Universal MR

Game Design Document

Done By: GG 1.3

View the vast, empty space from the perspective of mixed reality and fathom the wisdom and secrets of not just our solar system but the whole cosmos.

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Section 1

Introduction

This proposal for our Semester 2.2 Integrated Project, which is based on the XR Interactive World. Our group's (GG 1.3) proposed game is called "Universal MR," and it makes use of Mixed Reality via the HoloLens headset.

This proposal's primary purpose is to explain our group's application in terms of Introduction, Game Design, and UX Documentation.

Project Background

For our Interactive World, our group decided to utilize Mixed Reality. But because this is a graded project for school, we can't just come up with anything; we have to make sure the proposed idea complies with all of the module requirements. We made the decision to make "Education" our theme.

Design Rationale

The theme of the application is "Education" and the topic the XR Interactive World would be "Space". Education about our solar system for the next generation would be a fantastic idea. It is basic knowledge that one should know. Everyone can benefit from learning about the solar system, but young children in particular can develop a greater understanding of how unique and fragile Earth is. Understanding and safeguarding the uniqueness of the earth's resources will assist to ensure that it is safe and healthy for their generation to live on.

High Concept

Universal MR is an application that allow the use to educate themselves about the vast solar system. Interact and scaling planets for a better and close up view, engaging quizzes to test ones understanding and accurate information about topics relating to the solar system. To further proceed into the application, the user must participate in the quiz to test their memories and understanding of the respective planets.

If educational quizzes can be boring for some users, we decided to add another game for them to pump up their spirit from the wordy text with an arcade game.

*Incoming Asteroids are heading our way!! Our weapon system is currently offline; avoid them until our weapon come back online. *

Goals & Objective

- Educating users about the solar system and what's beyond in the depth of space.
- Ignite latent interest of science and astrology / astronomy.

Target Platform

Here is the device specification of the Hololens 2:

Display

Optics	See-through holographic lenses
Holographic Resolution	2k 3:2 light engines
Holographic Density	>2.5k radiant (light points per radian)
Eye – based rendering	Display optimization for 3D eye position

Visual Light Camera (VLC)

Specification	Design value (nominal)
Focal Length	1.08 mm
FOV (diagonal)	96.1 degrees
Coplanar (Both point forward and are parallel in view?)	Yes (for forward-facing VLC's)
Stereo Baseline	98.6 mm (for forward-facing VLC's)

Sensors

Head Tracking	4 visible light cameras
Eye Tracking	2 Infrared (IR) cameras
Depth	1-MP Time-of-Flight depth sensor
Inertial measurement unit (IMU)	Accelerometer, gyroscope, magnetometer
Camera	8-MP stills, 1080p30 video

Audio & Speech

Microphone array	5 channels

Speakers	Built-in spatial sound

Compute & Connectivity

System on chip	Qualcomm Snapdragon 850 Compute Platform
Holographic processing unit	Second-generation custom-built holographic processing unit
Memory	4-GB LPDDR4x system DRAM
Storage	64-GB UFS 2.1
Wi-Fi	802.11ac 2x2
Bluetooth	5.0
USB	USB Type-C DRP

Power

Battery Life	2-3 hours of active use. Up to two weeks of standby time.
Battery Technology	Lithium batteries
Charging Behaviour	Fully functional when charging
Cooling Type	Passively cooled (No fans)
Power Draw	In order to maintain/advance Internal Battery Charge Percentage while the device is on, it must be connected minimum to a 15W charger.

Fit

Sizing	Single size with adjustable band. Fits over eyeglasses
Weight	566 grams

Target Types

Age Group: Minimum age is 7 years old (Primary 1)

Here are the player types that this application is catering or targeting at:

Explorer

The Universal MR's sandbox element will appeal to players that have the "Explorer" trait. In the space simulation, people are free to act anyway they like. playing games and quizzes, discovering new worlds to discover and learn about.

Achiever

Achievers like displaying their success to others and advancing their status by accumulating points and status. Anything, including video game points and quiz results, may be used as "Points" to make the comparison.

Killer

Killer takes pleasure in "defeating" other players in this game. If they can push others out of their present spot on the leader board, they will feel a sense of accomplishment and their competitiveness will be sated.

Unique Selling Points

- Other than educational purposes, it can be for entertainment.
- Interactive & Scalable Planets.
- Use of mixed reality.
- Engaging game for fun & competitive.
- Quiz to gauge student understanding of the course topic.

Section 2

Game Overview

Game Concept

Universal MR is a Mixed Reality application where it allows users to interact with a realistic hologram of our solar system. Allowing users to explore and learn about the vast universe of space, awakening users' innate curiosity in the workings of the universe and making them wonder what may be lurking in the wide expanse of space.

To keep the user interested in the learning process, there are quizzes that must be finished in order to access new planets to explore and also evaluate students' understanding of course material.

There is also a mini game where it is designed to improve students' attitudes toward learning rather than dull ways to study.

Genre

Education, Sandbox, Action, MR

Rating

(Everyone) ESRB

Platform Minimum Requirement

To develop for Hololens, your PC should meet the following specifications:

Hardware Requirements

- 64-bit Windows 10 Pro, Enterprise, or Education (The Home edition does not support Hyper-V)
- 64-bit CPU
- 8 GB of RAM or more
- In the BIOS, the following features must be supported and enabled:
  - Hardware-assisted virtualization
  - Second Level Address Translation (SLAT)
  - Hardware-based Data Execution Prevention (DEP)
- GPU (The emulator might work with an unsupported GPU, but will be significantly slower)
  - DirectX 11.0 or later
  - WDDM 1.2 driver or later

Synopsis

Explore the vast ocean of space, interact with the planets to learn more about them. Complete quizzes to test your understanding of the respective planets and unlock new planets to explore.

Game Objective

Current Development

The objective of the application is to allow users to learn about our solar system, participate in quizzes and games.

Upcoming Development

Other than learning about our solar system, we could lean to more advance form astronomy. For example, constellations, study of the universe and its contents outside of Earth's atmosphere and many more.

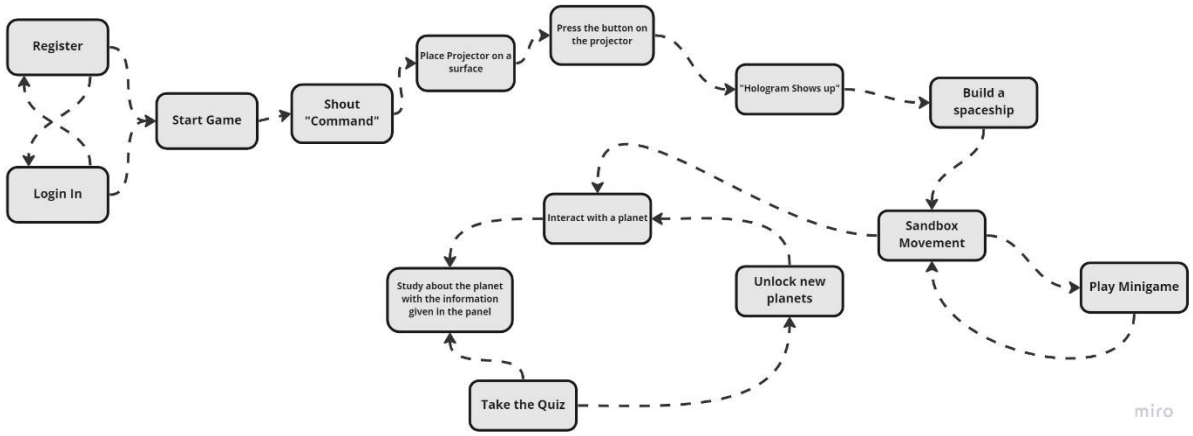
Game Rules

The application is in an interactive mixed reality setting. A holographic projector will emerge in front of the user once they say "Start." By grabbing it, setting it on a table, and pressing the projector's button, a lifelike hologram of the solar system will appear. Each planet in the solar system rotates for a specific amount of time as it travels around the sun.

Users are able to interact with the planets via grabbing or air tapping it. After selecting a planet, the solar system will vanish to let the user concentrate on the specifics of the planet, and an information panel containing a description of the chosen planet will then display.

To access the next planet to explore, you must pass quizzes. There is a mini game where you are piloting a spaceship and heading towards a field of asteroids, it’s an endless game where you have to avoid asteroids till you die. The scores depict how long you last in the game.

Game Structure

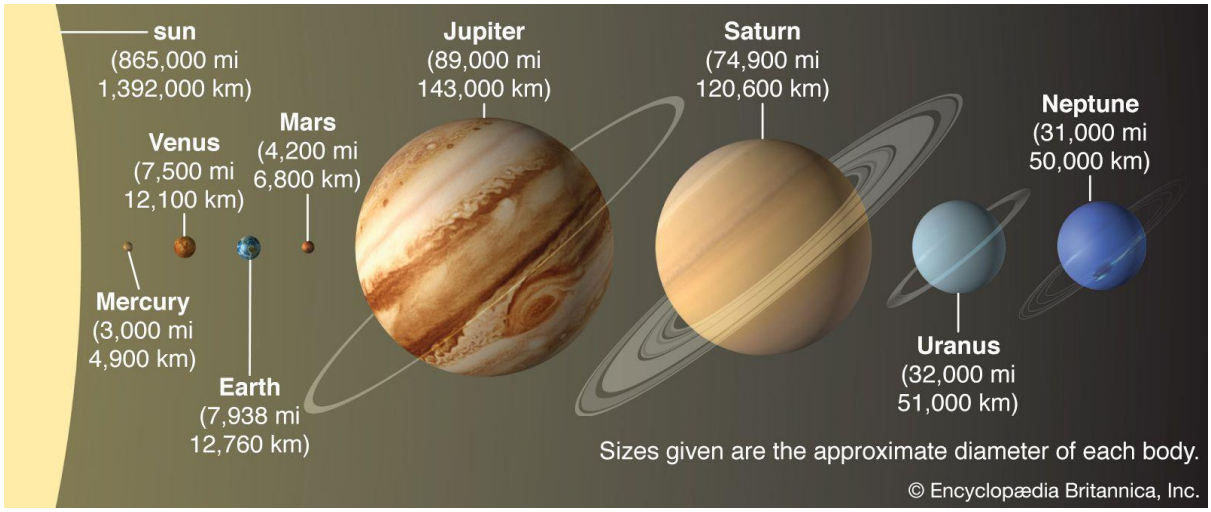


Gameplay

Character Line-Up

Planets

Planetary arrangements are calculated. We precisely replicated the solar system in our simulation.



Art

As a simulation, we keep it as real as possible, our planets texture design is not exactly similar but close enough to recognize the planet.

Level Design

We tend to gravitate toward the sci-fi motif for the educational application about "Space." Usually, innovative, and futuristic ideas are associated with sophisticated science and technology and space travel.

The solar system will appear as a realistic hologram from a projector that you can place at any flat surface.

Audio

We use these websites to tell users that they are login in or sign up.

- https://voicemaker.in/
- https://www.narakeet.com/app/text-to-audio/?projectId=82838538-da69-4b9d-9a8c-daaeb1a7b9b7

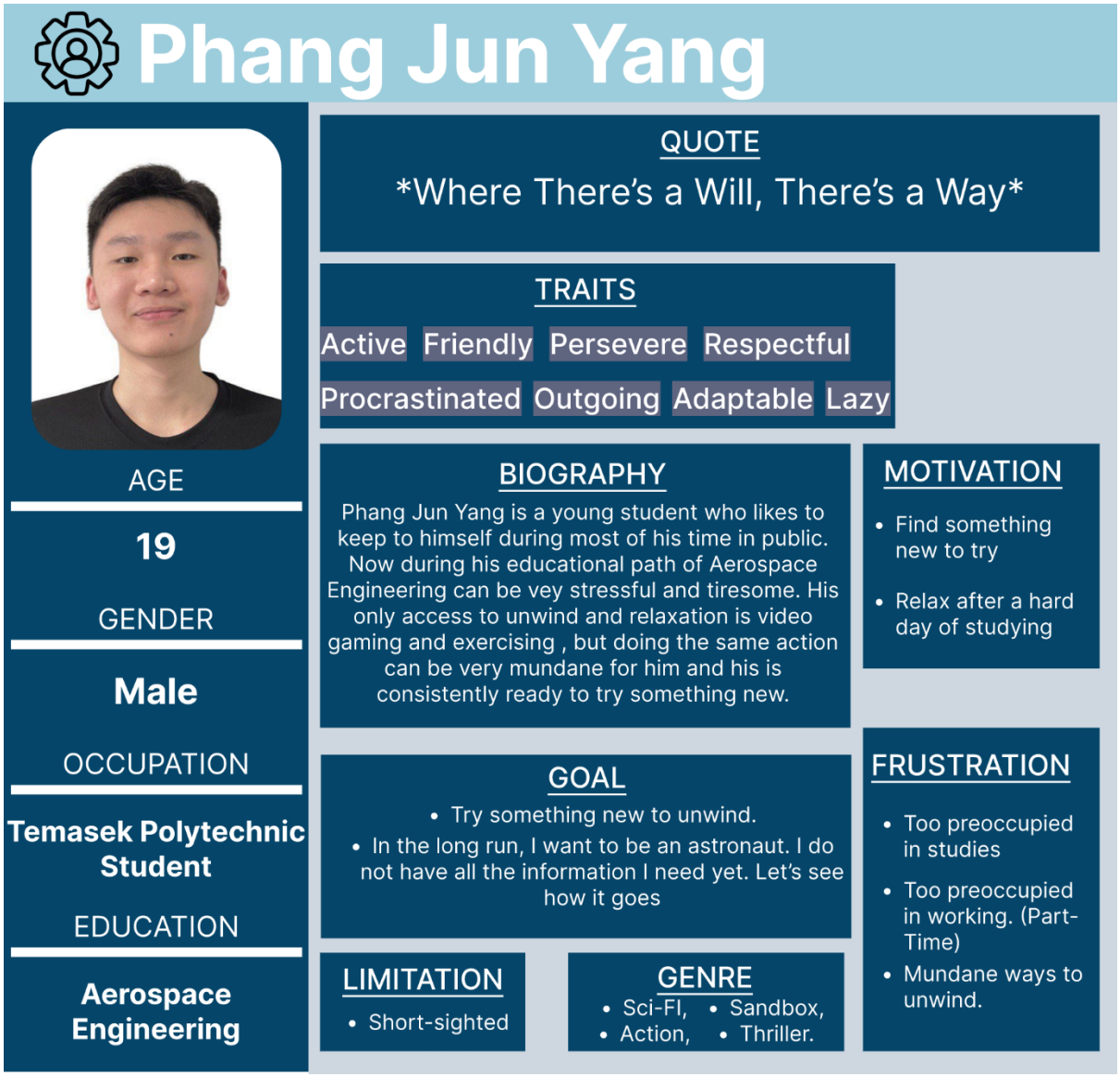
Wishlist

- Could have more different types of mini games.
- The application could have been more accurate, other planets also have moon not just earth.

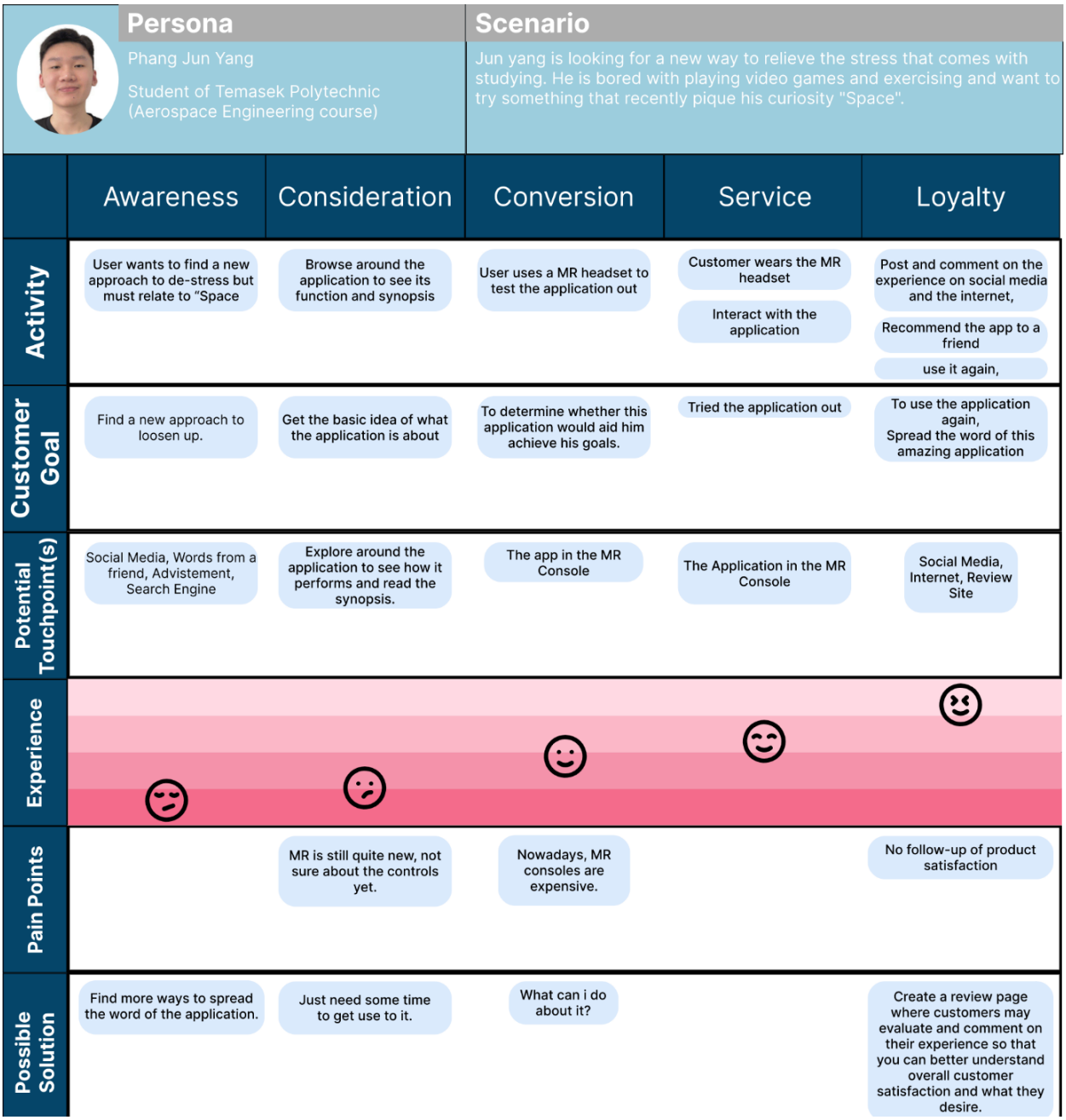
- The textures and appearance of each planet is good but could have done better if outside sources is available.
- We wanted to include the constellations, which are related to astronomy and have a side gig where you can view the stars of each constellation via a snow globe. Similar to how watch snow falls in a globe is so relaxing.

Section 3

User Persona



User Journey



Competitive Analysis

App Name	Pros	Cons
Stellar Sky – Planets Map 	• Voice Commands, • Detailed description and interesting facts of stars and constellations, • AR & VR mode implemented, • Awesome graphic of space and planets, • Support other languages,	• There are too many ads, • App will force close itself, • Limited access to those that did not buy premium,

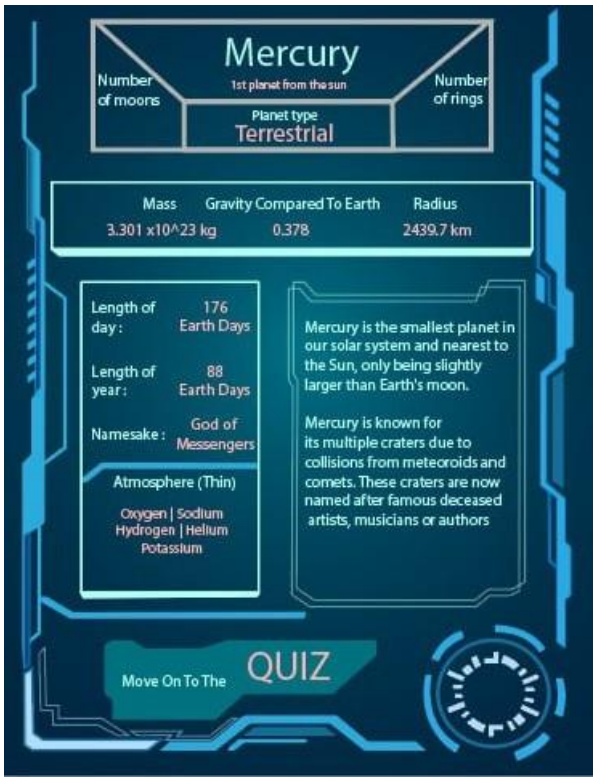
Pocket Universe: Virtual Sky Astronomy 	• Geared to newcomers to astronomy, • It shows planetarium view, showing the constellations in their proper position, • Stars and constellation quizzes, • Solar system motion around the sun, • 3D planets that you can spin,	• Provide no information on most stars, • Many duplicate questions in quizzes, • Some functions are amateurishly produced,
AR Solar System 	• Immersive experience and detailed information of each planet, • Enjoy the Augmented Reality of planets design, • Using Vuforia to create such a detailed solar system	• There might be some bugs in the system. Cannot see the other half of the solar system, • Control function is not labelled. • Not intuitive and no instruction, • Its teachers you more things other than the solar system, • Able to interact with the planets,

Supporting Research

Information UI

This application simulated space therefore “Sci-fi” comes to mind for design purposes.

- Keep it Cool
    - In particular blue and/or green, convey a classic sci0fi look. It suggests a futuristic world with slick technology.
- UI Design (Appearance)
    - Smooth and slick, clean-cut.
- Fonts (Colour)
    - Cool colour fonts for the normal words.
    - Warm colours fonts are similar to highlights, important information that can easily be tell apart.



Inclusive Design

Catering to People with Limitation

Limitation	How?
Visual Disabilities- Short sightedness	The simulation allows users to roam about, go closer to planets or information panels to gaze at them, or grasp them closer to oneself.
Language- Chinese & Malay	Does who are not fluence in English don't worry. We have a setting which allow you do change the language to a total of 3 language, "English, Chinese, Malay"
Age/Education- Primary 1 and above	The words in the information panel is easy to understand.
Body Measurement- Height difference	The headset will adjust to the wearer.

Limitation Excluded from Application Design

Race, Gender, Religions, Ethnicity	From the developing group perspective, it was quite challenging to incorporate these categories of limitation. Since there isn't a character for you to select as you are the character in charge of the environment. We may make the character AKA you neutral, but the concept is too broad.

Practises for Inclusive Design

- Adopt Accessibility

Application allows you to change font size, to allow you to see clearly for those who are short-sighted.
Application allows users to change language to one in which they are fluent.

- Avoid Stereotype

We thought of an idea to think outside the box, there is no gender, no race is needed or shown. Therefore, we making it avoid stereotype.

Usability Testing Link:

https://youtu.be/t5W3BkRvzEM