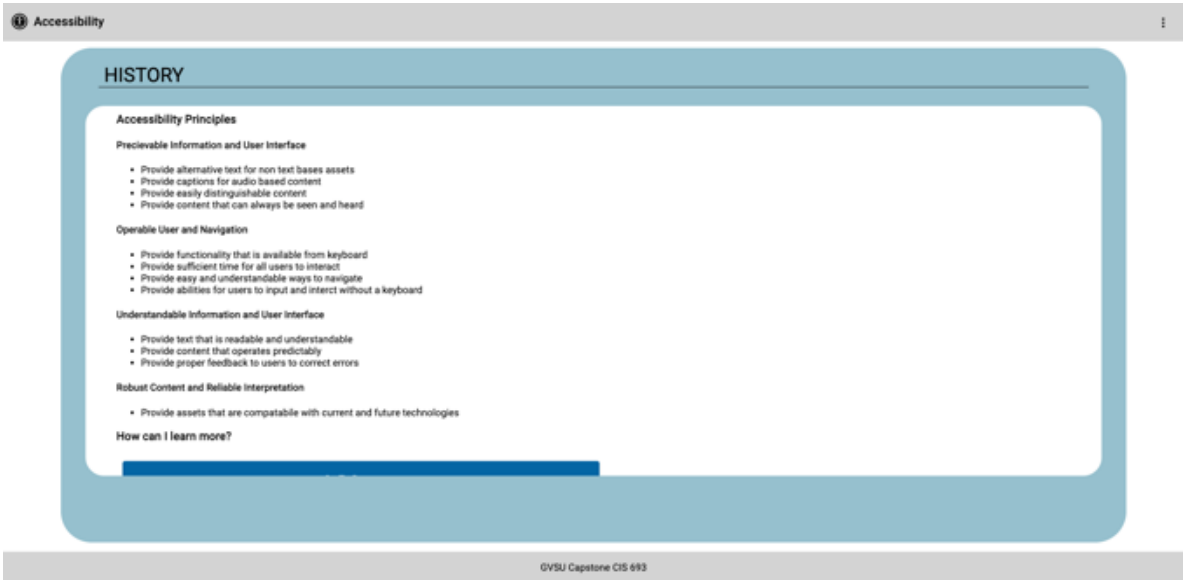
application that addresses the education of those developers and attempts to inform them of key topics around accessibility by providing history, resources and online learning modules to educate developers. This web application is an Angular 10 application built using Angular Material Design standards. It is hosted on an Amazon Web Services (AWS) S3 bucket. The application is data driven using various JSON objects to populate the content and overall experience of the site, allowing it to easily grow and incorporate new lessons, and resources, creating a fuller richer user experience.

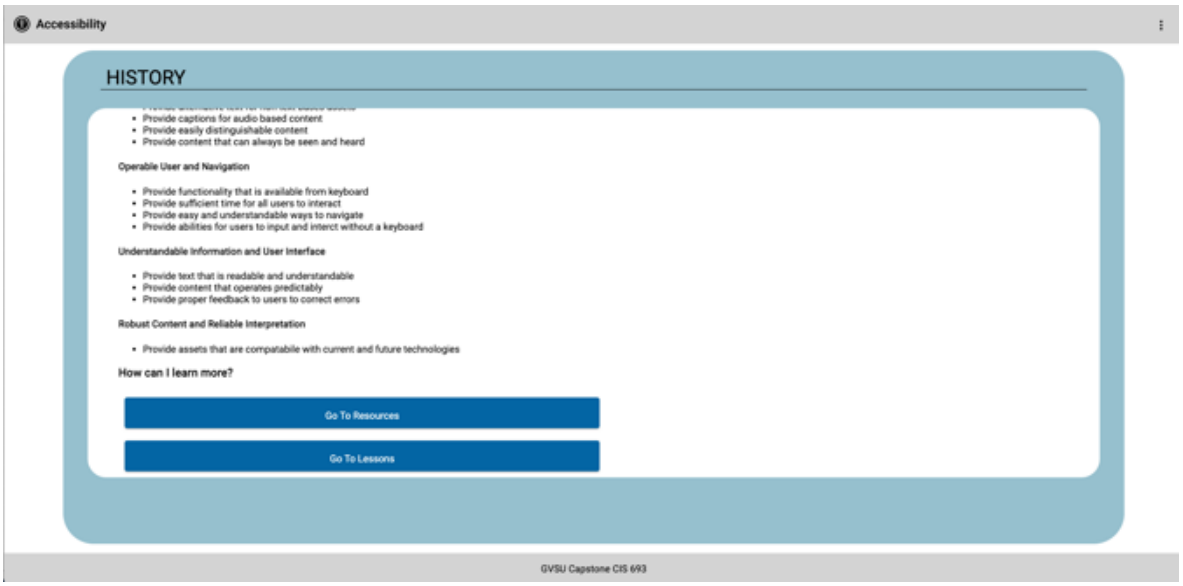
History

These screenshots include view of the history page within the application. As you can see it covers topics including what is accessibility, who sets accessibility standards and what are some core accessibility principles.


Accessibility
HISTORY
What is Accssibility?
In modern life the web has become much more than a convenient tool or a collection of nice to have features, it has become an everyday essential part of life. Maybe your work email comes to your phone, or you stream the latest news, pay your bills online, or use apple maps to get from you home to the grocery store, you are in fact using the web. This is why is has become imperative to make sure that the web is usable by all individuals, even those suffering from various disabilities. It is our responsibility as designers and developers to ensure that the web is inclusive to everyone.
*The following content is taken from Web Accessibility Initative
Web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them. More specifically, people can:
perceive, understand, navigate, and interact with the Web
contribute to the Web
Web accessibility encompasses all disabilities that affect access to the Web, including:
auditory
cognitive
neurological
physical
speech
visual
Web accessibility also benefits people without disabilities, for example:
people using mobile phones, smart watches, smart TVs, and other devices with small screens, different input modes, etc.
older people with changing abilities due to ageing
people with "temporary disabilities" such as a broken arm or lost glasses
people with "situational limitations" such as in bright sunlight or in an environment where they cannot listen to audio
people using a slow Internet connection, or who have limited or expensive bandwidth
GVSU Capstone CIS 693

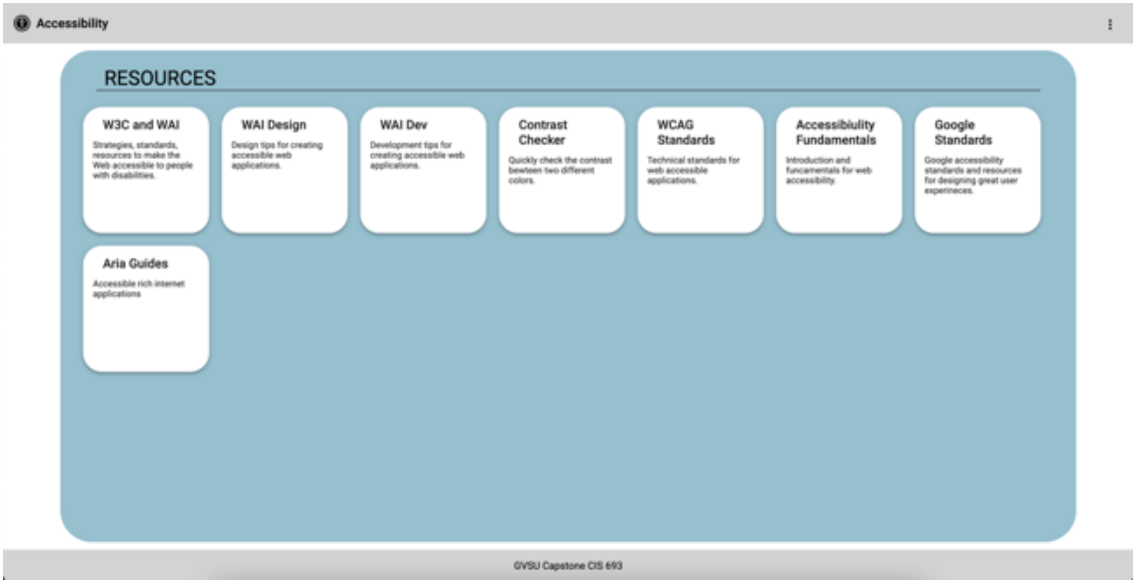

Accessibility
HISTORY
Who sets Accessibility Standards?
There are a couple sets of standards when it comes to web accessible guidelines, but the most notable guidelines are the WCAG 2.0 Standards Which were release in 2008. They are internationally recognized as a gold standard for making web application accessible to the widest range of users and disabilities.
These standards are created an maintained by World Wide Web Consortium (W3C) which is an international organization designed to help design web application standards.
Accessibility Principles
Precievable Information and User Interface
Provide alternative text for non text bases assets
Provide captions for audio based content
Provide easily distinguishable content
Provide content that can always be seen and heard
Operable User and Navigation
Provide functionality that is available from keyboard
Provide sufficient time for all users to interact
Provide easy and understandable ways to navigate
Provide abilities for users to input and interct without a keyboard
Understandable Information and User Interface
Provide text that is readable and understandable
Provide content that operates predictably
Provide proper feedback to users to correct errors
Robust Content and Reliable Interpretation
GVSU Capstone CIS 693





Resources

This screenshot is a view of the resources page of the application. This page includes various helpful resources and tools to give the user further detailed knowledge around different accessibility topics.



Lesson Example

These screenshots show the 7 lessons the application provides. Below you can see an example of a single lesson. All lessons follow the same general format as it is the content of the lesson that changes. The first two screenshots show example of the reading section of

the lesson. This is where the user can educate themselves on that specific topic. The next screenshot is the quiz portion of the lesson, where the user will be asked a series of multiple-choice questions on the given topic. Lastly a certificate is given showing the user they have completed the lesson.


Accessibility
1 Reading / Example
2 Quiz
3 Certificate
ARIA
What does the acronym ARIA stand for
Accessible Rich Internet Applications
Accessible Reliant Information Applications
Automated Reliance of Internet Accessibility
Automated Rich Internet for Accessibility
Which is not a key rule to remember with ARIA attributes
Use native elements where you can use them
All interactive elements must have an accessible name
HTML elements must have a limit of 3 AIRA attributes
Do not change native semantics, unless you really have to
Live Example
Next
Previous
GVSU Capstone CIS 693


Accessibility
1 Reading / Example
2 Quiz
3 Certificate
Congratulations
You have completed the following course:
ARIA Attributes
Live Example
Next
Previous
GVSU Capstone CIS 693

Project Management

For the project management I operated in a Kanban approach. I had a list of tasks that were prioritized in the order in which I need to accomplish them. I estimated each task and added a brief acceptance criterion so I could understand when that task was “completed”. I had weekly reviews with my advisor where we discussed the previous weeks progress as well as what was to be accomplished in the next week.

Organization

There are two major pieces in my project. The first was the main infrastructure of the application. I chose to create an Angular 10 application that would be deployed onto an AWS S3 bucket to be hosted. This was the bulk of the work to make sure these capabilities were functional. The three main capabilities I had to build were a history component, a resources component and a lesson component. I wanted these components to be data driven so the could grow overtime. The second piece of work was the content. I had to build the content of each component to complete the experience. The history was a brief history of accessibility, the resource component was a collection of useful accessibility resources and the lesson component was populated by JSON data that the application contained, one JSON file per lesson.

Reflection

This was a project that I was passionate about, however was a little naive about the scope of what I originally wanted to accomplish. Accessibility being such a large topic it was difficult to narrow down the key areas the project could focus on. As with everything, there was a deadline to meet and I quickly learned how I needed to scale back the scope in order to meet it. Looking back there was a little more time spent on the workings of the application, opposed to the content, than needed.

Conclusions

This project taught me a great deal about not only about accessibility but also about UI development in general. One of those most interesting takeaways from learning about accessibility is that often times, the improvements that we make for accessibility purposes are not just beneficial to users with different disabilities but tend to create richer and more helpful user experience for all users. This project accomplished a great deal including creating a working data driven application that includes lessons, history and various other resources. It includes seven lessons of various accessibility topics. At this time there are a coupe minor issues including aa small bug for the navigation menu items. They are not updated until the application is refreshed, even though they should be updated in real time. In the future I will continue to expand the lesson plan including more detailed lessons for users to continue their accessibility education. As this is an ever-growing topic this application needs to continue to grow and refresh the lesson plan with the needs of accessibility users.