MINNESOTA STATE UNIVERSITY, MANKATO
DEPARTMENT OF COMPUTER INFORMATION SCIENCE
COMPUTER SCIENCE PROGRAM

REQUIREMENTS ANALYSIS DOCUMENT

UNIVERSITY OF WISCONSIN, MADISON EMBODIED LEARNING TEAM

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1 | Introduction

1.1 | Purpose

The purpose of this document is to outline the specified requirements that we, the Hidden Villagers, are to complete within this semester. This document outlines the current active system in place for *The Hidden Village*, outlines work completed by previous teams, and discusses the scope of work for the Fall 2024 semester.

1.2 | THV Description

Currently, THV-O is a video game for teaching young children mathematics through embodied learning. In the game, users enter a fictional world where everyone is made up of shapes and in-game computer driven characters interact with players asking for their assistance to complete tasks. Tasks present in the form of users physically perform a movement by matching a sequence of poses provided by a computer-based avatar. Users' movements are captured by an algorithm-based API that detects body landmarks using the computer's web camera. By doing this, the player is actively engaging in the game while physically enacting movements that may emulate properties of geometric objects (e.g., a triangle) and mathematical transformations one might apply to a geometric object (e.g., dilation). Next, users encounter a conjecture (a statement about geometric objects and transformations) that they must assess the veracity (i.e., always true or ever false) and explain their answers. Upon completion, players interact with the computer-based characters who advance the player to the next level until they complete all the conjectures and the game.

1.3 | THV Development Goals

The goal of this project is to continue to define, implement, and test THV-O (The Hidden Village-Online), an interactive platform for creating collaborative classroom activities that also allows researchers to collect experimental data on student learning with a working motion capture sub-system that will serve as a fundamental component for physically interactive STEM learning. As an MVP, THV-O will allow both teachers and students to design and deliver curriculum for embodied activities. For example, users can create content in the form of mathematical conjectures (i.e., statements that users must determine the veracity (always true or never false) to which players provide justifications and perform a series of corresponding movements (i.e., sequences of body poses, a.k.a. M-Clips)). The goal is not only to provide players with activities that engage the body in coordination with the mind, but also to provide researchers with a rich corpus of language and movement data to assess how students conceptualize STEM concepts like mathematical objects and their transformations.

1.4 | THV Fall 2024 Semester Goals

For the Fall 2024 semester, we must build off of previous versions (v. 0.2, 0.3, 0.4, 0.5) and design and deploy the deliverables indexed in the preceding table of contents and described in this Requirements Analysis Document (RAD) in order of importance. This includes: (1a) implementing a method of data collection by connecting the web-based application (THVO), including the motion capture API, to the firebase database by updating and using data distiller and exporter scripts and (1b) adding a button

accessible to admins in the system to quickly access/download distilled data; (2) a functional settings menu that allows users to control (i.e., on/off) different features of the game (e.g., music, subtitles, narrative, movements, duration, frame rate, data capture, hints, scaffolds, etc.); (3) A narrative/script editor module that allows administrators to modify/customize the video game characters and storyline within a THV game module; (4) A tween function that composites individual pose data to create a fluid animation of the movements between START, INTERMEDIATE, END poses (i.e., a demonstration for players to watch of the movements from start to finish).

1.5 | Deliverables

Table 1. Deliverables for Fall 2024 Semester for THV-O

Deliverables	Type of work	Activities	Resources	Tech Skills	Priority
Review of existing Requirements Analysis Document (RAD) and current system/code base/user experience	Customer need and project state analysis	Client input, use existing system, review existing documentation and artifacts, **write SHORT report** – quickly. **Do not spend a long time on this!**	Client, handover from previous project, source code and documentation	User research, user experience, requirements analysis, coding and Github	High
Short prioritized list of user stories based on the RAD and system review above	Product management, technical writing	**Quickly** determine the most important capabilities and detail the user-facing impacts; define the minimum amount of acceptable functionality	Tools selected by team with client approval, further client and coach interactions	Product management	High
Revised RAD	Design and system planning	Update the RAD to reflect this semester's priorities and goals. Do not spend a long time on this – **move with alacrity**!	Client, coaches, existing project materials, newly developed user stories	Requirements analysis and documentation	High
Working extended software system	Software development and testing	Working software system as agreed in revised RAD. Supporting test plans, execution, and reporting to assure quality of working system.	Coding and testing tools including Github and connecting with previous Github repositories.	Software development, software testing	High
Recommendations for next project phase	Project planning	Create and document roadmap for future development efforts – know issues, desired new functionality, interesting untapped use scenarios	Client, coaches	Project planning	Low
Internal documentation	Documentation	Develop detailed internal documentation as to how the extended system was constructed	Client, coaches, project artifacts	Software development and documentation	Medium
External documentation	Documentation	User-facing documentation ensuring proper readiness to use and avail selves of functionality	Client, possible access to end users for feedback	Documentation	Medium

2 | Current System Development

2.1 | Overview

Prior to Minnesota State University – Mankato joining the project, two prototypes of THV-O were developed by the client, THV-O v0.1 and THV-O v0.2 (*see* Figure 2). Both prototypes were developed by the team at University of Wisconsin – Madison's chief developer, Ariel Fogel based on the original MS Kinect-based THV developed using the UNITY Game Engine (the non-online version). Since joining the project, 3 teams from the computer science division at Minnesota State University, Mankato have developed three successive prototypes THV-O v0.3 (Spring 2023), THV-O v0.4 (Fall 2023) and THV-O v0.5(Spring 2024). The current project team (Fall 2024) will develop from THV-O v0.5 by creating a new branch in github v. 0.6 that will extend the current capacity of THVO towards an MVP.

Figure 1. *Reference Key for previous THV versions:* (left) THV (middle) THV-O v0.1, (right) THV-O v0.2

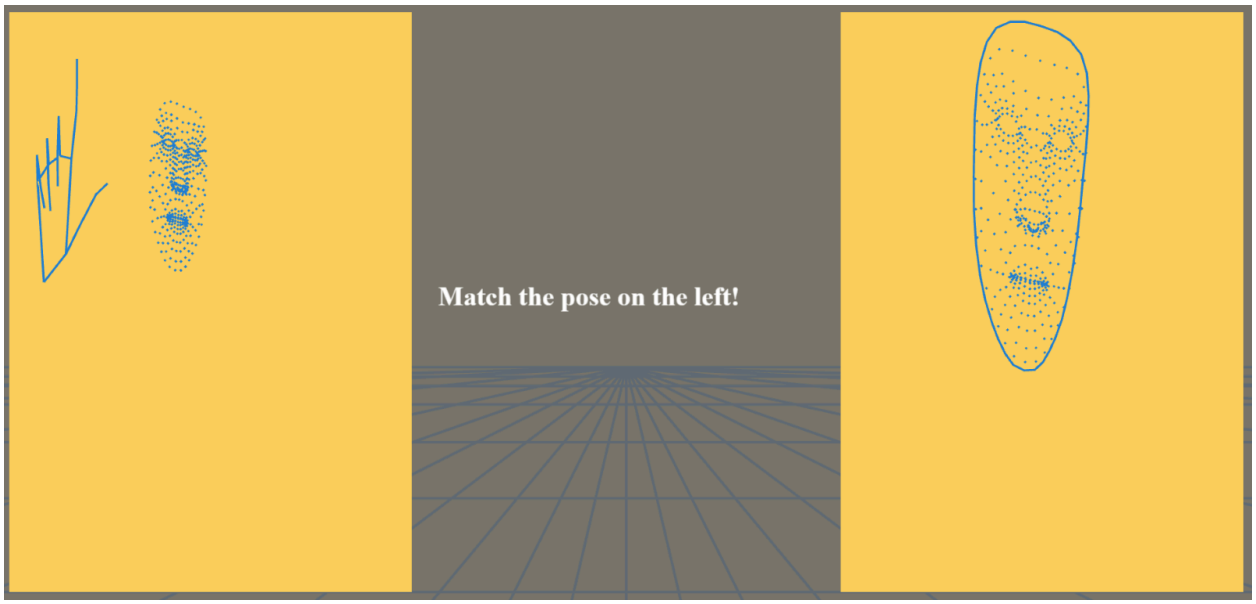
THV THV-O v0.1 THV-O v0.2

Crucial to THV-O's continued development is consistently upkeeping the codebase to prevent *code rot*, (i.e., software decay in which certain parts of a codebase remain untouched for extended periods, resulting in a deterioration of code quality and usability). We as a team will constantly check for outdated code by fixing bugs, updating documentation, and for available updates regarding packages and dependencies.

2.3 | Current Features of THV-O v0.5

2.3.1 | Database Comparison function

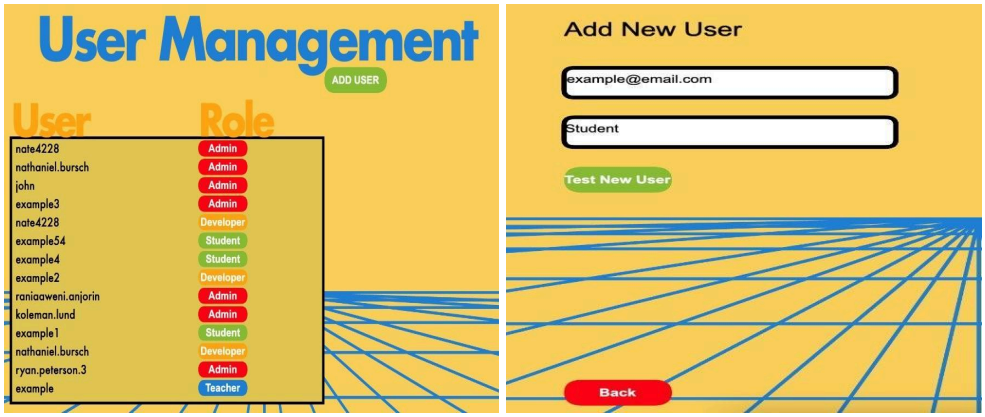
The current version of THV-O v. 0.5 has a functionality that pulls stored pose information based on conjecture ID and displays the START, INTERMEDIATE and END poses on the left side of the screen. On the right side of the screen, players real-time avatar is displayed and provides feedback for pose matching. As the player matches each pose, the next pose to match will be loaded on the left. The storage of pose data has been implemented .This functionality can leverage the existing code to create the folders/sub-folders from which pose data is pulled. The middle section of the screen is designated to provide text feedback to the player though this feature is not currently implemented.



Picture showing the pose that should be reproduced by the player.

2.3.2 | User Management

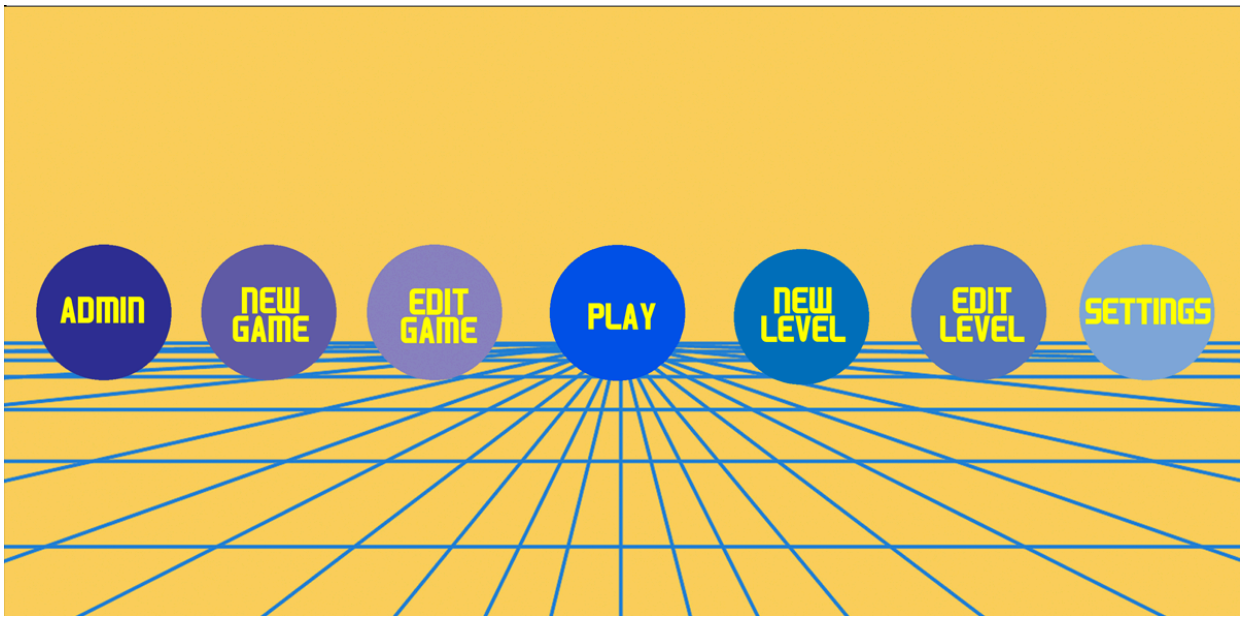
The client can create a new organization or project and add an admin that will be able to add more users and adjust their roles.



Picture showing user management menu and how to add a new user

2.3.3 | Main Menu

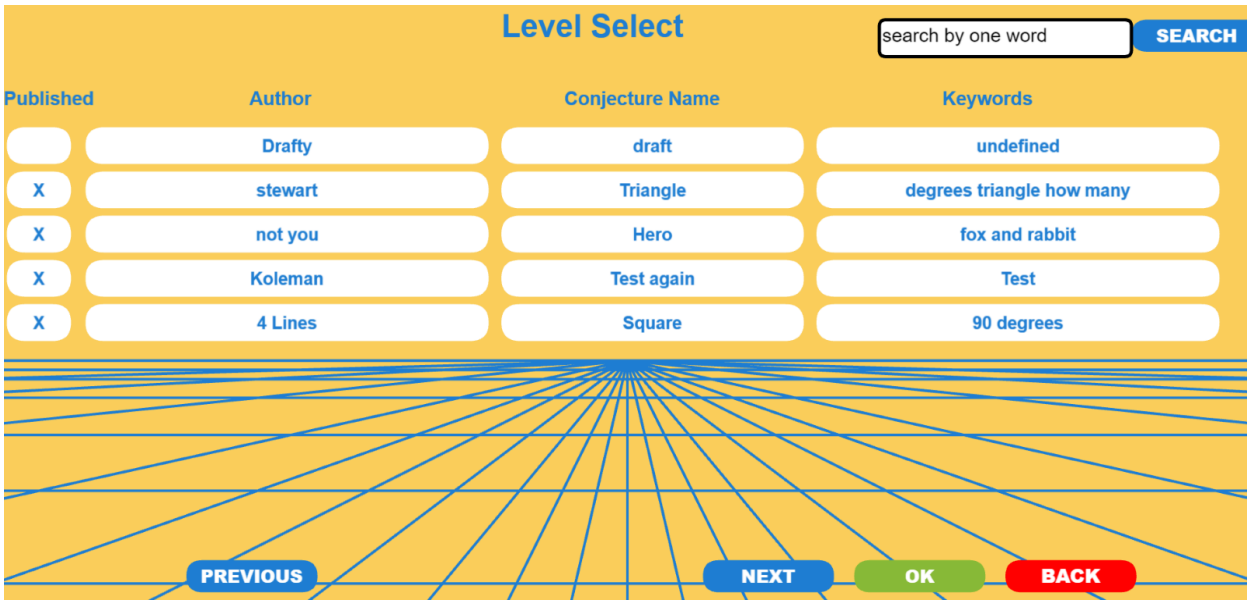
THV-O v.05 has main menu containing buttons that display based on the users role assigned by the admin. The buttons include “Admin,” “New Game,” “Edit Game,” “Play,” “New Level,” “Edit Level,” and “Settings.” The user is only able to see the buttons that they have permissions to, i.e. student user can only see play and settings, whereas admin and developer have access to every button.



Picture of current main menu

2.3.4 | New & Edit Level

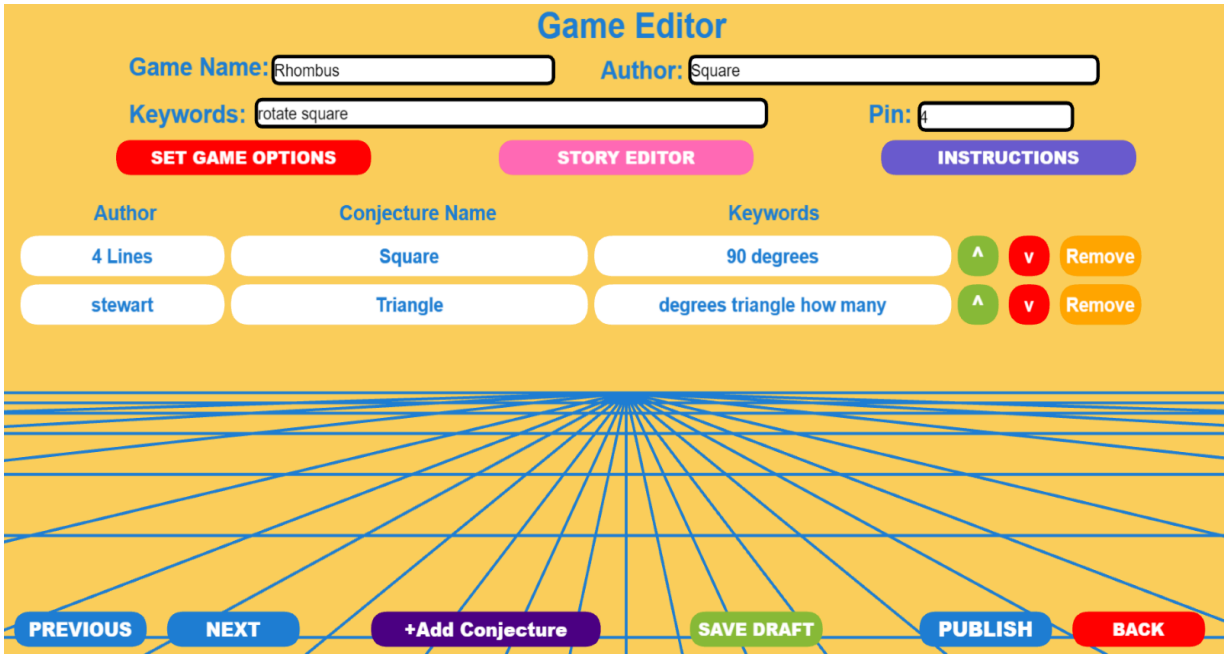
New level has the essential functionality of conjecture editor. The edit level button allows the player to edit their drafts and published levels present in the firebase. All users have the chance to see a preview of the level, but each level can only be edited via a pin. The previous team used a mockup wireframe provided by the client to guide their development. They also added a search bar in the level select screen so that when the creator of the level wants to edit their work, they can enter a keyword to make it quicker through a list of multiple levels.



Picture showing the level select screen

2.3.5 | New & Edit Game

Allows the user to click a button and select between different levels published. When the user clicks on “New Game,” it brings them to the game editor and where they can add levels by clicking on “addConjecture.” To add a level, the player can click on the “+” button in the level select module. The player can also choose the positioning of the levels as well as remove them if needed. The game editor module contains all published games, and the editing function is secured under a pin.



Picture of game editor screen

2.3.6 | Play button

The play button in THV-O v.05 displays all poses, allowing the user to begin gameplay

2.3.7 | External Documentation

External documentation for THV-O v.05 exists on the semester's Wiki page that contains the step by step guides on how to work with Firebase, which is essential to running THV and operating permissions. There is also a section in the documentation containing links to previous versions of the project and their repositories. Lastly, there is a ChangeLog file that contains the updates made during the project and future improvements, which can be found in the file present on GitHub.

3 | Overall Requirements

3.1 | Preliminary Debugging

THVO v.0.5 still contains some bugs and it is important to address these in moving forward for developing THVO v. 0.6. This may include issues with the login system, issues with displaying graphics, making sure buttons are displayed and functioning properly, fixing errors back-end errors associated with authoring content, saving content, editing content and playing content. In the scope of work, this is not intended to open pandoras box to fix all bugs, but rather to address any lingering issues that were not resolved from THVO v. 0.5.

3.2 | Data Collection

A primary goal for THV-O v0.6 is to implement and update a data distiller from THV-O v0.5. The data distiller currently allows researchers to download data collected by THV-O in .csv and .json formats using terminal commands. THV-O v0.6 aims re- implement this function by making a button that appears on the front end side based on login credentials so that researchers can download the data for a specific game module.

EXAMPLE DATA OUTPUTS (CSV FORMAT)

EVENT DATA LOG

UTC Time	Unix Time Stamp	ID	ROLE	GAME ID	GAME MODE	DA Rep	HINTS	Hint Count	Latin Square Order	HINT ORDER	CONJ	ETSS	ETSLO	Event Type	TF Given Answer	Correct	MC Given Answer	Corre
19-03-19T13:14:13	1553001253	111	Student	.		.	.	.	.	.	.	00:00.0	0:00:00	Login Success	.	.	.	.
19-03-19T13:14:13	1553001253	111	Student	.		.	.	.	.	.	.	00:00.0	0:51:00	Start	.	.	.	.
19-03-19T13:14:13	1553001253	111	Student	.		.	.	.	.	.	.	00:09.9	0:51:00	Main Menu	.	.	.	.
19-03-19T13:14:23	1553001263	111	Student	.	Research	.	.	.	.	.	.	00:09.9	0:51:00	Play	.	.	.	.
19-03-19T13:14:23	1553001263	111	Student	Swart_De	Research	.	.	.	.	.	.	00:14.9	0:51:00	Select Game	.	.	.	.
19-03-19T13:14:28	1553001268	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	.	00:15.0	0:51:00	Begin	.	.	.	.
19-03-19T13:14:28	1553001268	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	.	00:20.0	0:51:00	Narrative Intr	.	.	.	.
19-03-19T13:14:33	1553001273	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	1141	00:20.0	0:51:00	Conj1 Initializ	.	.	.	.
19-03-19T13:14:33	1553001273	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	1141	00:20.0	0:51:00	Narrative01 B	.	.	.	.
19-03-19T13:14:33	1553001273	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	1141	00:43.2	0:51:00	Instructions	.	.	.	.
19-03-19T13:14:56	1553001296	111	Student	Swart_De	Research	1	YES	6	1, 8, 2, 7, 3, 8,	1, 8, 7, 5	1141	00:49.0	0:51:00	Pose1 Begin	.	.	.	.
19-03-19T13:15:05	1553001305	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	00:50.0	0:51:00	Pose1 Match	.	.	.	.
19-03-19T13:15:05	1553001305	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	00:59.0	0:51:00	Pose2 Begin	.	.	.	.
19-03-19T13:15:15	1553001315	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	00:44.4	0:51:00	Pose2 Match	.	.	.	.
19-03-19T13:15:15	1553001315	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	01:47.5	0:51:00	Pose3 Begin	.	.	.	.
19-03-19T13:15:20	1553001320	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	01:47.5	0:51:00	Pose3 Match	.	.	.	.
19-03-19T13:15:20	1553001320	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	02:24.4	0:51:00	Conj1 TF Begi	.	.	.	.
19-03-19T13:15:25	1553001325	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	02:24.4	0:51:00	Conj1 TF End	T	1	.	.
19-03-19T13:15:25	1553001325	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	02:47.1	0:51:00	Conj1 Prf Begi	.	.	.	.
19-03-19T13:19:44	1553001584	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	05:25.2	0:51:00	Conj1 Prf End	.	.	.	.
19-03-19T13:19:58	1553001598	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	05:42.4	0:51:00	MC Begin	.	.	.	.
19-03-19T13:19:59	1553001599	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	05:42.5	0:51:00	MC Selection	.	.	B	
19-03-19T13:20:00	1553001600	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1141	05:44.2	0:51:00	Narrative01 E	.	.	.	.
19-03-19T13:20:01	1553001601	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	06:06.6	0:51:00	Narrative02 B	.	.	.	.
19-03-19T13:20:02	1553001602	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	06:53.1	0:51:00	Instructions	.	.	.	.
19-03-19T13:20:03	1553001603	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	06:55.1	0:51:00	Pose1 Begin	.	.	.	.
19-03-19T13:20:05	1553001605	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	08:41.0	0:51:00	Pose1 Match	.	.	.	.
19-03-19T13:20:06	1553001606	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	08:42.0	0:51:00	Pose2 Begin	.	.	.	.
19-03-19T13:20:07	1553001607	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	08:42.0	0:51:00	Pose2 Match	.	.	.	.
19-03-19T13:20:08	1553001608	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	09:02.8	0:51:00	Pose3 Begin	.	.	.	.
19-03-19T13:20:29	1553001629	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	09:23.5	0:51:00	Pose3 Match	.	.	.	.
19-03-19T13:20:30	1553001630	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	10:03.4	0:51:00	Conj1 TF Begi	.	.	.	.
19-03-19T13:20:30	1553001630	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	10:05.4	0:51:00	Conj1 TF End	T	1	.	.
19-03-19T13:20:47	1553001647	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	10:48.9	0:51:00	Conj1 Prf Begi	.	.	.	.
19-03-19T13:20:47	1553001647	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	11:11.0	0:51:00	Conj1 Prf End	.	.	.	.
19-03-19T13:20:49	1553001649	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	12:13.0	0:51:00	MC Begin	.	.	.	.
19-03-19T13:21:12	1553001672	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	10:03.4	0:51:00	MC Selection	.	.	.	.
19-03-19T13:21:58	1553001718	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	1142	10:05.4	0:51:00	Narrative02 E	.	.	.	.
19-03-19T13:22:00	1553001720	111	Student	Swart_De	Research	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	2	10:48.9	0:51:00	Narrative Outi	.	.	.	.
19-03-19T13:23:46	1553001826	111	Student	Swart_De	.	1	YES	6	2, 8, 3, 1, 4, 8,	1, 7, 5, 8	2	09:02.8	0:51:00	Credits	.	.	A	
19-03-19T13:23:47	1553001827	111	Student	Swart_De	.	.	.	.	.	.	.	09:23.5	0:51:00	Main Menu	.	.	.	.

DATA KEY:

UTC Time	Universal Time Code
Unix Time Stamp	Uses the Computers Clock to provide a second time stamp
ID	The USERS Login ID
ROLE	Based on Login Credential (“Admin” “Student” “Teacher”)
GAME ID	Name of the Game Played

GAME MODE	Research/Teaching
DA Rep	Repetition of Directed Actions
HINTS	Were Hints Active
Hint Count	How many hints were delivered
Latin Square Order	The latin square assignment conjectures presented in
HINT ORDER CONJ	Latin square assignment hints presented in
ETSS	Duration of game since start
ETSLO	Duration of the event by subtracting end from start time
Event Type	Identifies what event is being done by the player
TF Given Answer	Identifies the TF answer indicated by the player
Correct	Indicates if the Players TF is Correct
MC Given Answer	Identifies the MC answer indicated by the player
Correct	Indicates if the Players Multiple Choice is Correct

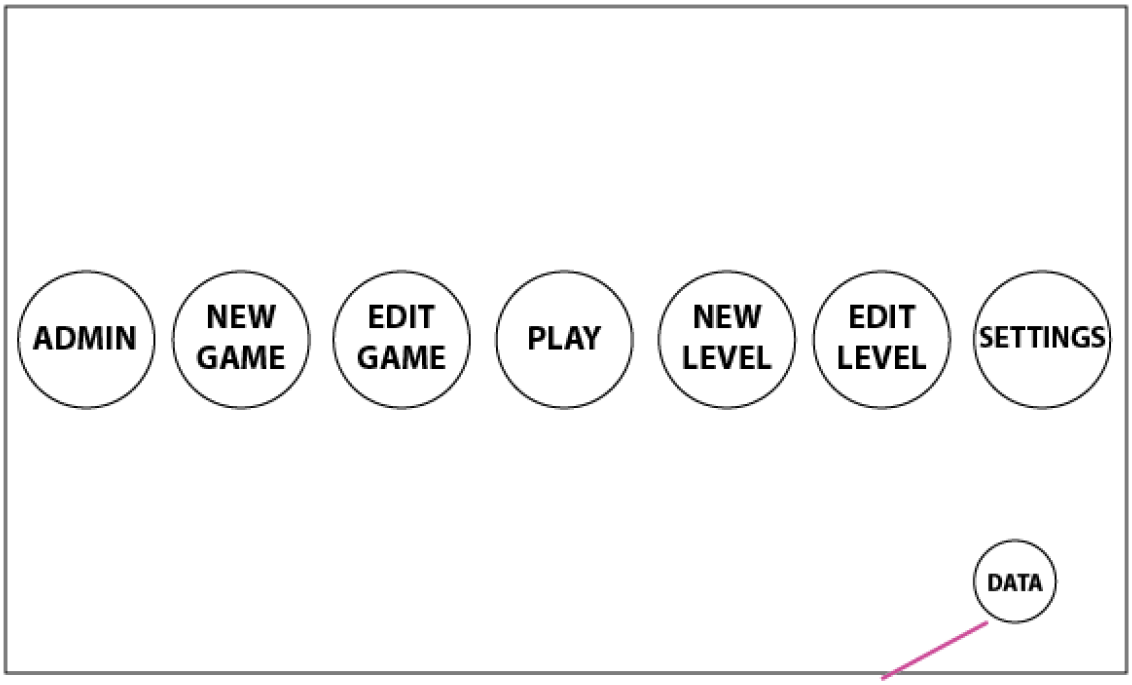
MOTION DATA LOG (CSV)

time	P0_x	P0_y	P0_z	P0_viz	P11_x	P11_y	P11_z	P11_viz	P13_x	P13_y	P13_z	P13_viz	P15_x	P15_y	P15_z	P15_viz	P23_x	P23_y	P23_z	P23_viz
1471470.7	0.4985755	0.4066868	0.4066868	0.506	0.5825651	0.5217759	0.4066868	0.506	0.6075863	0.6907447	0.4066868	0.506	0.6113587	0.8283876	0.4066868	0.506	0.5505437	0.8643105	0.4066868	0.506
1471587.3	0.4983062	0.4070838	0.4070838	0.506	0.5823464	0.5218245	0.4070838	0.506	0.6080227	0.6882083	0.4070838	0.506	0.6116344	0.8283922	0.4070838	0.506	0.5507531	0.8643172	0.4070838	0.506
1471687.4	0.4979631	0.4083641	0.4083641	0.506	0.5822977	0.5224785	0.4083641	0.506	0.6081412	0.6897439	0.4083641	0.506	0.6121736	0.8283196	0.4083641	0.506	0.551079	0.8647204	0.4083641	0.506
1471787.5	0.4974976	0.4059216	0.4059216	0.506	0.5818152	0.522288	0.4059216	0.506	0.6081737	0.689709	0.4059216	0.506	0.612187	0.8280072	0.4059216	0.506	0.5513452	0.8647636	0.4059216	0.506
1471887.6	0.4971299	0.4085235	0.4085235	0.506	0.5812631	0.522498	0.4085235	0.506	0.6078298	0.690697	0.4085235	0.506	0.6120374	0.8284994	0.4085235	0.506	0.5518522	0.8684505	0.4085235	0.506
1471987.2	0.4958877	0.4068638	0.4068638	0.506	0.581622	0.5221068	0.4068638	0.506	0.6083695	0.6907467	0.4068638	0.506	0.612108	0.8272576	0.4068638	0.506	0.551852	0.8682057	0.4068638	0.506
1472087.8	0.4958058	0.4067904	0.4067904	0.506	0.5803122	0.5222064	0.4067904	0.506	0.6080953	0.6880426	0.4067904	0.506	0.6118238	0.8269956	0.4067904	0.506	0.5513399	0.8676901	0.4067904	0.506
1472187.8	0.4957298	0.4056388	0.4056388	0.506	0.5806353	0.5222099	0.4056388	0.506	0.6069996	0.6886399	0.4056388	0.506	0.6112955	0.8283867	0.4056388	0.506	0.5513445	0.8676555	0.4056388	0.506
1472288	0.4956991	0.4061441	0.4061441	0.506	0.5806714	0.5224125	0.4061441	0.506	0.6070131	0.6906863	0.4061441	0.506	0.6116811	0.8283648	0.4061441	0.506	0.551176	0.8676324	0.4061441	0.506
1472388	0.4960968	0.4061591	0.4061591	0.506	0.5804778	0.5231041	0.4061591	0.506	0.6070405	0.6868793	0.4061591	0.506	0.6116272	0.826292	0.4061591	0.506	0.5506032	0.8679231	0.4061591	0.506
1472488.1	0.4963146	0.403256	0.403256	0.506	0.5806836	0.5228564	0.403256	0.506	0.6070502	0.6861965	0.403256	0.506	0.611629	0.8265929	0.403256	0.506	0.5503148	0.866964	0.403256	0.506
1472587.3	0.4975215	0.4028218	0.4028218	0.506	0.5803424	0.5219274	0.4028218	0.506	0.6086646	0.6778696	0.4028218	0.506	0.6120976	0.8247071	0.4028218	0.506	0.5520224	0.8639729	0.4028218	0.506
1472688.3	0.4974989	0.4028273	0.4028273	0.506	0.5816977	0.521913	0.4028273	0.506	0.6110456	0.676727	0.4028273	0.506	0.6125256	0.8219279	0.4028273	0.506	0.5525932	0.8628749	0.4028273	0.506
1472788.4	0.4993863	0.4031669	0.4031669	0.506	0.5827838	0.5200558	0.4031669	0.506	0.6116646	0.6754361	0.4031669	0.506	0.6133076	0.8222235	0.4031669	0.506	0.5527822	0.859947	0.4031669	0.506
1472888.4	0.499481	0.4030601	0.4030601	0.506	0.5828066	0.5200208	0.4030601	0.506	0.6121363	0.6741745	0.4030601	0.506	0.6133046	0.8209046	0.4030601	0.506	0.5528398	0.8599103	0.4030601	0.506
1472988.6	0.4998368	0.4030335	0.4030335	0.506	0.5829904	0.5199669	0.4030335	0.506	0.6128632	0.6727039	0.4030335	0.506	0.6133157	0.8209268	0.4030335	0.506	0.5529727	0.8601833	0.4030335	0.506
1473088.6	0.5000277	0.4039361	0.4039361	0.506	0.5832978	0.5199882	0.4039361	0.506	0.6131409	0.6726276	0.4039361	0.506	0.6133004	0.8219214	0.4039361	0.506	0.5521809	0.8602609	0.4039361	0.506
1473188.7	0.5000393	0.4039657	0.4039657	0.506	0.5836194	0.5198988	0.4039657	0.506	0.6131111	0.6732268	0.4039657	0.506	0.6117761	0.8253383	0.4039657	0.506	0.5500692	0.8602706	0.4039657	0.506
1473288.7	0.5000398	0.4040405	0.4040405	0.506	0.5847366	0.5198255	0.4040405	0.506	0.6137915	0.6739507	0.4040405	0.506	0.6100312	0.8269284	0.4040405	0.506	0.5487059	0.860235	0.4040405	0.506
1473388.9	0.499752	0.4038925	0.4038925	0.506	0.5846586	0.5192595	0.4038925	0.506	0.61448	0.6739436	0.4038925	0.506	0.6079334	0.8287513	0.4038925	0.506	0.5467273	0.8602066	0.4038925	0.506
1473488.8	0.4997888	0.4036648	0.4036648	0.506	0.5846097	0.5185431	0.4036648	0.506	0.6147223	0.6675452	0.4036648	0.506	0.6042629	0.8269628	0.4036648	0.506	0.5467465	0.8588659	0.4036648	0.506
1473589	0.4994645	0.4034334	0.4034334	0.506	0.5846497	0.5184761	0.4034334	0.506	0.6139922	0.6718363	0.4034334	0.506	0.6011993	0.8280385	0.4034334	0.506	0.5467628	0.8588174	0.4034334	0.506
1473689.1	0.5003281	0.4018614	0.4018614	0.506	0.5841697	0.5186141	0.4018614	0.506	0.6135802	0.6718625	0.4018614	0.506	0.6013559	0.8268226	0.4018614	0.506	0.5467719	0.8590789	0.4018614	0.506
1473789.1	0.5000513	0.4007468	0.4007468	0.506	0.5839765	0.5177896	0.4007468	0.506	0.6144452	0.6717963	0.4007468	0.506	0.6037723	0.8265191	0.4007468	0.506	0.5479618	0.8590701	0.4007468	0.506
1473889.2	0.4995552	0.4008877	0.4008877	0.506	0.5838401	0.5178469	0.4008877	0.506	0.6137221	0.6719933	0.4008877	0.506	0.6064219	0.8261591	0.4008877	0.506	0.5480018	0.8591412	0.4008877	0.506
1473988.7	0.4995219	0.4004892	0.4004892	0.506	0.5825695	0.5174294	0.4004892	0.506	0.6133713	0.671187	0.4004892	0.506	0.6079456	0.8257573	0.4004892	0.506	0.5491123	0.8593634	0.4004892	0.506
1474089.5	0.4979717	0.4027771	0.4027771	0.506	0.5816011	0.5172909	0.4027771	0.506	0.612509	0.6704003	0.4027771	0.506	0.6096772	0.82235	0.4027771	0.506	0.5497546	0.8591619	0.4027771	0.506
1474189.5	0.4973407	0.4027361	0.4027361	0.506	0.5816413	0.5172405	0.4027361	0.506	0.6113285	0.6722601	0.4027361	0.506	0.6101503	0.8225101	0.4027361	0.506	0.5495288	0.8584236	0.4027361	0.506
1474288.8	0.49774	0.4010879	0.4010879	0.506	0.5805552	0.5171143	0.4010879	0.506	0.6108469	0.6720966	0.4010879	0.506	0.6101561	0.8217079	0.4010879	0.506	0.550912	0.8578709	0.4010879	0.506
1474389.7	0.4977356	0.4011565	0.4011565	0.506	0.5800148	0.5174631	0.4011565	0.506	0.6105514	0.6749422	0.4011565	0.506	0.6108964	0.8226401	0.4011565	0.506	0.5509366	0.8565082	0.4011565	0.506
1474489.8	0.4985002	0.4015223	0.4015223	0.506	0.5790354	0.517489	0.4015223	0.506	0.6098532	0.6749185	0.4015223	0.506	0.6109166	0.8226408	0.4015223	0.506	0.552219	0.8560385	0.4015223	0.506
1474589.9	0.4992698	0.3998751	0.3998751	0.506	0.5792193	0.5175052	0.3998751	0.506	0.6099263	0.6755242	0.3998751	0.506	0.6110895	0.8229029	0.3998751	0.506	0.5527309	0.8560494	0.3998751	0.506
1474689.9	0.4992608	0.4000554	0.4000554	0.506	0.5791634	0.517265	0.4000554	0.506	0.6099055	0.6754885	0.4000554	0.506	0.6111022	0.8240737	0.4000554	0.506	0.55136	0.8558836	0.4000554	0.506
1474789.1	0.4991368	0.4001839	0.4001839	0.506	0.5797626	0.5196806	0.4001839	0.506	0.6082325	0.6769375	0.4001839	0.506	0.6103221	0.8244677	0.4001839	0.506	0.5496663	0.8561139	0.4001839	0.506
1474890.1	0.4996375	0.4022076	0.4022076	0.506	0.5798201	0.5194002	0.4022076	0.506	0.6083186	0.6749362	0.4022076	0.506	0.6097306	0.8244624	0.4022076	0.506	0.5493388	0.8562517	0.4022076	0.506
1474990.2	0.4996047	0.4040618	0.4040618	0.506	0.5808252	0.5210328	0.4040618	0.506	0.6082861	0.6775674	0.4040618	0.506	0.6096218	0.8245289	0.4040618	0.506	0.54887	0.8566418	0.4040618	0.506
1475090.2	0.5005007	0.4041545	0.4041545	0.506	0.5811692	0.5210598	0.4041545	0.506	0.6082898	0.6796238	0.4041545	0.506	0.6092682	0.8248381	0.4041545	0.506	0.5484576	0.8575363	0.4041545	0.506
1475190.3	0.5011199	0.4045047	0.4045047	0.506	0.5818902	0.5212918	0.4045047	0.506	0.6082544	0.6816558	0.4045047	0.506	0.6087433	0.8278677	0.4045047	0.506	0.5472641	0.857628	0.4045047	0.506
1475290.4	0.5015661	0.4046134	0.4046134	0.506	0.582154	0.5215626	0.4046134	0.506	0.608293	0.6807345	0.4046134	0.506	0.6082239	0.8281114	0.4046134	0.506	0.5472072	0.857965	0.4046134	0.506
1475390.2	0.5015584	0.4046373	0.4046373	0.506	0.5836777	0.5215223	0.4046373	0.506	0.608654	0.6815342	0.4046373	0.506	0.6081944	0.8301808	0.4046373	0.506	0.5467067	0.8580002	0.4046373	0.506
1475490.6	0.5031085	0.4039227	0.4039227	0.506	0.5836909	0.5216329	0.4039227	0.506	0.6092428	0.6809757	0.4039227	0.506	0.6080725	0.8300678	0.4039227	0.506	0.5469794	0.8581366	0.4039227	0.506
1475590.7	0.5035645	0.4041083	0.4041083	0.506	0.5837705	0.521413	0.4041083	0.506	0.6092532	0.6809191	0.4041083	0.506	0.6080471	0.8301039	0.4041083	0.506	0.5467893	0.8583236	0.4041083	0.506

MOTION DATA KEY

Time	Time stamp of 1 Frame of the API's Motion Data (x, y, z, viz)
P0_x	P0 Landmark x coordinate in approximated space
P0_y	P0 Landmark y coordinate in approximated space
P0_z	P0 Landmark z coordinate in approximated space
P0_viz	Vizibility Parameter of the P0 Landmark

DATA BUTTON



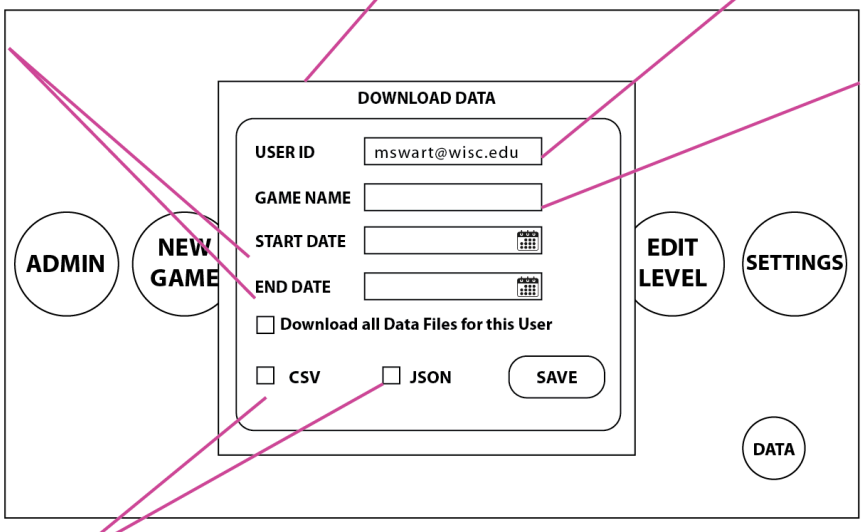
PRESSING THE **DATA** BUTTON INITIATES A POPUP THAT, BASED ON LOGIN CREDENTIALS, PRESENTS A SERIES OF PULL DOWN MENUS THAT, BASED ON AN INDEXING OF THE DATA STORAGE REPOSITORY ON FIREBASE, ALLOWS USERS TO INDICATE THE GAME NAME, THE DATE(s), AND THE FORMATS FOR DOWNLOAD (i.e., CSV, JSON)

THE DIALOGUE BOX THAT APPEARS WHEN THE **DATA** BUTTON IS PRESSED WILL ALLOW THE USER TO SPECIFY THE RANGE OF DATA FROM A SPECIFIC GAME's PLAY WITHIN A PARTICULAR TIME FRAME THAT IS DETERMINED BY THE TIME STAMP INDEXED ON THE FILE IN FIREBASE.

USER ID IS AUTO-POPULATED BY LOGIN CREDENTIAL

START/END DATE IS A DROPDOWN MENU, MOST LIKELY THERE IS AN EXISTING JS PACKAGE TO CREATE SUCH, THAT USES THE INPUTED DATE AS A PARAMETER TO FIND ALL THE DATA FILES THAT ARE TIMESTAMPED WITHIN THE GIVEN RANGE

GAME NAME IS A DROPDOWN MENU THAT THE CHOICES ARE POPULATED FROM THE LOGIN CREDENTIALS IN WHICH ALL THE GAMES FOR WHICH THE USER IS LISTED AS AN AUTHOR OR WHEN THE USER CREDENTIAL IS THAT OF AN ADMIN OR RESEARCHERa



CSV & **JSON** CAN BOTH BE SELECTED TO BE DOWNLOADED BY THE USER

3.2.1 | Steps

The first step in this process will be to consult with the previous team's work on building a database.

4 | Additional Considerations

4.1 | Migration to PixiJs– Technical Debt

As it stands, The Hidden Village utilizes ReactPixi as the main package to render and create graphics. JSPixi is a similar graphics package that is used to render basic components with a lot more overall functionality and methods to use. For future development, our team recommends that The Hidden Village be migrated from using ReactPixi to PixiJS as its main package. There are a lot more methods in PixiJS that can be used for building basic shapes and rendering more complex features.

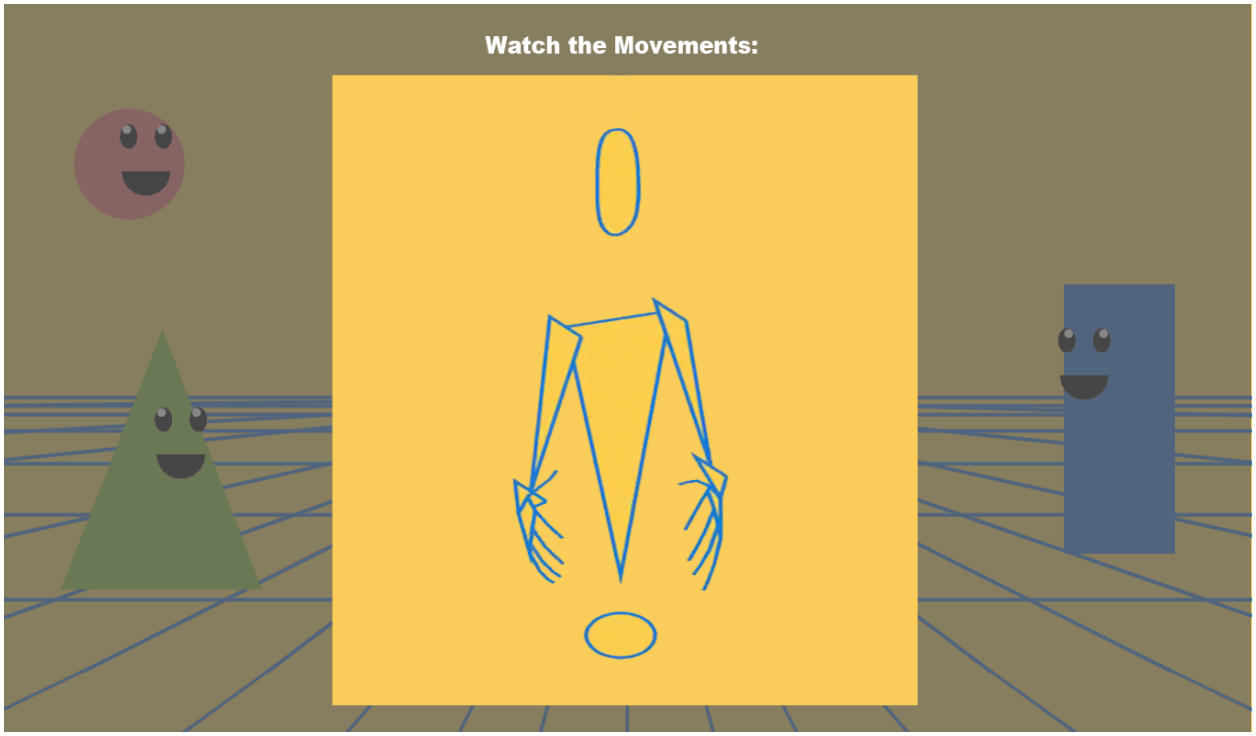
This migration is to first be consulted with subject matter experts. Once determined to be an issue that would interfere with future development of gameplay, this additional feature should be front loaded and prioritized.

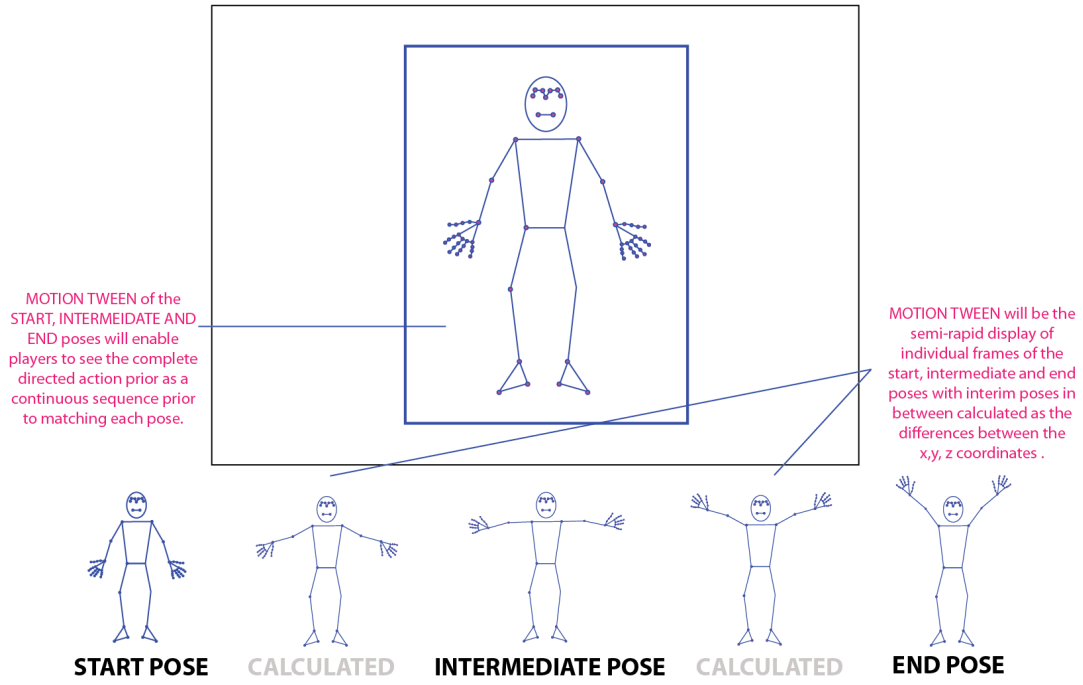
4.1.2 | Steps

To accomplish this migration, developers should first install the PixiJs package. This can be accomplished by using `npm install PixiJs`. Then replace the import methods to import PixiJs instead of ReactPixi. Developers should comb through the code base and change the ReactPixi specific methods to PixiJs. This should be done in an iterative approach, to ensure that none of the changes will cause issues.

4.2.1| Stretch Goal: Motion Tween from Pose Data

Currently, there are three poses that are stored by THV-O v0.4. There are ***start***, **intermediate**, and **end** poses. However, there is no transition between the different poses that are displayed. This often leads user failing to understand that the series of poses are actually, in totality, a continuous motion. THV-O v0.5 will attempt to create a tween function to transition between the different poses. This is possible by calculating interim pose coordinates between the start, intermediate and end poses and displaying them in semi-rapid succession as a type of animatic that essentially displays the series of poses as one continuous movement.





4.2.2 | Steps

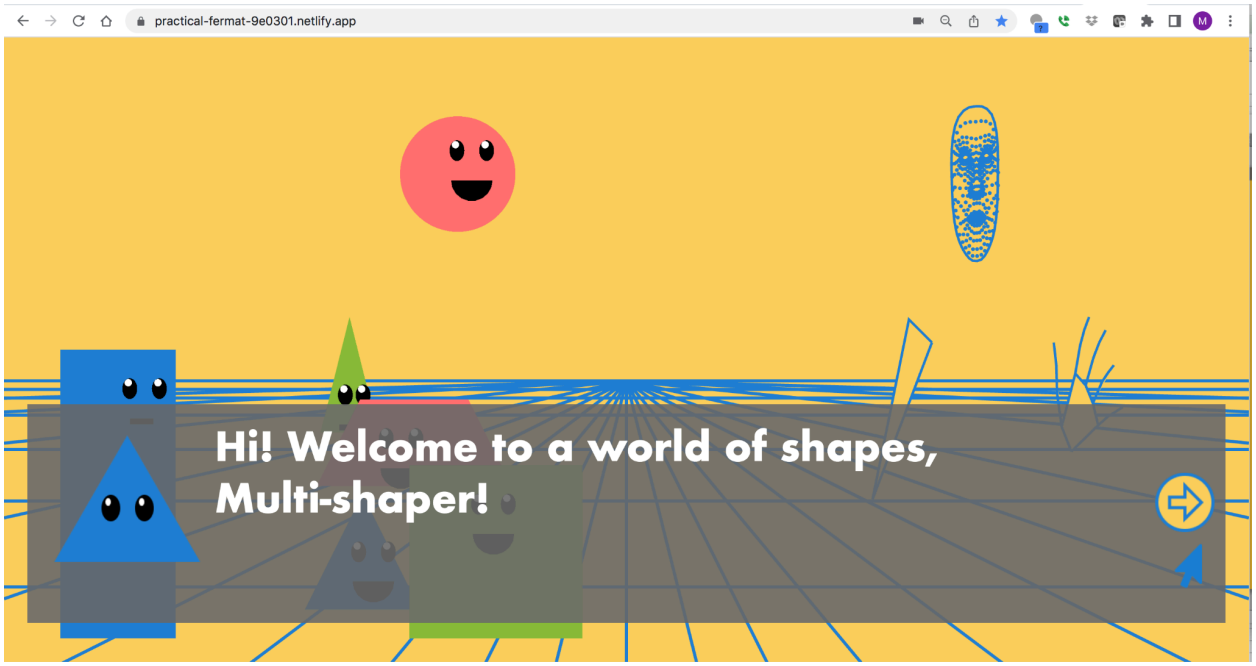
We will start by creating a button within the curriculum/game editor that allows administrative users (ranging from admins, teachers, students, players) to create/edit a storyline (certain users are denoted

by permissions) through a template formatted document (an example of this document currently exists from v0.2 and is stored on the github repository). The current v0.2 document is not WYSIWYG, but is a text based document. Ideally, we would like to design a UX based interface that, similarly to the Conjecture editor. Specific fields and boxes the user can fill out to create a narrative within the game. Modifying storylines will be within a specific game curricula such that admins will be able to select a game curriculum and a button will allow them access to a UX that will allow them to edit the specific fields: (1) character, (2) dialogue, and add more dialogue with a "+/-/edit" option that will add lines to the dialogue delivered by a particular character (see Figure X).

4.3.1 | Stretch Goal: Script Editor Module

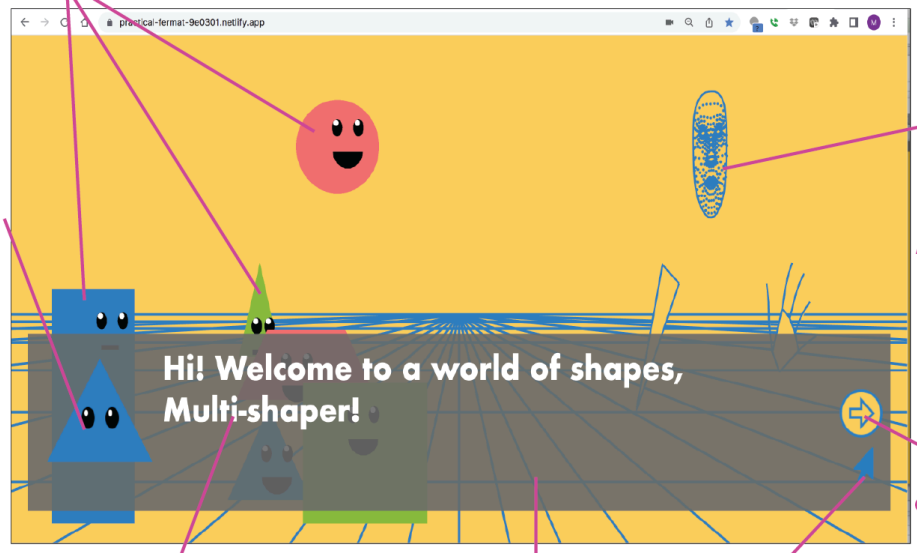
A goal for the fall 2024 scope of work is to build a module that will allow users (e.g., researchers, admins, teachers, students, players) with appropriate permissions (via user ID, role and password) to easily create a custom storyline for any specific game/curriculum saved in The Hidden Village's repository. By doing this, we will make it easier for our clients to change certain aspects of the game's story if new features are implemented or the game's text needs to be updated or if activities are centered around opportunities that include creating narratives around particular curricula . This module can leverage previous code (based on existing code from v0.2) into a graphical interface that allows users to add chapters, and lines of dialogue (delimited by allowable characters with a character count that dynamically changes the font size of text until a maximum character count/minimum font size is reached) attributed to particular characters.

Functionality of this module with coordinate with curricular content units such that when adminstrators create a curricular unit, they will have the option to access the script editor to customize the narrative of the gameplay experience.The existing code already includes default characters and a an existing storyline that should remain the DEFAULT for THVO that is implemented whenever users play games where no specific custom story/script has been provided. While preliminary functionality will be based on the existing (i.e., default) "shape" characters currently implemented, it would be ideal for the system to either allow narrative designers the option of selecting either default characters or even uploading .png sprites (saved to a sprites directory in firebase that assigns IDs to characters based on the unique game module ID) that enables users to create a custom storyline with their own characters. Access to the story/script editor is done through a button in the game editor module (see below).



BACKGROUND SPRITES ARE RANDOMLY GENERATED AND PLACED WITHIN THE BOUNDARIES OF THE BACKGROUND AND ARE ON A VISIBLE LAYER THAT IS BEHIND THE FOREGROUND WHERE THE CURRENT DIALOGUE IS BEING ACTIVELY DELIVERED. FOR ANY GAME MODULE THAT DOES NOT CUSTOMIZE THE SHAPE CHARACTES ARE DEFAULT CHARACTERS, BUT IDEAL FUNCTIONALITY OF THE STORY/SCRIPT EDITOR MODULE WILL ALLOW USERS TO UPLOAD THEIR OWN SPRITES

DEFAULT BACKGROUND IS GENERATED IN REACT AND SERVES AS THE BACKGROUND FOR ALL OF THVO. IN IDEAL IMPLEMENTATION, THIS DEFAULT BACKGROUND IS DEPLOYED IN ALL INSTANCES OF THVO GAME PLAY UNLESS ALTERNATE BACKGROUND ARE UPLOADED BY THE USER IN FOR A CUSTOMIZED NARRATIVE



PLAYERS AVATAR DISPLAYS IN REAL-TIME VIA THE MEDIAPIPE API AND DEPICTS USERS FACES AND UPPER TORSO AND PELVIS, INCLUDING FORARMS, UPPER ARMS, HANDS AND FINGERS

SPEAKING SPRITE IS THE SPRITE THAT IS ACTIVELY DELIVERING DIALOGUE. THE SHAPE CHARACTES ARE DEFAULT CHARACTERS, BUT IDEAL FUNCTIONALITY OF THE STORY/SCRIPT EDITOR MODULE WILL ALLOW USERS TO UPLOAD THEIR OWN SPRITES

NEXT BUTTON ALLOWS USERS TO ADVANCE TO THE NEXT SCREEN WHEN THE CURSOR HOVERS OVER THE BUTTON FOR A SET DURATION

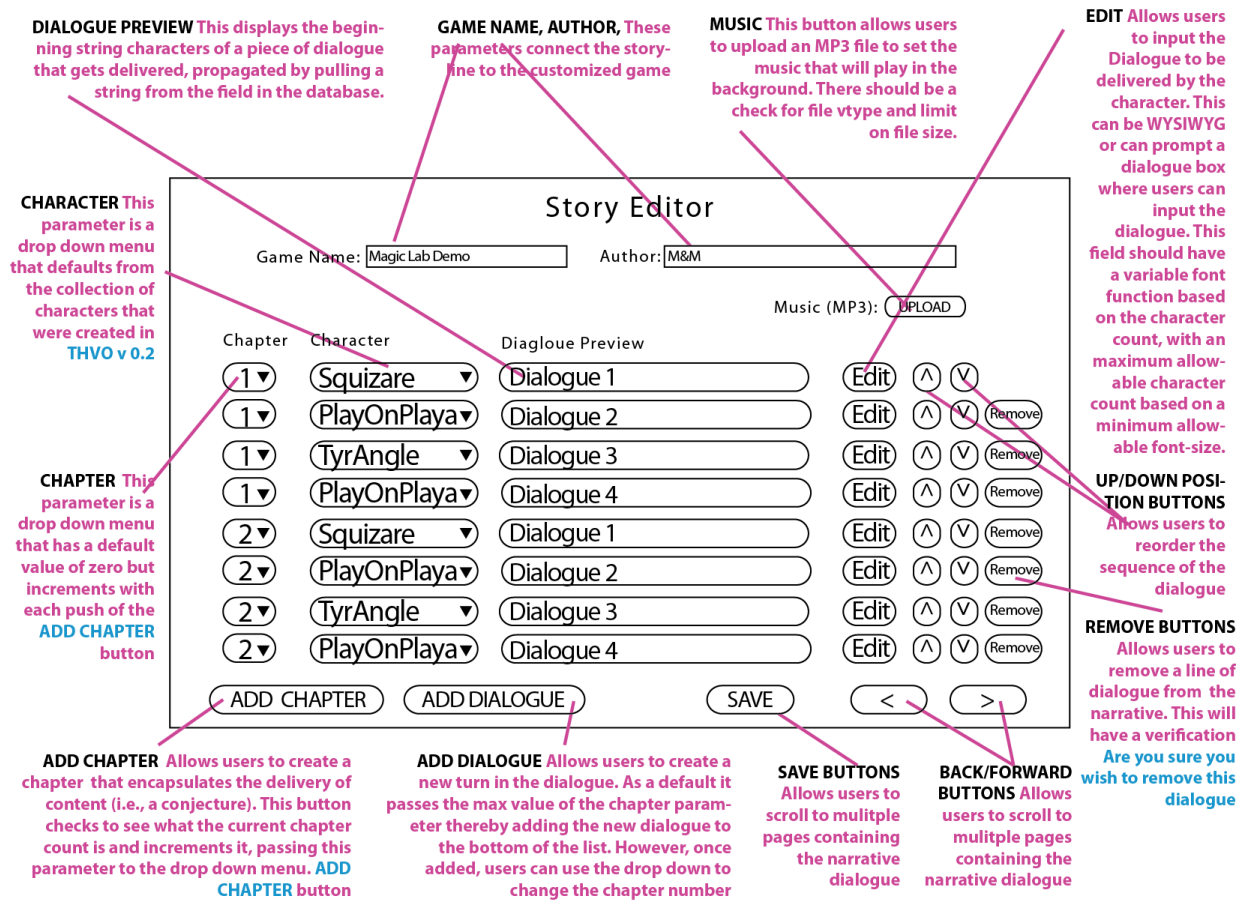
DIALOGUE ARE THE LINES WRITTEN BY THE USER WHEN WRITING A NARRATIVE FOR THE GAME MODULE. IDEALLY, THERE IS CODE THAT WILL IMPLEMENT A DEFAULT FONT SIZE BASED ON A $0 \leq$ CHAR LIMIT $\leq$ MAX, THAT WILL ALSO ADJUST (DECREMENT) THE FONT SIZE BASED ON INCREASING INTERVALS OF CHARACTERS, BUT ULTIMATELY DELIMITED TO A MAXIMUM CHARACTER LENGTH DETERMINED BY A MINIMUM VIABLE FONT SIZE

DIALOGUE DELIVERY AREA IS A DESIGNATED AREA WHERE LINES OF DIALOGUE ARE DELIVERED

CURSOR HOVERS ON THE SCREEN AND APPEARS AFTER A TIMER BASED ON THE COMPUTERS INTERNAL PROCESSOR CLOCK AND IS CONTROLED BY THE USERS RIGHT HAND MOVMENTS


Game Editor
Game Name: MAGIC LAB DEMO
Author: M&M
Keywords: TRIANGLE
Pin: 1234
SET GAME OPTIONS
STORY EDITOR
INSTRUCTIONS
Author
Conjecture Name
Keywords
M&M
TRY ANGLES - THEY'RE FUN!
TRIANGLES, ANGLES, DEGREES, EQUILATERAL
^
v
Remove
PREVIOUS
NEXT
+Add Conjecture
SAVE DRAFT
PUBLISH
BACK

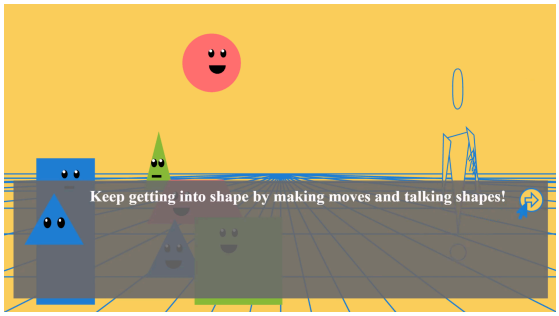

Story Editor
Game Name: MAGIC LAB DEMO
Author: M&M
Keywords: TRIANGLE
Pin: 1234
Chapter
Character
Dialogue Preview
1 Squizzare It was the best of shapes, it was Edit ^ v Remove
1 PlayOnPlaya What? Behind the rabbit? Edit ^ v Remove
1 TyrAngle Four Score and Seven Shapes Edit ^ v Remove
1 PlayOnPlaya Follow the white rabbit? Edit ^ v Remove
2 Squizzare You can't handle the truth! Edit ^ v Remove
2 PlayOnPlaya Adrianne!?! Edit ^ v Remove
2 TyrAngle There is no spoon... Edit ^ v Remove
2 PlayOnPlaya We'll always have Paris. Edit ^ v Remove
Add Chapter
Add Dialogue
<
>



3.4.1 | Steps

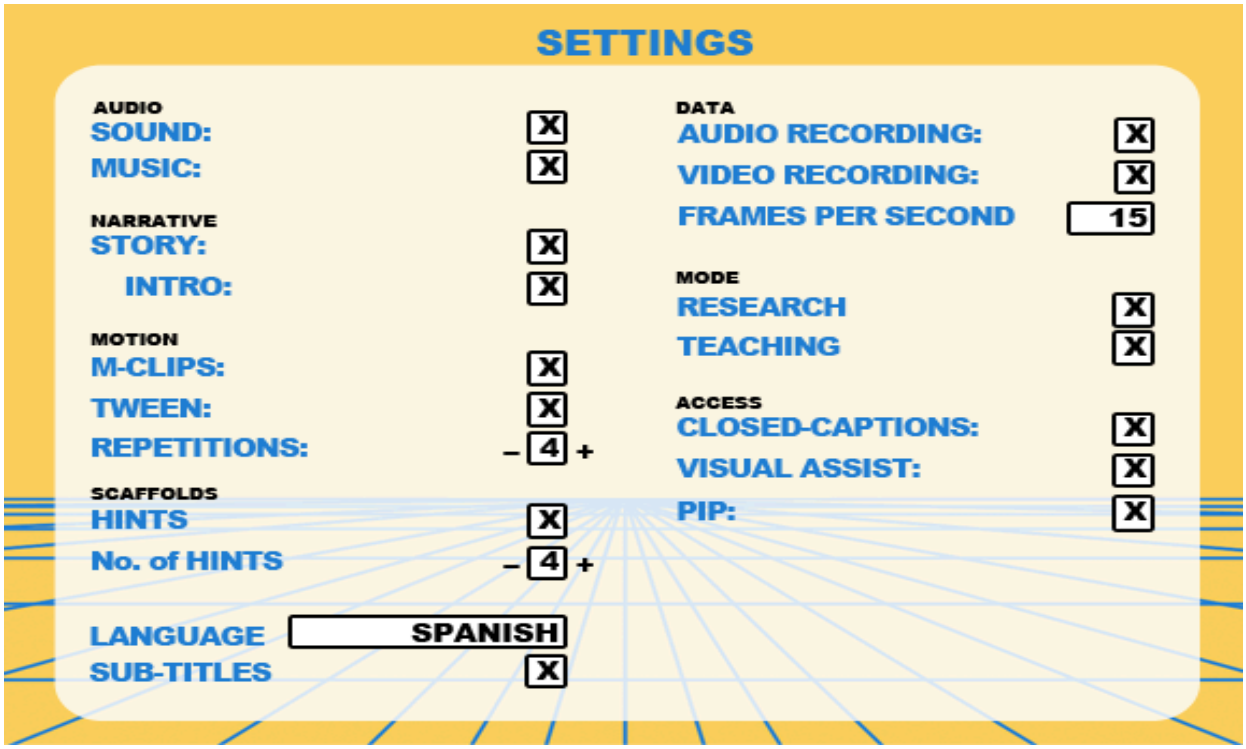
We will start by creating a button within the curriculum/game editor that allows administrative users (ranging from admins, teachers, students, players) to create/edit a storyline (certain users are denoted by permissions) through a template formatted document (an example of this document currently exists from v0.2 and is stored on the github repository). The current v0.2 document is not WYSIWYG, but is a text based document. Ideally, we would like to design a UX based interface that, similarly to the Conjecture editor. Specific fields and boxes the user can fill out to create a narrative within the game. Modifying storylines will be within a specific game curricula such that admins will be able to select a game curriculum and a button will allow them access to a UX that will allow them to edit the specific fields: (1) character, (2) dialogue, and add more dialogue with a “+/-/edit” option that will add lines to the dialogue delivered by a particular character (see Figure X).

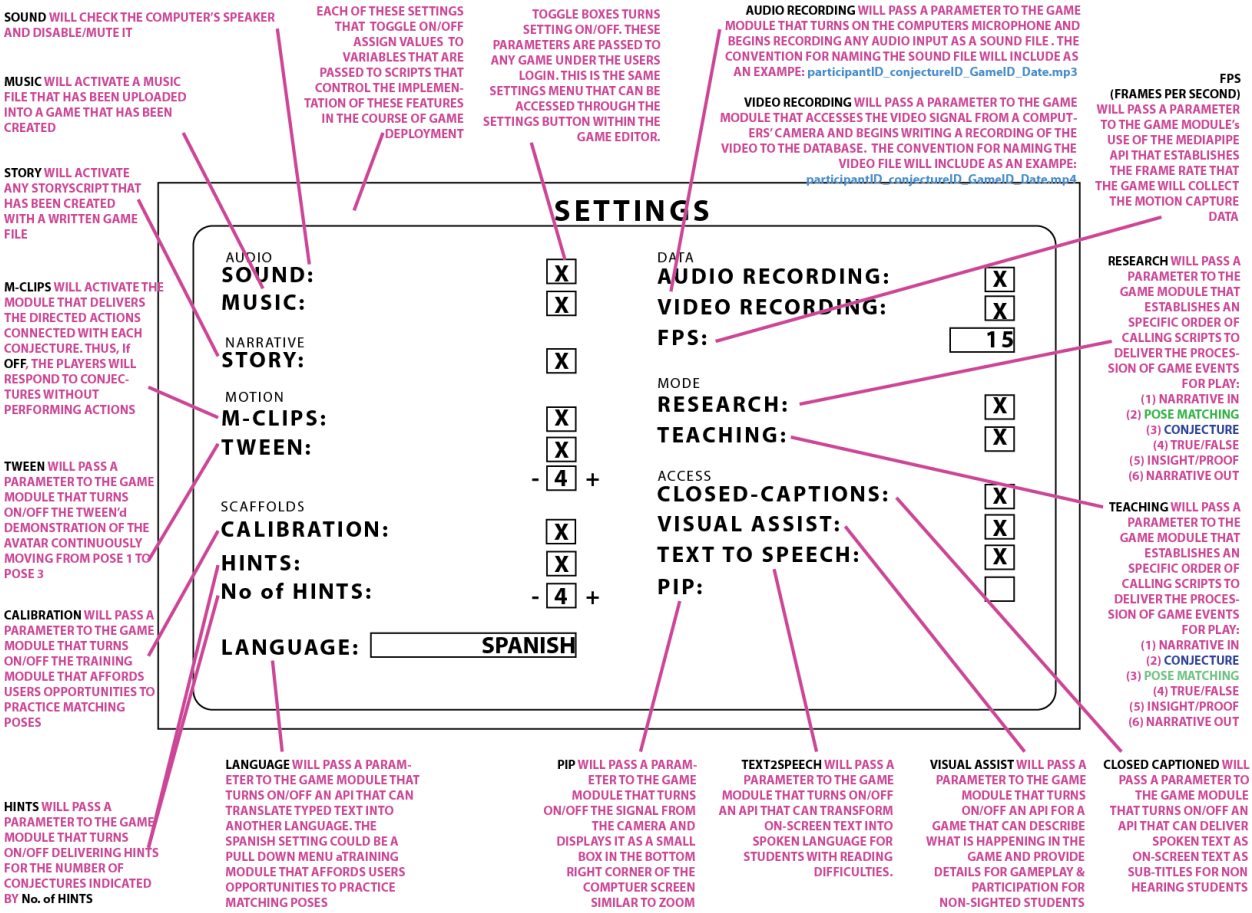
Figure X. Delivery of Narrative, Plot and Setting with Characters in THV-O v0.2



4.4.1 | Stretch Goal: Game Settings Menu

Create and implement a settings menu that will allow users to control (i.e on/off) different features of the game. For the current build, the features of the settings menu: (1) Sound, (2) Music, (3) Story, (4) M-Clips, (5) Tween, (6) Repetitions, (7) Calibration, (8) Hints, (9) No. of Hints, (10) Language, (11) Audio Recording, (12) Video Recording, (13) FPS, (14) Research Mode, (15) Teaching Mode, (16) Closed Captions, (17) Visual Assist, (18) Text to Speech, (19) Picture-in-Picture. In all this will allow teachers, admins, researchers and game designers ability to customize game and data collected.





4.4.2 | Steps

Once the first settings have been determined, it will be crucial to conduct a thorough code tour to determine what scripts will need to be written to turn various settings on and off as well as determine which modules will call those scripts. Settings will be specific to each game. If no settings are specified, there should be a default for all settings. Access to settings are determined by login credentials. We will then decide on how to design the settings menu so that navigation is easy for the basic user which will allow them to customize their game easier. After we decide on how we want the setting menu to look and what functionalities we feel that it should have we will then confirm with our client and build the settings menu and implement it into the game.

5 | Semester Timeline

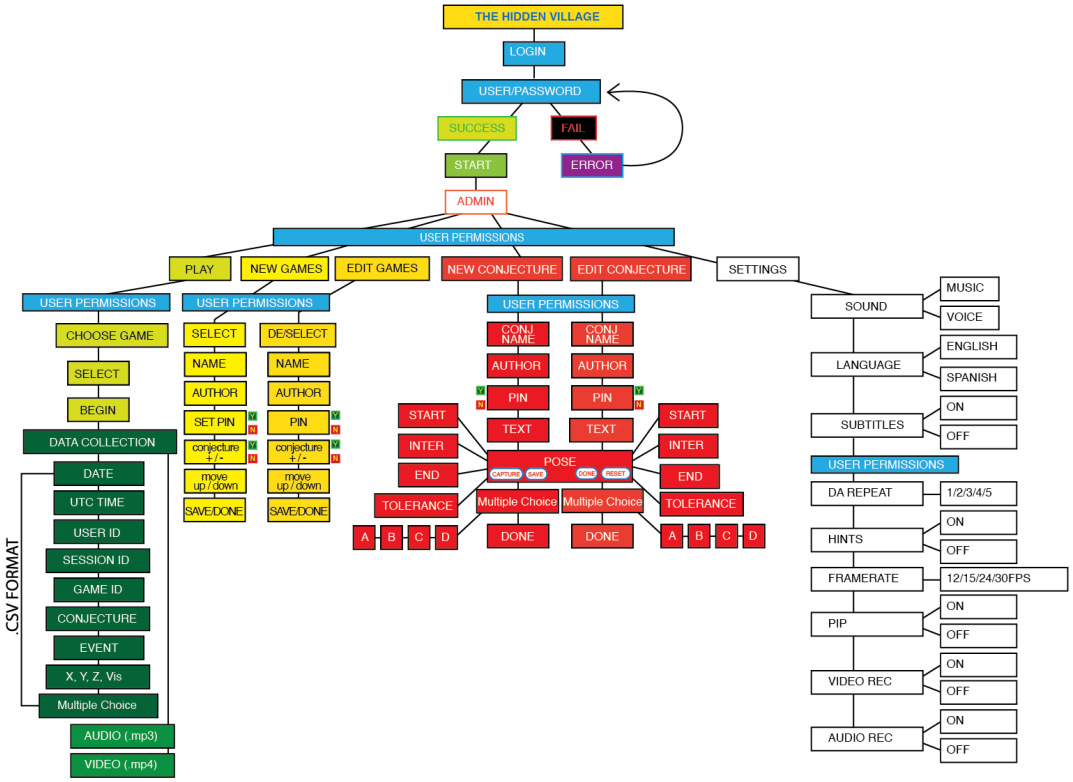
Terminology:

- **Code Review** refers to a meeting the students have with our faculty, where they review and provide feedback for the code we've written.
- **Code Freeze** is the program's recommended end date of feature development. Once code freeze is reached, the only code that should be written is bug fixes.

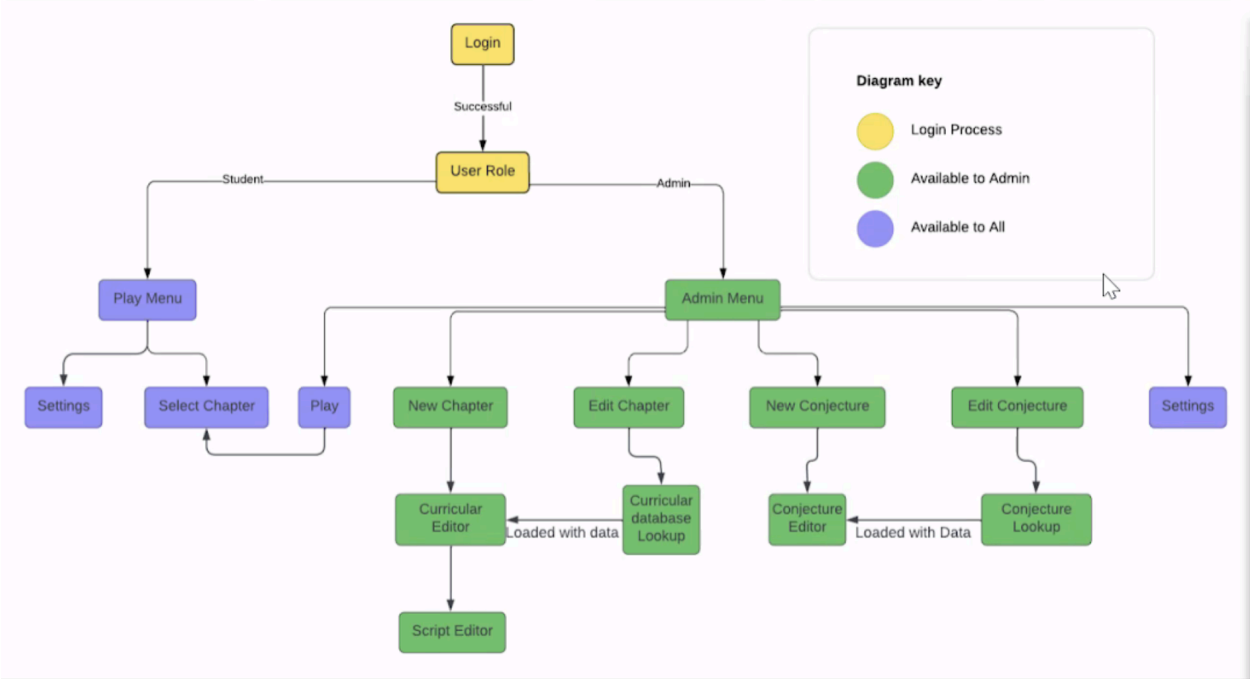
Other important dates to note:

- No standup meeting **Friday, September 20th**, as we will be giving our 1Q presentation during that time.
- Either Client meeting or standup meeting will be rescheduled or canceled **the week of October 14th**, as we will be giving our midterm presentation during that time.
- No client meetings **November 27th, 28th, and 29th**, as we have a break for Thanksgiving.
- No meetings during finals week, **the week of December 9th**.

6 | THV-O Architecture Schematic



7 | Process Schematic



8 | Client Approval

Client Name	Signature	Date
Mitchell Nathan		
Michael Swart