Visibility Tile Flip Documentation

Stream C Dynamic Destroyer

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Introduction

There are approximately **285 million people** who are **visually impaired** in the world and 39 million of them are blind (WHO, 2010). Visual impairment affects a large part of the global community yet despite the opportunities that new technologies have on improving their lives, people with visual impairment continue to face a world that is primarily not built for them.

Due to this, people with visual impairment are not only physically limited but often have challenges with communication and mental health problems with isolates them from the mainstream community. The loss of one's vision severely impacts those who are experiencing it first hand and those around them. We wanted to draw awareness to visual impairment, so it is important to understand what they are going through in order to solve any problems that they have.

Our research found that vision loss affects the quality of life, ability to travel, and sense of independence, along with significant financial costs. Vision impairment affects tasks such as reading, socialising, and pursuing leisure activities as well as basic daily activities (Brown et al. 2014). Outside the house, people with visual impairment are not benefited by many of the visual experiences in urban environments, and as such the general public lacks understanding of how to approach and help those with visual impairment.

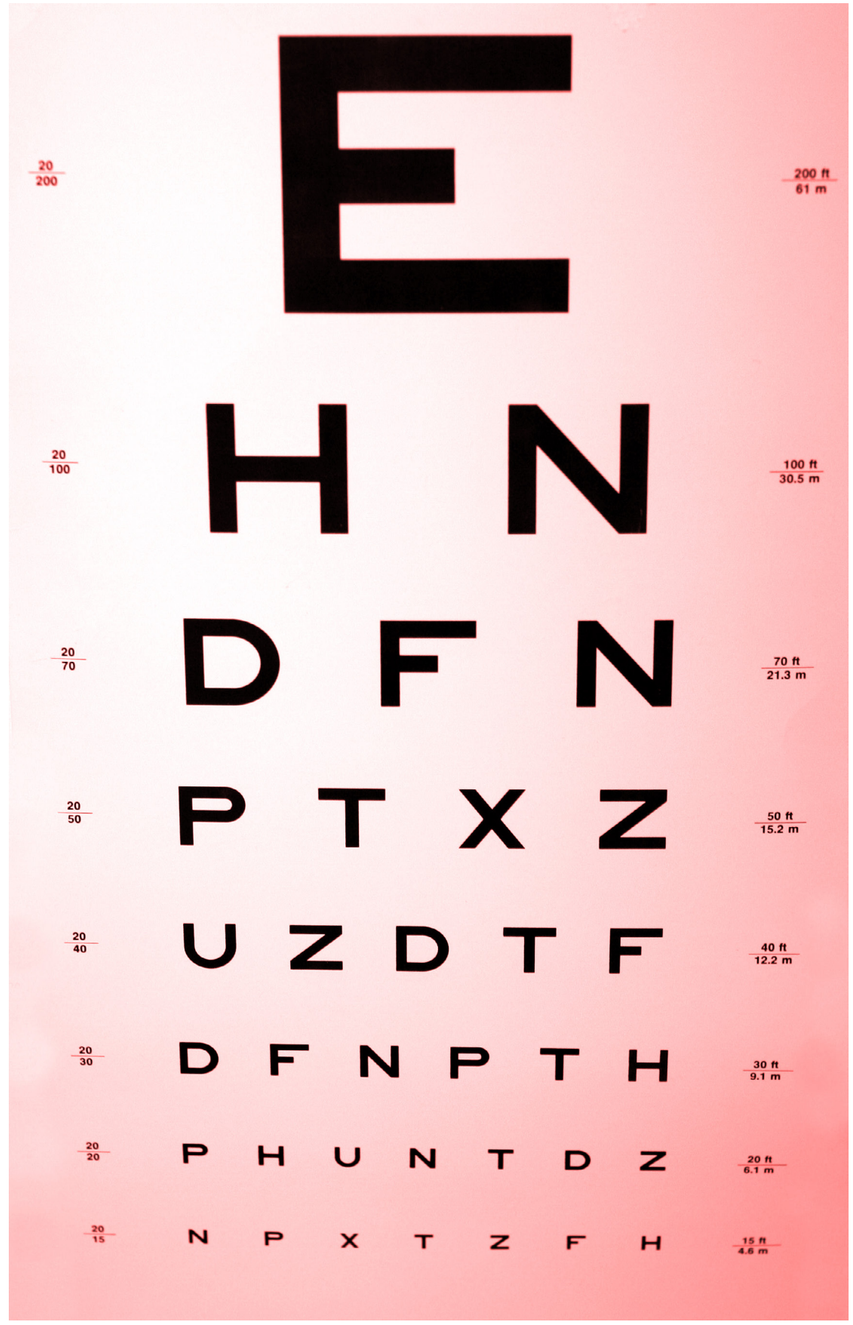
http://www.apprenticeshipguide.co.uk/rehabilitation-worker-visual-impairment/

Technologies for Awareness

Technologies such as virtual reality and interactive displays have been used for disability awareness but these are often challenged in public space. Virtual reality and game simulations has been effective in helping people empathise through simulated blind experiences (Henry, Brown, Tang & Hanneghan, 2015). This however, lacks further action and community engagement in a public space. Interactive displays have been useful in gaining attention, though need to consider continuous engagement with audience, intuitivity, and the impact of the message delivered (Parra, Klerkx & Duval, 2014).

Therefore, we saw a need for a design that would engage with a wider audience to reflect experiences of visual impairment.

Our design for **Visibility Tile Flip** aims to educate people with sight on visual impairment through empathy, and how to help them in their everyday scenarios through short and simple activities in a multi-sensory format.



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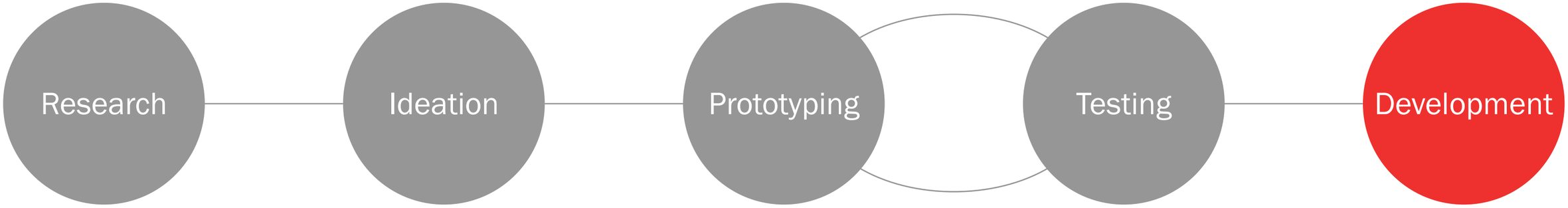
Overview of Design Process



Research report and initial concepts

Narrowing down initial concepts, low-fidelity prototypes, user testing and iterations towards final concept

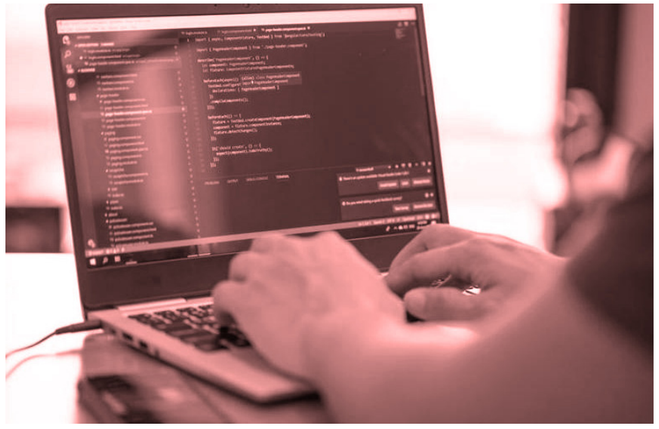
Implementation of final concept

Research on implementation

We decided to implement our prototype in Godot due to the ease of learning the software. Unity was initially considered but decided against because of the steeper learning curve of the C# language compared with the Python-like GDScript of Godot.

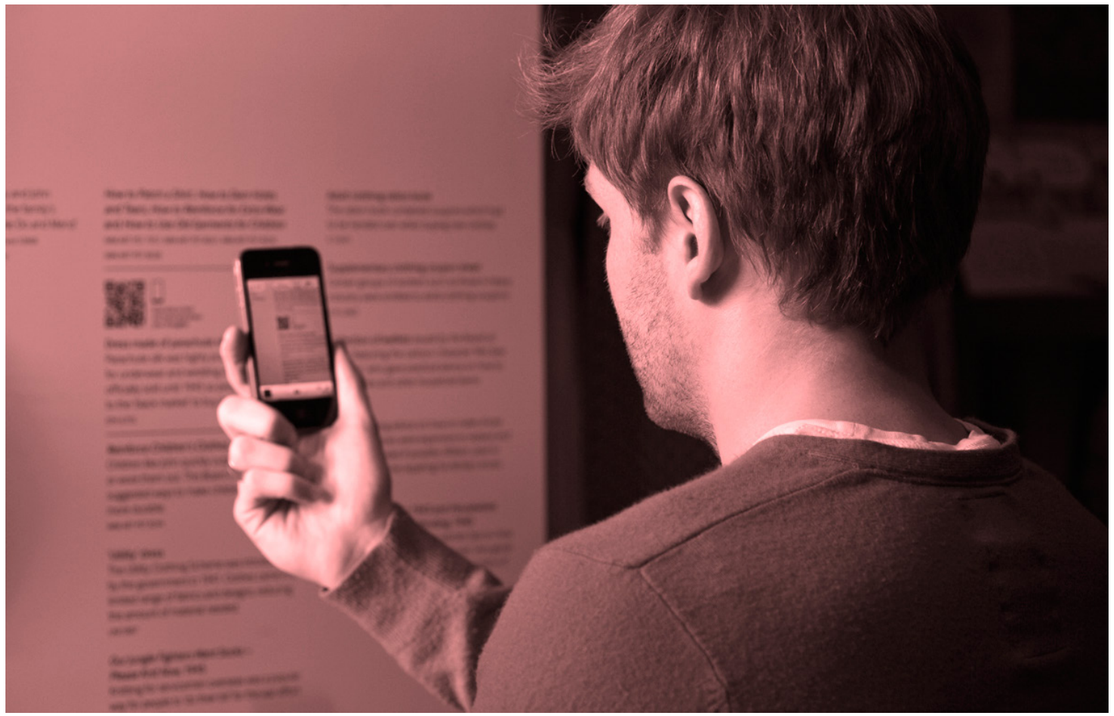
Iteration and testing

Before working on our final product we decided to add elements to our game and test with our users, whether or not the changes were beneficial. These included the addition of activities and other modes of interaction, like augmented reality. The changes were well received as it made the game more interesting and we considered adding in these functionality.



https://www.techrepublic.com/article/how-to-get-a-developer-job-the-best-programming-languages-to-learn/

Overview of Design Process



https://clairebaileyross.com/2012/06/11/what-does-success-look-like-for-museum-qr-code-usage/

Development

Development was more complicated than initially thought and it was quickly realised that if we wanted users to interact with the display via QR code we will need to host the game on a web server. The host that was chosen was Heroku for our programmer's familiarity with the platform. This involves developing an API which the Godot client will communicate with to display whenever the user decides to drop in. The API was written in Node.js. It also involves creating a persistent database to allow for drop-in play and was written in Postgresql.

More innovative features were thought up but regrettably were not able to be realised as most of the time was spent on developing the core functionality of the initial design. More information on these features can be found in the future revisions section.

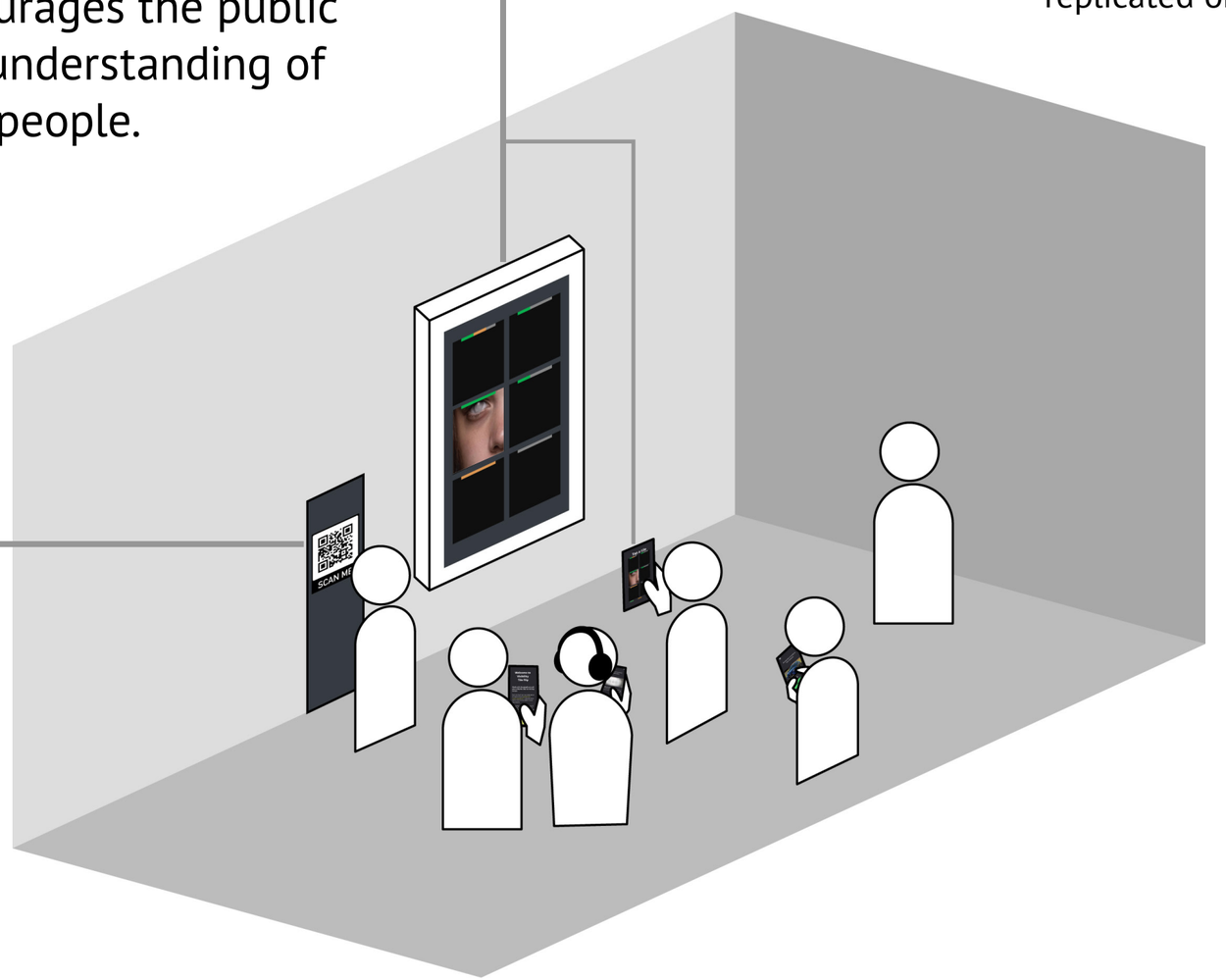
Core Functionality

Visibility Tile Flip is a public installation in the form of a large screen that encourages the public to work together to gain a new understanding of the struggles of vision impaired people.

The installation will be located in a large crowded space such as a shopping centre to encourage the community to interact with it in a familiar and relaxed environment.

1 QR Code Stand

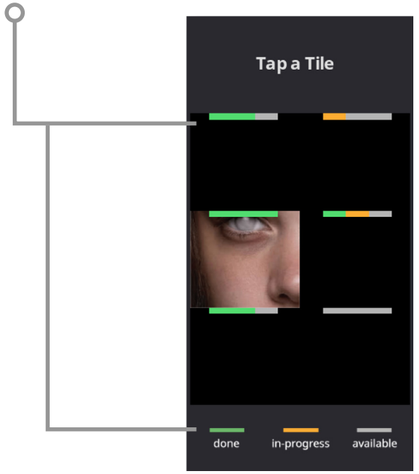
A stand is located in beside the installation where passersby walk up to it due to curiosity. On the stand is information about the installation and vision impairment as well as a QR code where users can scan using their mobile device to be taken to the welcome screen.



2 Tiles Screen

Once they read the instructions they can proceed to a screen which displays 6 tiles which are replicated on the large screen.

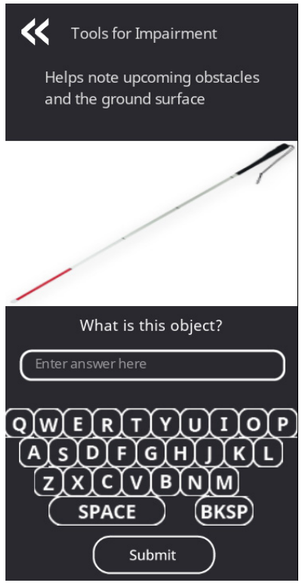
Users will notice a progress bar which indicates which tiles are currently being worked on and completed.

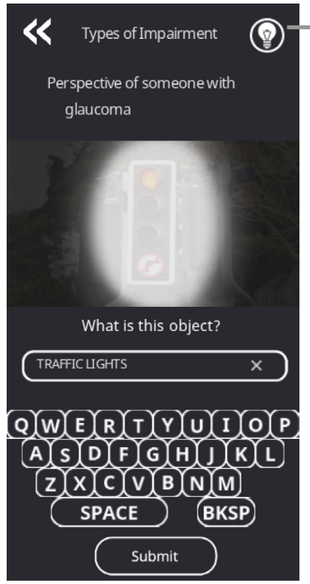


Core Functionality

3 Tile Activities

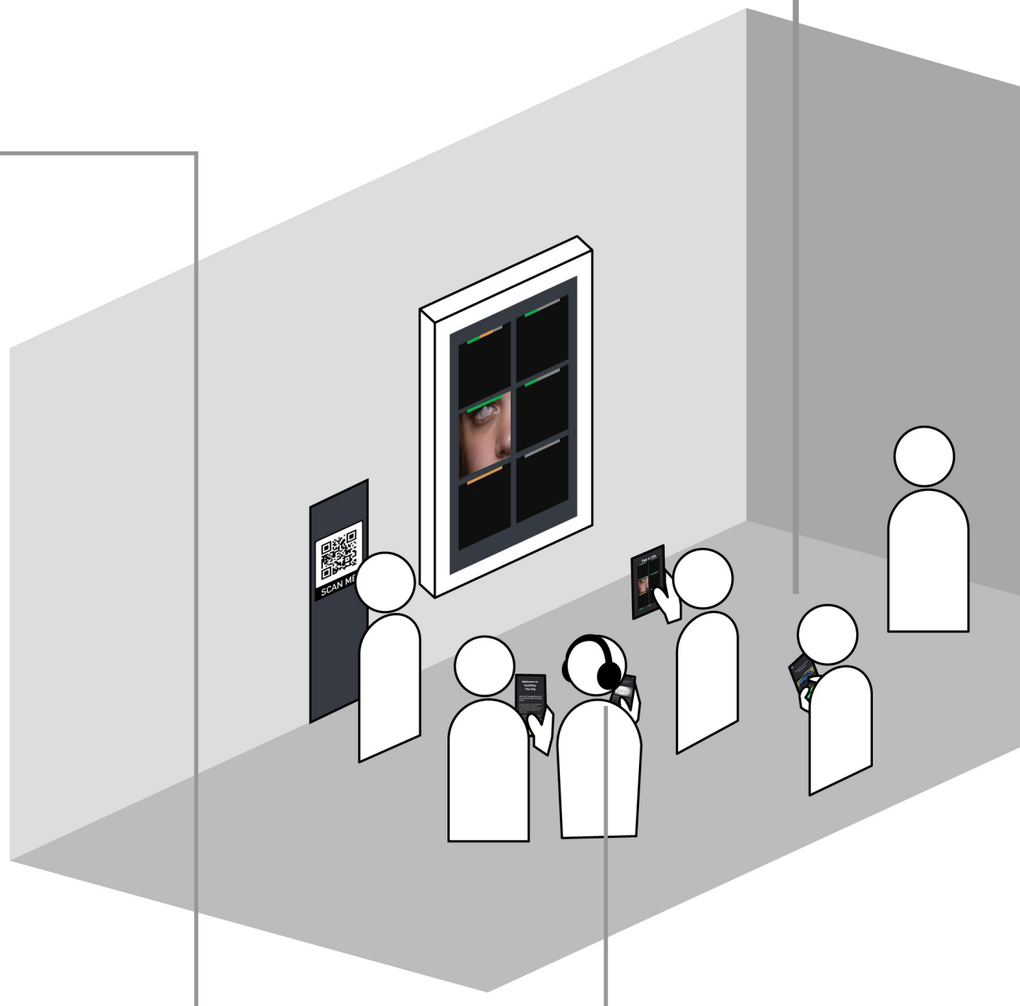
By tapping on a tile, users are prompted to complete a small guessing object activity.





2 different activities:
identifying assistive visual impairment tools and objects through lens of impairments.

Tapping on the lightbulb in the top right will provide a hint in the form of audio feedback to help you.



4 Working to Completion

Once they complete the activity, a progress bar above the respective tile will turn green to indicate that it has been completed. The progress bar requires 3 correct attempts to complete, encouraging you to work with the people around you. Filling the bar will flip the respective tile revealing part of an image.

By flipping all the tiles a simple message about how to approach and assist people with vision impairment will be displayed, which will hopefully evoke empathy towards them.

Application Screen Flow

Heroku Server

GET board state
board state

PUT board state,
reset all values

PUT board state,
tile[x, y] is flipped

GET request sent to server for the board state

Client receives the board state shows it to the user

Client displays a random pair of objects and impairments

If the answer is incorrect the client displays an error.
If the answer is correct, the client displays a confirmation and the server is updated.

The client uses the board state provided by the server to update the game screen.

Once a tile has been solved three times it will flip and display a part of an image.

Once all tiles are flipped and the larger image is displayed, an informative screen will be displayed afterward.

Welcome Screen

Welcome to Visibility Tile Flip

Work with the people around you to flip the tiles on the big screen.

Each tile has 3 mini activities about an experience of people with visual impairment. Complete all of them to learn more about visual impairment.

A progress bar appears on top of every tile. A green means one of the activities are complete. Orange means someone is working on the tile.

Have fun and be kind!

Join the Game

Tiles Screen - Initial State

Tap a Tile

done in-progress available

Puzzle Screen

Types of Impairment

Perspective of someone with glaucoma

What is this object?

Enter answer here

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
SPACE BKSP

Submit

Puzzle Screen - Typing Answer

Types of Impairment

Perspective of someone with glaucoma

What is this object?

TRAFFIC LIGHTS

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
SPACE BKSP

Submit

Puzzle Screen - Correct Answer

Types of Impairment

Perspective of someone with glaucoma

TRAFFIC LIGHTS

CORRECT!

Return to Tiles

Puzzle Screen - Typing Answer

Types of Impairment

Perspective of someone with glaucoma

What is this object?

CAT

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
SPACE BKSP

Submit

Puzzle Screen - Incorrect Answer

Types of Impairment

Perspective of someone with glaucoma

What is this object?

Incorrect! Try Again

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
SPACE BKSP

Submit

Plays a soundbyte to help the user identify the object

Tiles Screen - Tile Flipped

Tap a Tile

done in-progress available

Informative Screen

Approach:
if you suspect someone may need a hand, walk up, greet them and identify yourself

Ask:
"Would you like some help?" The person will accept your offer or tell you if they don't require assistance

Assist:
listen to the reply and assist as required. Not all people who are vision impaired will want assistance - don't be offendend if your assistance is not required

Keep the blind in mind.

Back to Board

The server is notified that all the tiles have been flipped and wil reset the board state.

Requirements

Hardware

- Large external screen
- Laptop
- HDMI cable
- Internet-connected mobile device

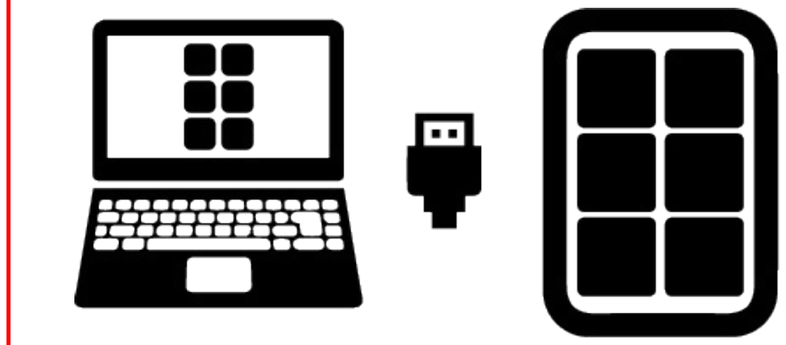
Software

- QR code reader installed on mobile device
- Internet browser

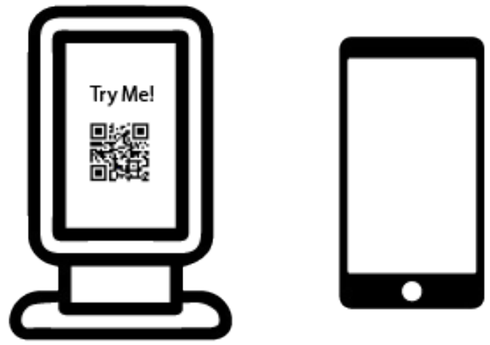
Set-up instructions

For the setup of the large screen, an external screen needs to be connected to a windows laptop with a HDMI cable connecting the two. The file from https://github.com/uknable/multiplayeraround/blob/master/visibilitytileflip.exe should be downloaded onto the laptop. Navigate to the downloaded visibilitytileflip.exe file and run it on the laptop. Once you click the “Join Game” button, the tiles progress of the game will be replicated on the the large external screen.

For gameplay, users need to have an android device which is connected and able to access the internet as well as have a QR code reader installed on their mobile device. When users scan the QR code with the QR code reader, they are taken to https://uknable.itch.io/3200a3 where can access the Visibility Tile Flip game.



Connect laptop to an external screen via HDMI cable



Make sure you have a mobile phone and QR code reader

Known Issues

Currently the game does not work on ios devices due to the “itch.io” website not being compatible with it. When users with an apple device scan the QR code, it will display a loading symbol infinitely. As a result, it is better to use an android device when interacting with the installation.

Future Work/Versions

Augmented Reality

For future versions, we would like to implement augmented reality into the app so that users have more to interact with rather than just screen based activities. We want them to really empathise for people with vision impairment by changing the way they perceive everyday objects when interacting in an environment.

However due to time constraints of the assignment, we were unable to implement it into the app. Another issue that prevented the implementation of augmented reality was the gaming engine we used. Although still very new, augmented reality is still being tested in Godot and we were not comfortable using it since there was not much resources and libraries available online.

Using AR would involve overlaying filters based on visualisations of types of vision impairment, over the footage from the user's device camera.

Adding animations to the app such as when tiles flip over would create more flow and aesthetics between screens rather than static screens. We also plan to add more interactive activities into the app to add engagement and hope that the user will be more inclined to remember the message at the end.

We imagine that Visibility Tile Flip could be implemented as an installation space in open public spaces such as shopping malls for future versions. This would make use of gathering people and gain more widespread attention than within a room.

Bibliography

World Health Organisation. (2010). Global data on visual impairment. Retrieved from https://www.who.int/blindness/publications/globaldata/en/

Brown, J., Goldstein, J., Chan, T., Massof, R., & Ramulu, P. (2014). Characterizing Functional Complaints in Patients Seeking Outpatient Low-Vision Services in the United States. Ophthalmology, 121(8), 1655-1662.e1. doi: 10.1016/j.ophtha.2014.02.030

Henry, John & Brown, Alex & Tang, Stephen & Hanneghan, Martin. (2015). Using Serious Games to Create Awareness on Visual Impairments. 165-170. 10.1109/DeSE.2015.65.

Parra, G., Klerkx, J. and Duval, E. (2014). Understanding Engagement with Interactive Public Displays. Proceedings of The International Symposium on Pervasive Displays - PerDis '14.

Graphics

Iconfinder. (n.d.). 'Advertising exhibition stands' by Nadiinko. [online] Available at: https://www.iconfinder.com/icons/2663385/advertisement_advertising_display_exhibition_stand_icon [Accessed 29 Oct. 2019].

Iconhot.com. (n.d.). display Icons, free display icon download, Iconhot.com. [online] Available at: https://www.iconhot.com/icon/default-icon/display-5.html [Accessed 29 Oct. 2019].

Iconscout. (n.d.). Hdmi Icon of Glyph style - Available in SVG, PNG, EPS, AI & Icon fonts. [online] Available at: https://iconscout.com/icon/hdmi-219 [Accessed 29 Oct. 2019].

Joel, V. (n.d.). Server Icon. [online] Noun Project. Available at https://thenounproject.com/search/?q=server&i=2933788 [Accessed 29 Oct. 2019].

Soares, G. (n.d.). 'Everyday Activities' by Guilherme Silva Soares. [online] Iconfinder. Available at: https://www.iconfinder.com/icons/2132677/computer_laptop_notebook_pc_ultrabook_icon [Accessed 29 Oct. 2019].