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BIT3901 B

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1. ABOUT THE OBSERVATION TRAIL

1.1. OVERVIEW

Canada is composed of a variety of geographical landscapes, each housing vastly different ecosystems. Our team has decided that for our Design Studio project, we want to help users experience these ecosystems in the comfort of their own homes. Using virtual reality head-mounted display (VR HMD) headsets and cellular devices or desktops, users will be able to explore different biomes of Canada and observe and experience the different elements of which they are composed.

The Observation Trail is a multiplayer educational experience, where the user wearing the VR headset (the "hiker") will walk through condensed biomes and encounter different animals. The hiker will then have to describe the animal to their partner (the "guide") using different descriptors. The guide will have a limited time to find the described animal and explain to the explorer how to interact with the animal so that they may continue down the path. We believe that this experience will help educate users on how humans should react to encountering different animals and help them learn more about Canada's varied environments.

We believe that this project is best presented as a VR experience with a few challenges and less of a full-fledged VR video game. This allows us to focus more on the visuals and interactive elements of the trail and worry less about coding a more in-depth game or competitive aspect.

1.1. AUDIENCE

Due to the simplistic gameplay intended, this application will be suitable for a wide variety of expertise and skill level. Primarily, it will feature aspects that make it educational and informative for younger school-age children around the grade 4 level (8 to 9 years old), as it is at this point that the Ontario curriculum introduces the concept of habitats and the effects of humans and other animals on these habitats. Alternatively, it can also be used as an educational piece on survival in scout/girl guide groups, an introductory activity for guided hikes which may encounter these animals, and as a simple, fun, competitive game between friends. As the Oculus Rift has a minimum age of 13 years old for safety reasons, the game will be designed in a way that is accessible using only desktop and mobile for situations where the participants are too young to use the VR headset, as in the case of the primary target audience.

1.2. TECHNICAL REQUIREMENTS

In terms of hardware requirements, we will be using the Oculus Rift for the hiker, accompanied by either a cellular device or desktop for the guide's guidebook. If possible, we would like to aim for the hiker to also be able to play on desktop, for situations where the user is unable to use a VR HMD.

For the programming, we will be using the Isotope JavaScript plug-in to help code the guidebook filters, as it allows filtering by multiple filter groups at once and pre-loads all content so that there will be no lag while filtering. The VR experience itself will use A-Frame for WebVR code.

We intend on using Visual Studio Code for our coding program and creating low-poly models using Maya. We will also use GitHub to help organize and plan our project milestones.

1.1. KEY FEATURES AND PROJECT SCOPE

1.1.1. TECHNICAL FEATURES

Head movement (high priority)
Hikers will have the ability to look around their environment with a normal range of motion. The environment will correspond to the direction of the hiker's line of sight. Ideally, we would also like to track elevation of the head so that the user is able to duck to avoid birds.

Directional movement (high priority)
For the hiker, we believe that the user would be comfortable using the joystick available with the Oculus Rift to help them move along the path and navigate throughout the experience.

Audio Headset (low priority)
Ideally, we would like to have audio play in accordance to the type of environment the hiker is walking through (e.g., leaves cracking through a forest or sand shifting on a beach). The audio would also have to be set on a low volume as to allow communication between the guide and the hiker. This is set as a low priority as the experience can still be made without this element entirely. It would only assist in better submerging the hiker into the VR biomes.

1.1.2. DESIGN FEATURES

Environment Design (high priority)
There will be a variety of low-poly designs for the biomes that the users will encounter. There will be a clear path for the users to follow as well as different objects users may use when encountering animals. We will be aiming for at least two of the biomes, with all six biomes being a stretch goal should production go smoothly.

Figure 1. Path followed in the hiking trail.

The biomes included in the game are:

- Deciduous forest (high priority)
- Boreal forest (high priority)
- Wetlands (medium priority)
- Grasslands (stretch goal)
- Rocky Mountains (stretch goal)
- Coastal Rainforest (stretch goal)
- Tundra (stretch goal)

Animal design (high priority)
We wish to have a variety of animals incorporated into the game including quadrupeds (e.g., moose, bison), but also avian and apods (e.g., hawks, snakes, respectively). All species should however all follow the same low-poly design similar to Figure 2.

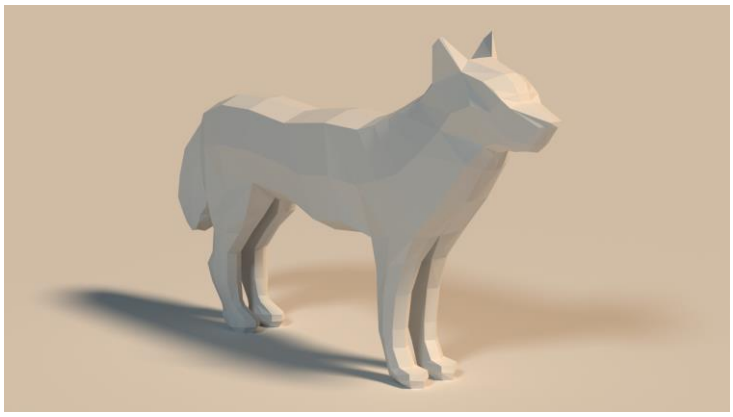


Figure 2. Sample of low-poly 3D modelled animal (without texture).

1.1.3. INTERACTION FEATURES

Object interactions (medium priority)
Depending on the animal the hiker encounters, the guide may advise the hiker to use an object that is placed within the environment. The hiker would then direct their hand towards that object to select and use it. Failing this, selectable text options will be made available. For example, throwing some berries from a bush towards a squirrel to distract it. While this element can assist with the educational elements of the experience, it is not as high a priority for our team.

Searching elements for the Guide (high priority)
The guide must be able to navigate on either their cellular device or on their desktop/laptop through an encyclopedia-like webpage efficiently within a time restraint. This means that the navigation of the filters must be intuitive and user-friendly on both devices.

1.2. DEVELOPMENT PLAN

1.2.1. WEEK BY WEEK SCHEDULE

Milestone 3 (February 6, 2019)
- Model filler objects
- Begin set-up of test environment (loading objects/materials, loading background audio, loading timer to screen, loading start/selection screen)
- Code guidebook template
- Begin modelling deciduous environment pieces and action items

Milestone 4 (February 13, 2019)
- Finish modelling deciduous environment and action pieces
- Begin modelling deciduous animal pieces
- Start personalizing the test environment to be the deciduous environment

- Begin program testing for actions taken (selecting different actions, selecting correct action, selecting incorrect actions)
- Research interactions and search terms for animals, and put in reference document

Alpha Presentation (February 15, 2019)
- Have some finished models to display
- Have beginnings of an environment to display

Milestone 5 (February 27, 2019)
- Continue modelling deciduous animal pieces
- Add animals to guidebook as finished
- Begin programming random animal generation into environment
- Begin programming actual actions available throughout game as functions

Milestone 6 (March 6, 2019)
- Finish modelling deciduous animal pieces
- Finish inputting animals in guide and environment
- Finish programming action functions

Milestone 7 (March 13, 2019)
- Begin programming available actions to animals and results of each action
- Begin modelling boreal forest environment pieces
- Find open source audio for deciduous
- Implement deciduous audio

Beta Presentation (March 15, 2019)
- One functional biome (deciduous)

Milestone 8 (March 20, 2019)
- Finish modelling boreal forest environment pieces
- Modelling boreal forest animal pieces
- Add animals to guidebook as completed

Milestone 9 (March 27, 2019)
- Expand environment to add boreal environment, animals, and interactions
- Find open source audio for boreal
- Implement audio
- Begin modelling wetlands environment pieces and animal pieces

Milestone 10 (April 3, 2019)
- Finish modelling wetland environment pieces and animal pieces
- Add animals to guidebook as completed
- Expand environment to add wetlands environment, animals, and interactions
- Find open source audio for wetlands
- Implement audio

Final Submission (April 5, 2019)
- 2.5 biome environment (deciduous, boreal, and wetlands half of wetlands/grasslands)

1.2.2. REQUIRED ASSETS

Biome	Environment Building	Animals
Deciduous	- Background sound - Ground plane - Maple tree - Birch tree - Mossy Rock - Fallen tree	- Racoon - Red fox - Porcupine - Snowy owl - Skunk
Boreal	- Background noise - Ground plane - Pine tree - Red spruce tree - Sedimentary rock - Tree stump	- Lynx - Black bear - Deer - Moose - Red-tailed hawk
Wetlands	- Background noise - Ground plane - Cattail - Wooden boards and posts (walkway)	- Beaver - Canadian goose
General Use	- Rock - Trail mix bar - Alternate path - Action arrow	

1.2.3. STRETCH GOALS

Goal	Assets required
Action Item Sounds	- Sound for throwing an item - Sound for opening a wrapper - Sound for running feet - Sound for a bird swooping overhead
Grasslands Biome	- Background noise - Ground plane - Grass - Shrub - Bison - Coyote - Pronghorn antelope
Mountains Biome	- Background noise - Ground plane - Mountain - Lake - Mountain goat - Bighorn sheep - Cougar - Grizzly bear - Elk
Coastal Forest Biome	- Background noise - Ground plane - Fern - Broadleaf tree - Otter - Western rattlesnake - Bald eagle - American badger - Gray wolf
Tundra Biome	- Background noise - Ground plane - Small shrub - Iceberg - Polar bear - Arctic fox - Snowshow hare - Seal - Caribou

1.3. THE TEAM

1.3.1. DAWN EGGLETON

Dawn will be the primary programmer for the project, as she has extensive web-based coding experience in HTML, CSS, and JavaScript/jQuery. With two co-operative education work terms in UI/UX, she will also be consulting on the user experience of the Observation Trail. As needed, she will also function as a back-up 3D modeller in the later stages of the project. Additionally, she will be functioning as the project manager.

1.1.1. KALIA HAMEIRI

Kalia is the team leader, along with the head software and 3D visual designer. She has multiple years experience with designing and programing console applications and 2D games. As needed, she will be able to provide supplemental programming. Kalia's main skills are in visual art and as such, she will be focusing on the main visual aspects of the virtual world. Kalia has prior experience modeling, texturing, rigging, and animating with Autodesk Maya. She will be using her skills to populate the virtual environment that The Observation Trail takes place in.

1.1.2. OMAR EL TAYARA

Omar will oversee designing the user interface and its elements, as well as ensuring user experience is good. One of his roles will be to work on the responsive web page layout, ensuring it is designed in a sleek and user-friendly layout. Kalia and him will be work closely together to ensure cohesion in the design. He will also be helping with texturing models.

1.1.3. YOUSEF ABDEL RAHMAN

Yousef has been assigned the roles of writer and float, in which he will overview the written documents as well as revising story fluidity and ensuring that instructions are clearly laid out within The Observation Trail experience. He will also be working as the backup programmer, assisting with the JavaScript and HTML portions of the experience. Yousef will also be able to help the design team if they need more assistance, whether it be with creating wireframes, sketches or 3D models.

2. USER INTERACTION SPECIFICATIONS

2.1. EXPERIENCE FLOW AND APPLICATION ARCHITECTURE

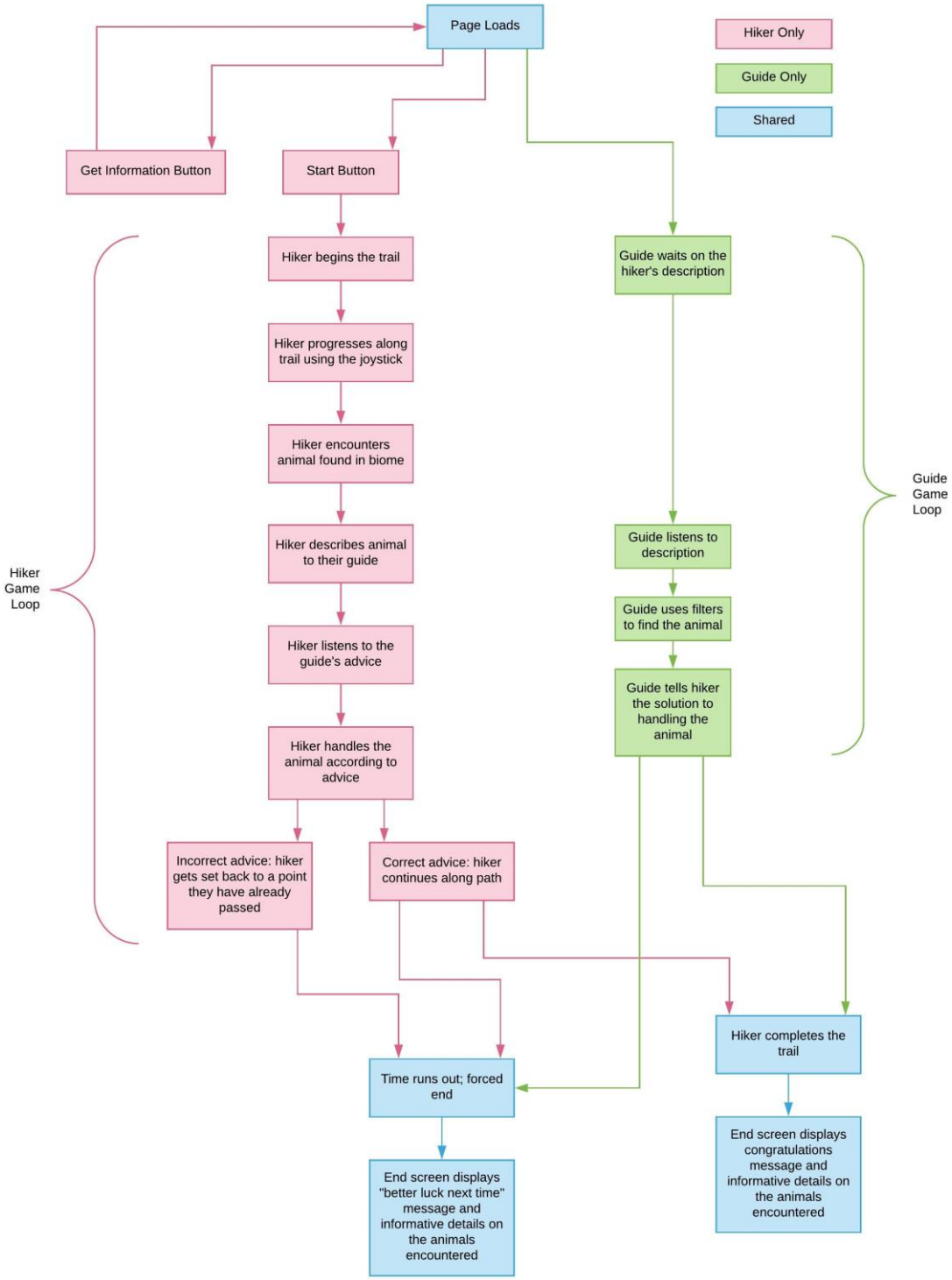


Figure 3. Diagram of game flow, including where the paths of the hiker and guide diverge and re-converge.

2.2. WIREFRAMES AND STORYBOARDS

2.2.1. THE GUIDEBOOK

We have designed the guide book to work dynamically on one web page using the isotope script. The top row of buttons will remain static, as they are the main search terms. Depending on which term is selected the attributes presented in the second row will change. The attributes act like radio buttons and only one can be selected at a time (per search term). As the guide selects search terms and their corresponding attributes, the number of animal photos diminish. The clear button will remove any current radio button selection.

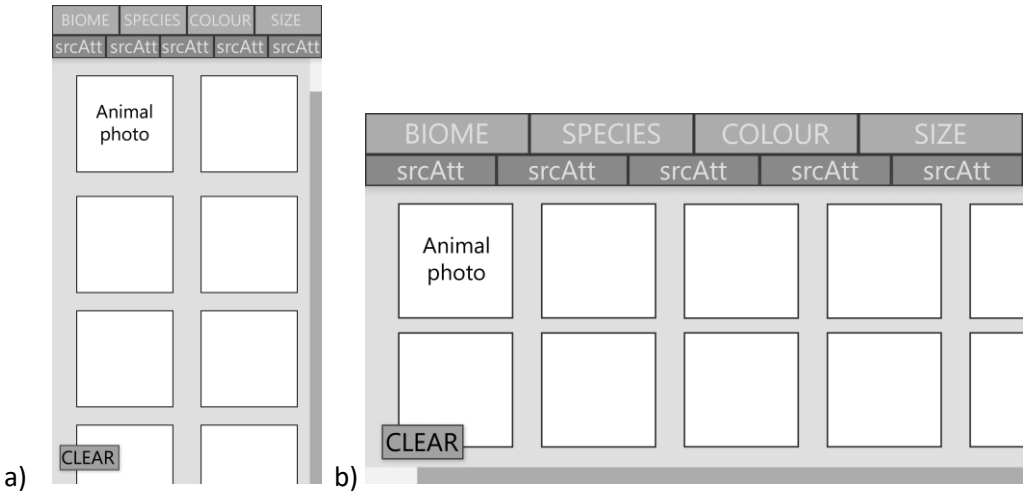


Figure 4. Mobile wireframe for the guidebook. The guidebook page will be responsive to the orientation of the smartphone.

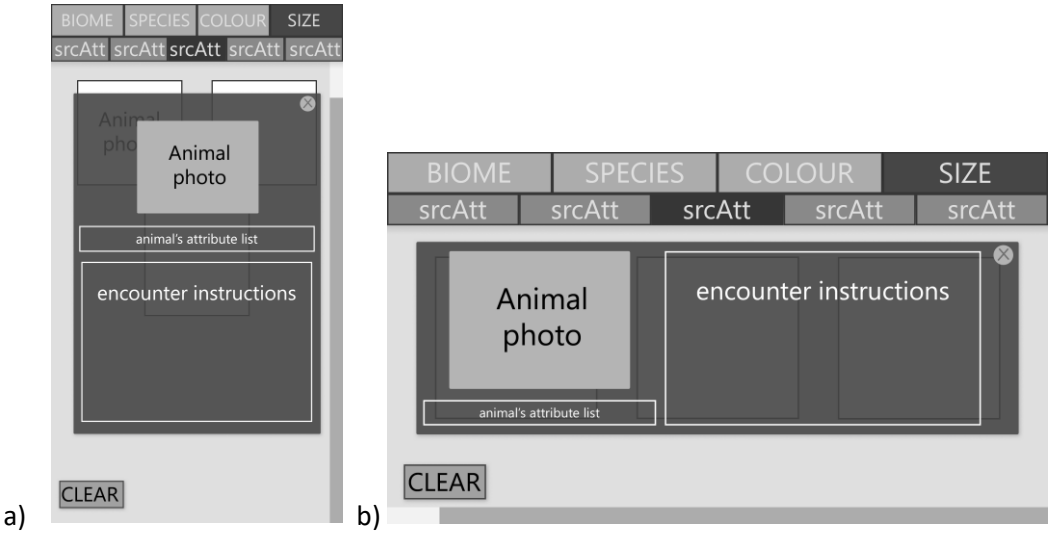
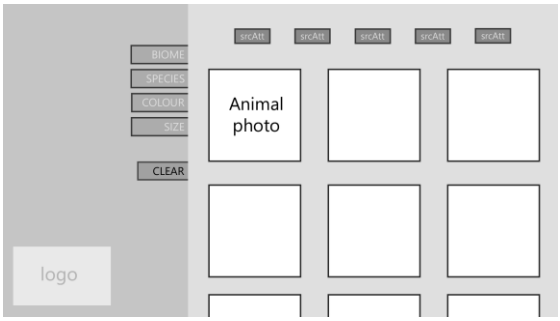


Figure 5. Mobile wireframe for the animal pop-up. The guide can press an animal photo (at any time) to get a pop up with information on the selected animal. Users can press the (x) to close the pop-up.

a) 

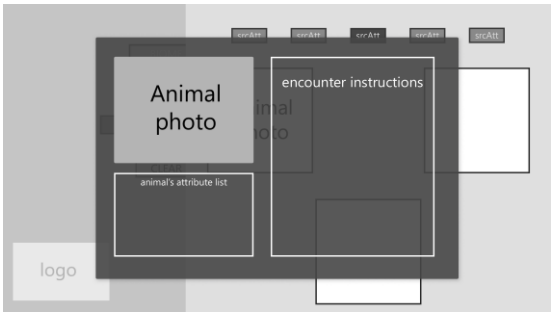
b) 

Figure 6. Desktop wireframes of the guidebook, featuring the general guidebook view (a) and the animal pop-up (b).

2.2.2. THE HIKE

The hike will be primarily intended for a VR experience using the Oculus Rift. However, it will be available for users that are solely on desktop as well, to accommodate younger age brackets and users who experience sickness or other health concerns when using a VR headset.

a) 

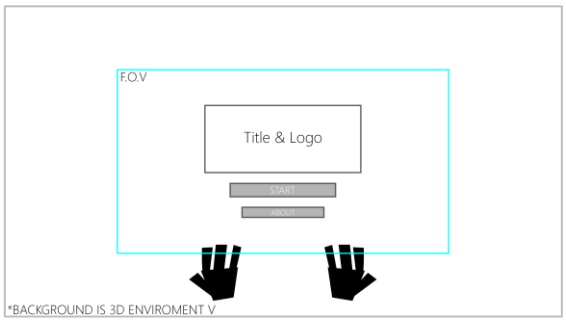
b) 

Figure 7. The landing page for both desktop and HMD display. The title and buttons will hover in a 3D room made of the environments featured in the game which have been arranged in a ring. The user can select to start or see an about screen. HMD users will be able to view their avatar's hands, while those on the desktop will interact with a cursor.

a) 

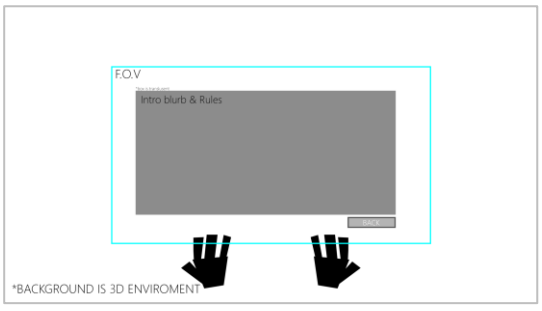
b) 

Figure 8. The about screen. This screen will display the rules and background information of experience. It will be in the same 3D environment as the Intro screen, either replacing the intro screen content or placed behind the camera until the about button is pressed. The user can interact with the back button to return to the introduction screen content.

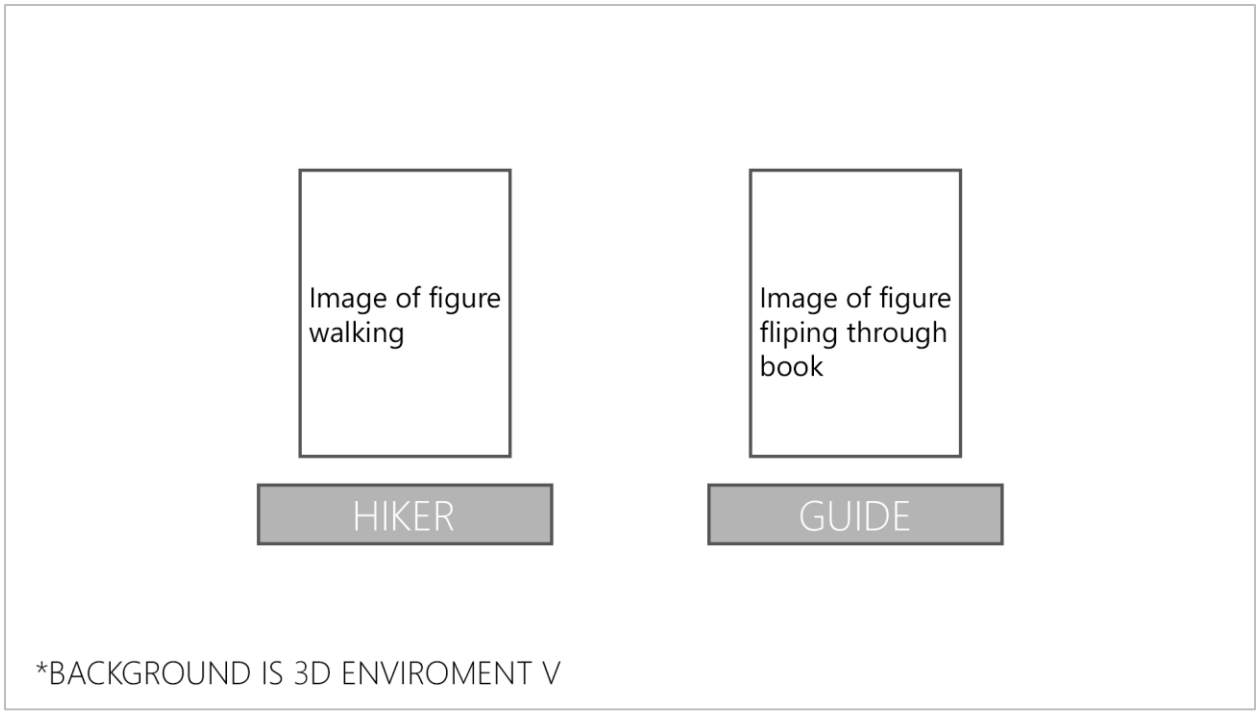
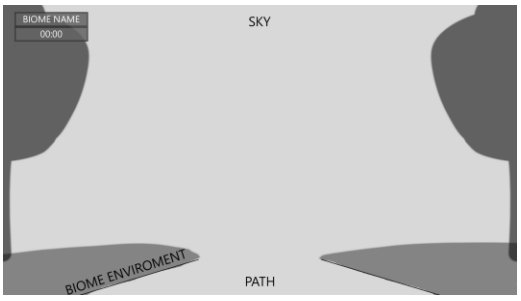


Figure 9. The role selection screen for hiker or guide. The 3D environment is the same as the two previous screens in Figures 6 and 7. Users on desktop can choose between being a hiker or being a guide. VR users cannot be a guide, and mobile users cannot be a hiker, and so will not experience this screen.

a) 

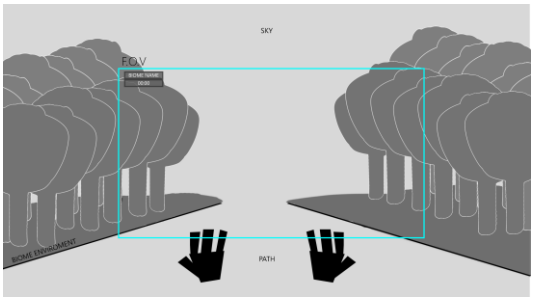
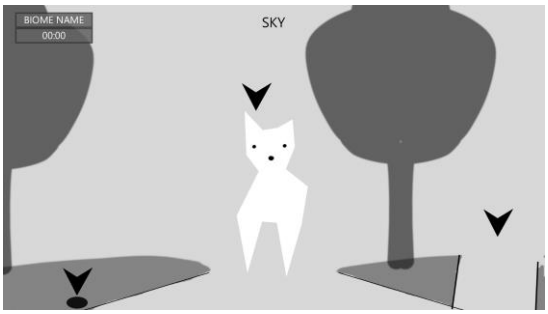
b) 

Figure 10. A representation of the hiking environment. Hikers are placed on a path within a 3D environment. The flora of the current residing biome will be presented on either side of the path, keeping the user on a linear trail. The Hiker will be able to see the biome they are in as well as their time in the experience. These elements will be static to the camera view so they will always be present no matter which way the camera is facing.

a) 

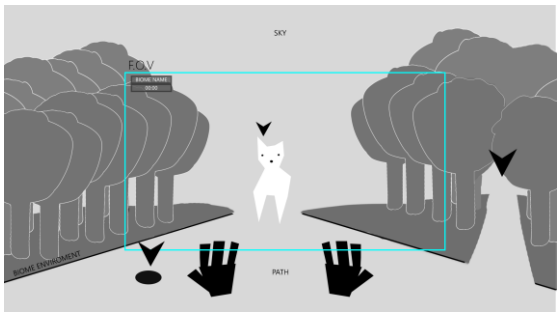
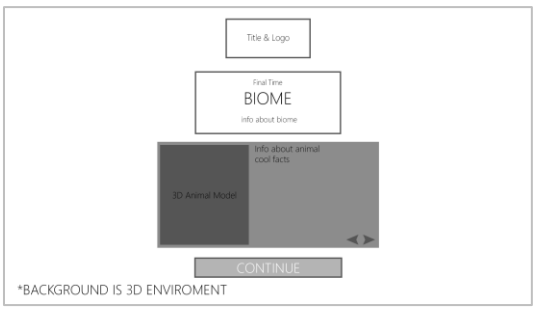
b) 

Figure 11. A representation of an encounter screen. The animal will block the Hiker's path and three options of action/interaction will be available to the hiker (highlighted by arrows).

a) 

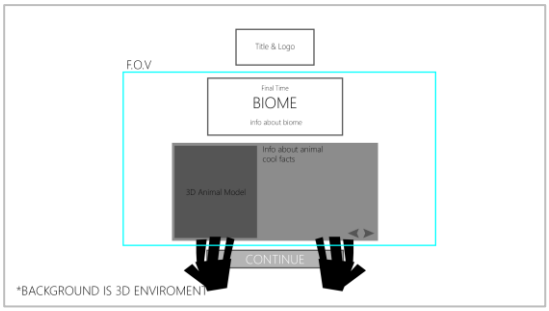
b) 

Figure 12. The trail completion screen. Once time on the trail is complete or the timer runs out, Hikers will have an ending screen available to them. They will see their final time (if they completed the trail successfully) and a list of the animals they encountered, along with some basic information about these animals.

2.3. DIAGRAMS AND PHYSICAL LAYOUT

While playing The Observation Trail, the two players should not be able to see each other's screens (as pictured in Figure 3). This is especially important for the guide, who should be finding the animal based solely on the hiker's description.

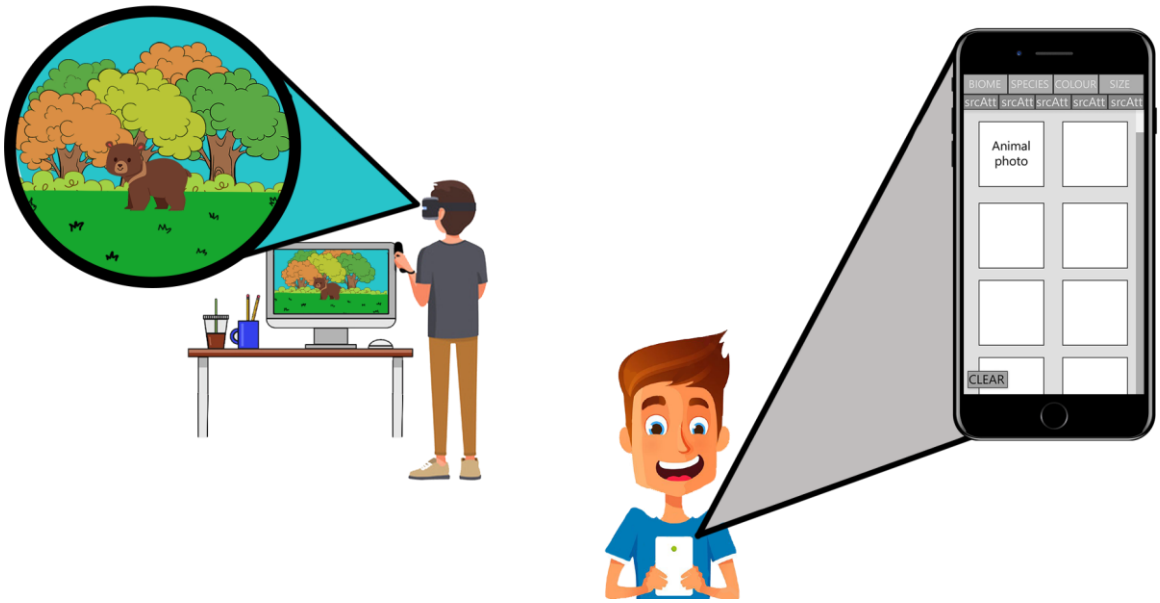


Figure 13. Diagram of physical layout.

2.4. DESIGN COMPS

Full resolution design comps of the guide's experience on mobile phone and the hiker's experience in a VR headset can be found in Appendix A.

APPENDIX A: DESIGN COMPS

Figure A1. A representation of the virtual environment presented to the hiker.

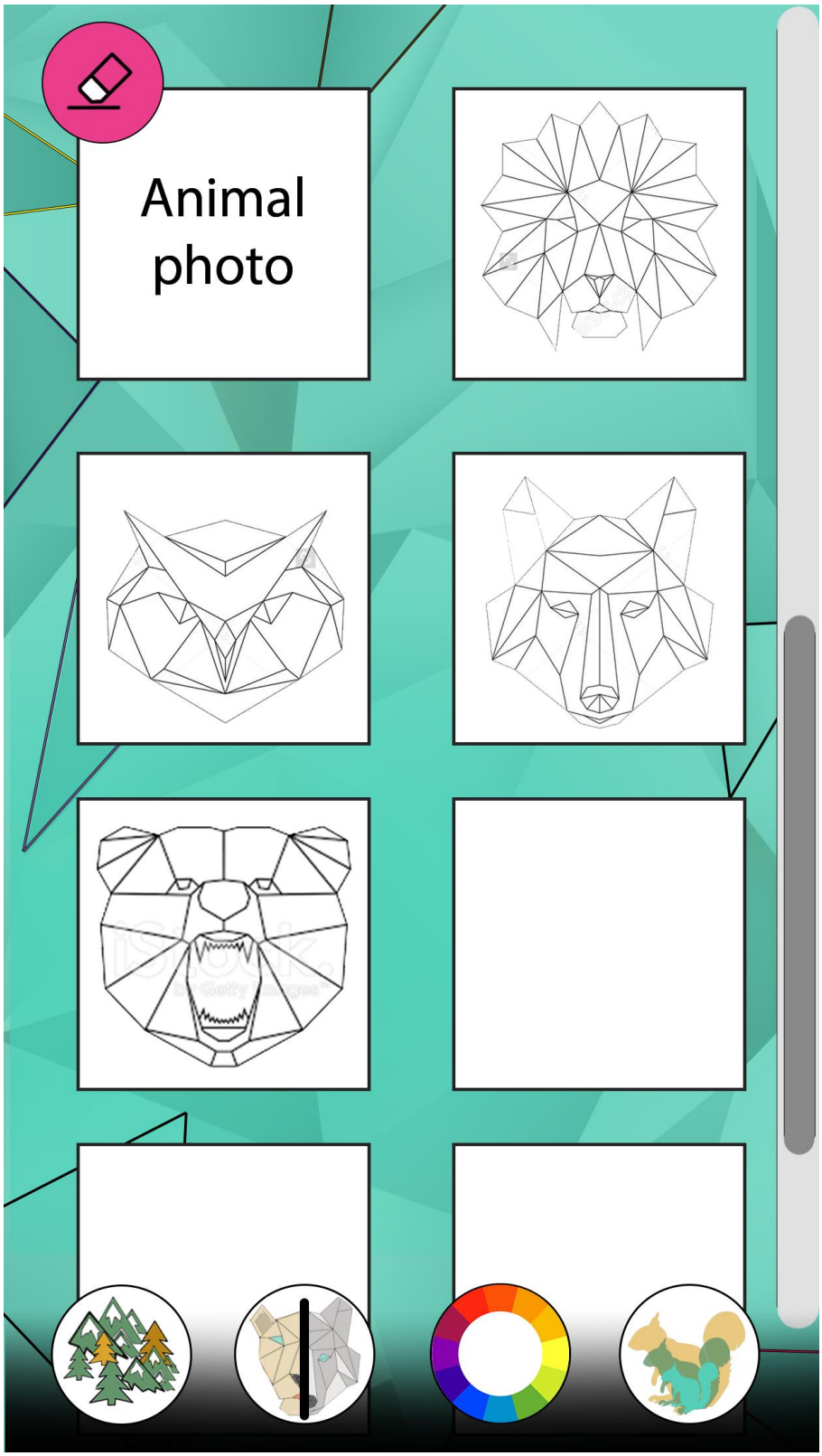


Figure A2. A color mock-up of the mobile phone representation of the guidebook (no selection made).

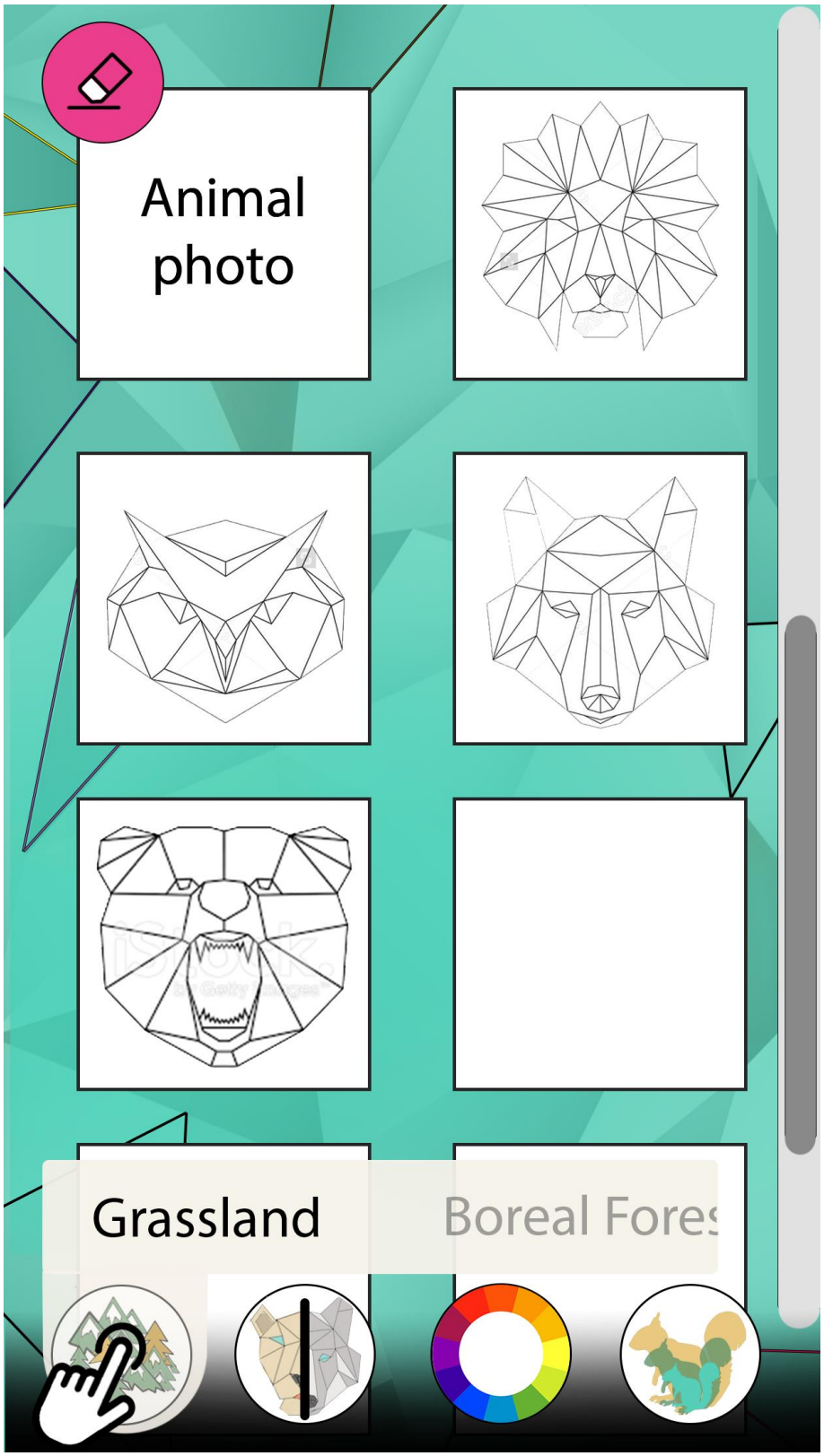


Figure A3. A color mock-up of the mobile phone representation of the guidebook (biome selected).