SOFTWARE REQUIREMENTS SPECIFICATION

Version 4.0
April 21, 2011

Revision Sign-off

By signing the following, the team member asserts that he has read the entire document and has, to the best of his knowledge, found the information contained herein to be accurate, relevant, and free of typographical error.

Name	Signature	Date
Michael Fore		
Sean Owen		
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Matthew Williams		

Revision History

The following is a history of document revisions.

Version	Changes	Edited
Version 1.0	Initial draft.	**11/07/2010**
Version 1.1	Revised Use-Case scenarios, Edited changes from version 1.0, Added requirements for *Healing Vision* application	**12/10/2010**
Version 2.0	Added new cover sheet style, added requirements for 'Froggie Says' game.	**1/30/2011**
Version 3.0	Added requirements for new games, updated general and framework requirements.	**2/28/2011**
Version 4.0	Minor revisions and changes to keep document up to date.	**4/21/2011**

Contents

1. Introduction

1.1 Purpose

Included in this document are the functional and non-functional requirements of *Healing Touch* system. Furthermore, this document reflects the needs of Texas Health Resources (THR) and ensures that members of *Healing Touch* implement those needs.

1.2 Intended Audience

This document will allow THR clients and project sponsors to verify that project requirements are implemented and give members of *Healing Touch* a reference of what needs to be completed.

1.3 Scope and Objectives

The primary objective of *Healing Touch* is to create a computerized system designed to provide therapeutic and rehabilitative exercises through gaming on multi-user, multi-touch devices. In addition, the system provides for the collection, storage, and retrieval of relevant game results in order to report patient outcomes for monitoring and comparative purposes. This system will be used to rehabilitate THR patients and allow for the analysis of collected data pertaining to various medical conditions.

A framework will be developed to run on both the Microsoft Surface and the Apple iPad that will support the addition of a variety of games and transfer of collected game data to a remote SQL database. Each game is designed to record metrics that are relevant to monitoring the rehabilitation of various medical conditions. The *Healing Vision* standalone program will be capable of registering patients and clinicians into the system, printing patient profiles, and generating reports on patient gaming results.

2. Glossary

Apple iPad	The Apple iPad is a touch-interface tablet computer designed and distributed by Apple.
Healing Touch Framework	The framework is the backend software that allows a user to login and choose a game. It also handles data collected from game plays and sends this data to the database.
iOS4	iOS4 is the Operating System that runs on the Apple iPad platform.
Microsoft Surface	Microsoft Surface is a multi-touch product from Microsoft which is a combination of software and hardware technology that allows a user, or multiple users, to manipulate digital content by the use of gesture recognition.
Metrics	A metric is a definite magnitude of a physical quantity, defined and adopted by convention and/or by law, which is used as a standard for measurement of the same physical quantity.
Neuromuscular	Pertaining to the voluntary control of muscles by nerves.
THR	Texas Health Resources
Session	Time between patient log in and log out
Healing Vision	Standalone application designed to access the *Healing Touch* database

3. General Description

3.1 Product Perspective

Healing Touch is a system that is designed to aid in the rehabilitation of THR patients. The system contains two main components: The *Healing Touch* framework, which will run on multiple platforms, and a standalone desktop program, *Healing Vision*, which interfaces with a remote database that maintains all patient game data. *Healing Vision* provides a way for patient data to be organized and queried, thus allowing THR to monitor patients and analyze results.

3.2 Product Functions

Healing Touch is a tool created to assist in patient rehabilitation through gaming as well as provide the ability to monitor and report progress. In order to accomplish these two goals, the system contains a framework that will run on the Microsoft Surface and Apple iPad platforms. The framework allows for the inclusion of a variety of games and collection of game data from patient play sessions. The second part of the system, *Healing Vision*, is a standalone application which gives a clinician access to a database that contains game data and patient information. Through *Healing Vision*, the clinician can add and edit patient profiles as well as generate reports of game results.

3.3 User Characteristics

Healing Touch is designed to be used by anyone, but specifically by patients with various cognitive and neuromuscular conditions. Additionally, clinicians will monitor the use of the system as well as interface with *Healing Vision* to register patients and analyze the collected data.

3.4 Operating Environment

The *Healing Touch* is designed to operate with the following software/hardware:

- Microsoft Windows Vista on Microsoft Surface
- iOS4 on Apple iPad
- Microsoft Windows XP or better for the standalone application
- Microsoft Windows Server 2008 R2 with Microsoft SQL Server 2008

3.5 General Constraints

Time Constraints:

Limited by academic school year (ends May 7, 2011)

Surface Limitations:

Limitations on the Surface SDK

Computing Power
Internet Connectivity
Responsiveness

iPad Limitations:

Limitations on the iPad SDK
Number of users
Screen Size
Computing Power
Internet Connectivity

3.6 Assumptions and Dependencies

The *Healing Touch* Project assumes the end-user has the following:

- SQL software
- An iPad or a Surface with network capabilities
- A computer with a Windows operating system of XP or greater
- A clinician that is capable of guiding the patient through the system

4. External Interface Requirements

4.1 User Interfaces

The user interface for the Surface and iPad shall be intuitively designed to limit user errors. Each screen shall contain an exit application button and a back to home button. Before each game, the patient shall be presented with directions on how to play.

The *Healing Vision* interface shall be designed for quick and easy access to data from the SQL database. Registration shall also have a simple interface for clinicians to enter patient data.

4.2 Software Interface

The framework produced by this project shall allow additional games to be easily added. The framework shall be the central hub of communication between the games and the database. *Healing Vision* shall be capable of adding, modifying, and querying data from the database.

5. Constraints

5.1 CON-01

Games developed for *Healing Touch* shall be approved by customers.

5.2 CON-02

When data input is required from the user, text field use shall be kept to a minimum.

5.3 CON-03

Both single player and multiplayer games shall be included in the games developed for the initial system.

5.4 CON-04

Games shall include a range of cognitive and neuromuscular skills testing.

6. Functional Requirements

6.1 General Requirements

6.1.1 GEN-01

Patients shall be able to play a series of games geared toward rehabilitative and testing purposes using the *Healing Touch* application on the Microsoft Surface and the Apple iPad.

6.1.2 GEN-02

Patient profile and gaming results shall be stored on and retrieved from a remote database.

6.1.3 GEN-03

All interaction with the database shall be limited to the Microsoft Surface, Apple iPad, and the stand alone application on a clinician workstation.

6.2 Surface Specific Requirements

6.2.1 SUR-01

Users shall be able to choose from Free Play Mode and Test Mode. In Free Play Mode, no login ID is required and game information is not sent to the database. In Test Mode, the user must login with a valid patient ID and all game data will be recorded and sent to the database.

6.2.2 SUR-02

The Surface shall have a wired connection to the database. If connection is lost, no game data is sent to the database for that session and a warning is displayed.

6.2.3 SUR-03

The user shall have the option to choose between a grid view and an album view for the game menu page.

6.2.4 SUR-04

During in-game menus, clinicians shall be able to place down their ID card and choose temporary game options for that single play session.

6.2.5 SUR-05

Guests shall be able to select game options from an in-game menu.

6.3 iPad Specific Requirements

6.3.1 IPD-01

Clinicians shall configure the iPad for a specific patient. Whenever *Healing Touch* is started on that iPad the patient will automatically be logged in.

6.3.2 IPD-02

Game data shall be stored locally on the iPad until the next connection to the database upon which all game data will be transferred.

6.3.3 IPD-03

The patient shall have the option to choose between a grid view and an album view for the game menu page.

6.4 *Healing Vision* Requirements

6.4.1 HVN-01

Clinicians shall use a standalone application, *Healing Vision*, to access the main database by logging in with a valid administrator account.

6.4.2 HVN-02

Clinicians shall be able to create, edit, and print patient profiles. Clinicians shall also be able to create new clinician accounts.

6.4.3 HVN-03

Clinicians shall be able to generate reports for individual patients and comparative studies.

6.4.4 HVN-04

Clinicians shall be able to select game options for a patient using *Healing Vision*.

6.4.4 HVN-05

Healing Vision forms shall be dynamically created by reading information in the database.

6.4.5 HVN-06

If connection to the database is lost, *Healing Vision* shall display a disconnection error.

6.5 Froggie Says Requirements

6.5.1 FSR-01

The game shall be made up of two parts. First, the computer shall display a pattern of button presses. Second, the user will imitate the pattern of button presses.

6.5.2 FSR-02

The game shall build on a random sequence of button presses by adding one press on each successfully completed sequence by the user.

6.5.3 FSR-03

The game shall play two sounds: one to be used during pattern display by the computer and for correct button input by the user and one to be used for incorrect input by the user.

6.5.4 FSR-04

On an incorrect button press by the patient during a sequence, the game shall display a game over screen and offer the options to play again, allow the clinician to change game options, or return to the *Healing Touch* menu screen.

6.5.5 FSR-05

The following information shall be collected and sent to the database at the conclusion of every game: date played, hardware used, and generated pattern as well as all game option settings for that play.

6.5.6 FSR-06

On the Microsoft Surface, the game shall allow for a clinician to set temporary game options on the Froggie Says menu screen or between games by dropping his/her ID card onto the Surface.

6.5.7 FSR-07

The game shall have a delay between the computer pattern and the user turn to be set by the clinician.

6.5.8 FSR-08

The game shall have an option to display a countdown timer with the allotted time to complete the sequence to be set by the clinician.

6.6 Touchdown! Requirements

6.6.1 TDN-01

The user shall throw an unlimited amount of footballs at a target by drawing a line to determine throw power and angle.

6.6.2 TDN-02

The user shall throw footballs until the target is hit once, at which point the game will end and display end game options to play again, allow the clinician to change game options, or return to the main *Healing Touch* menu screen.

6.6.3 TDN-03

The screen shall pan to follow the football in flight.

6.6.4 TDN-04

Target distance shall be random between values set by a clinician with the lower limit being 2,248 pixels and the upper limit being 4,290 pixels.

6.6.5 TDN-05

The following information shall be collected and sent to the database at the conclusion of every game: distance from target, hardware used, throws taken, how many throws improved upon the previous throws, and the standard deviation of distance from target.

6.6.6 TDN-06

Options shall be included to add constant or variable wind and to view the arc of the football to be set at the clinician's discretion.

6.7 Meteor Defense Requirements

6.7.1 MTR-01

The user shall defend four cities against waves of meteors by tapping on the screen, causing a cannon to shoot a projectile to destroy them.

6.7.2 MTR-02

Speed, frequency, and number of meteors shall increase as the game progresses.

6.7.3 MTR-03

The game shall include a heat bar on the cannon to prevent the user from shooting randomly as fast as possible.

6.7.4 MTR-04

The game shall show the heat gauge, percentage of accuracy, and a timer counting down to the end of the game.

6.7.5 MTR-05

Cannon heat bar shall be derivative of the rate of spawn and is modified as the game progresses.

6.7.6 MTR-06

The cities shall be destroyed on one impact from a meteor.

6.7.7 MTR-07

The game shall end when there are no more cities to defend (loss), or when the timer runs out and at least one city is still safe (win).

6.7.8 MTR-08

The game shall have options editable by the clinician to set ranges of frequency and speed of the meteors, which will also increase as the game progresses.

6.7.9 MTR-09

On the Microsoft Surface, the game shall allow for a clinician to set temporary game options on the Meteor Defense menu screen or between games by dropping his/her ID card onto the Surface.

6.8 Air Hockey Requirements

6.8.1 HOC-01

The game shall be playable by two users on the Microsoft Surface in Free Play mode and on the Apple iPad.

6.8.2 HOC-02

The players shall hit a puck around the screen using virtual paddles to score on each other’s goals.

6.8.3 HOC-03

Air Hockey shall not communicate with the database.

6.8.4 HOC-04

Users shall be able to set game options such as goal limit and game timer.

6.8.5 HOC-5

The game shall end when the score limit is reached by a player or time runs out.

7. Non-functional Requirements

7.1 Performance Requirements

7.1.1 PR-01

Resource demands of designed games shall be kept within the limits of the Microsoft Surface and Apple iPad.

7.1.2 PR-02

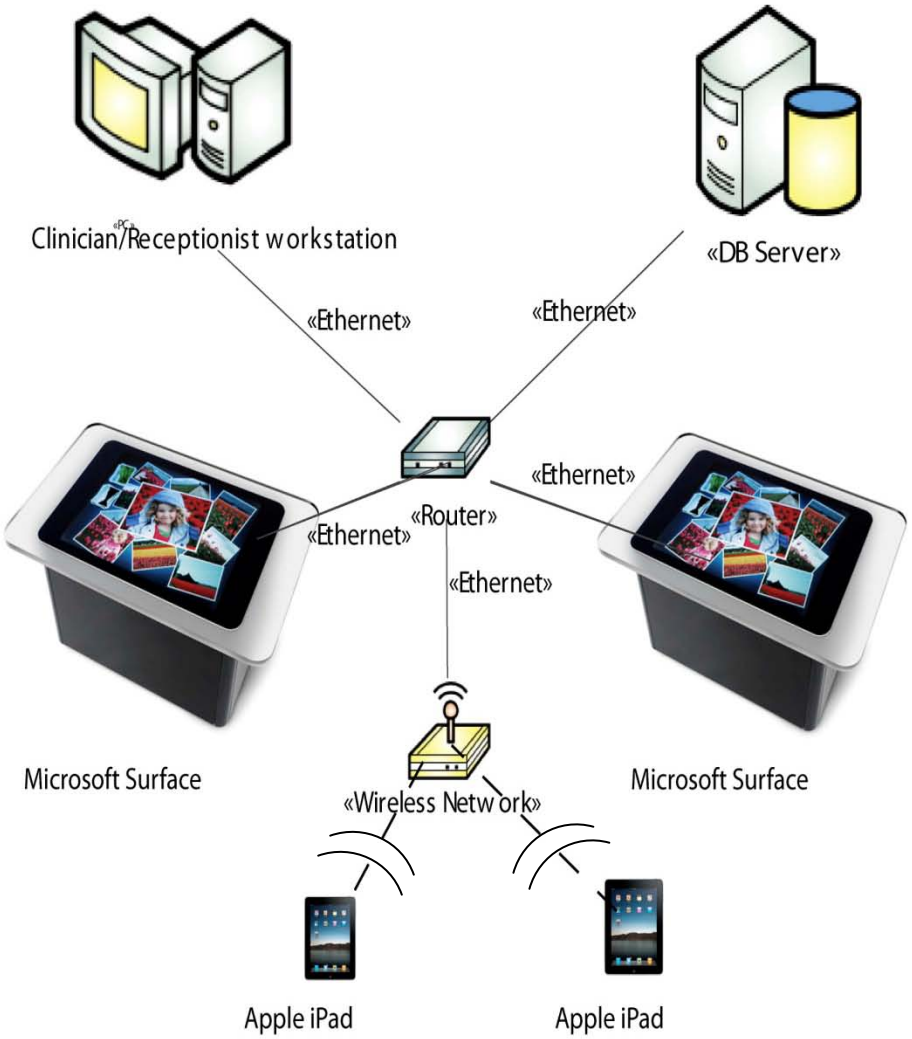
Framework and games shall quickly and accurately interpret user input.

7.2 Software Quality Requirements

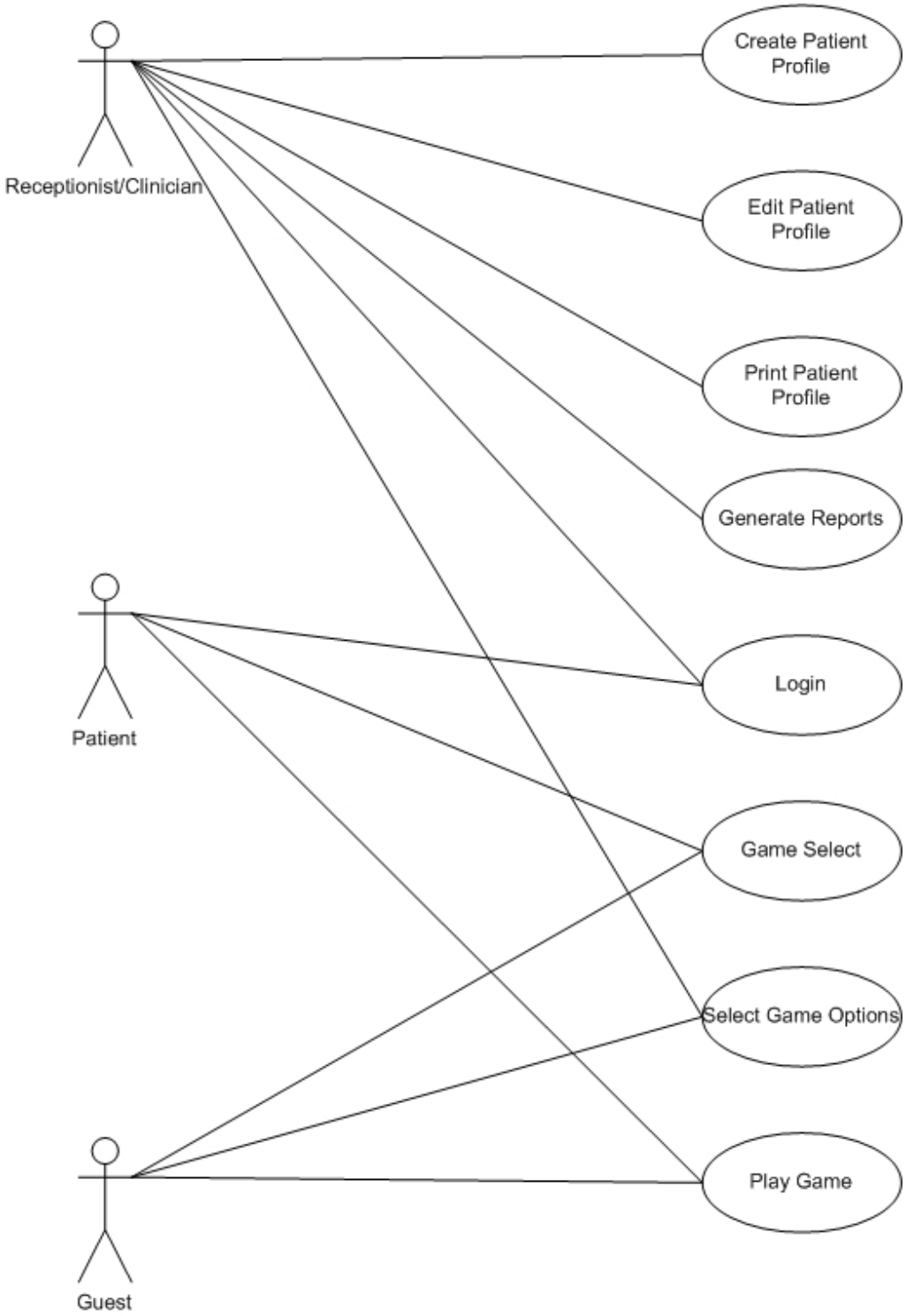
7.2.1 SQR-01

The system shall be capable of expansion. Additional games can easily be incorporated into the system.

Appendix A. Network Map



Appendix B. Use Cases



Create Patient Profile	
Actors	Clinician
General Goal	Using the *Healing Vision* application, the clinician shall create a patient profile and submit the patient's information into a database.
Pre-Conditions	A patient has first given the clinician his or her information. This also assumes that network connectivity is present for the information to be sent over to the database.
Triggers	The clinician enters a patient's data into *Healing Vision*. When finished, the clinician hits submit, and the patient's data is sent to the database for storage.
Course of Events	1. The clinician opens *Healing Vision*. 2. In the application, the clinician enters the patient's data into the appropriate fields. 3. The clinician clicks a submit button on the application. 4. The data is stored in the database.
Alternate Paths	If there is no database connectivity, there will be an error message displayed and *Healing Vision* will not allow you to create new patient profiles.
Post Conditions	The new patient data is now stored in the database and the ID numbers for the patient is auto-incremented, starting at zero.

Edit Patient Profile	
Actors	Clinician
General Goal	Using *Healing Vision*, the clinician shall edit a patient profile and update the database.
Pre-Conditions	A patient's profile should already exist in the database. This also assumes that network connectivity is present for the information to be sent over to the database.
Triggers	The clinician edits a patient's data using *Healing Vision*. When finished, the clinician hits update and the patient's data is updated in the database.
Course of Events	1. The clinician opens the *Healing Vision*. 2. The clinician selects an existing patient record and selects the edit option. 3. The application displays the current patient information. 4. The clinician changes the patient information. 5. The clinician clicks an update button on the application. 6. The patient information is updated in the database.
Alternate Paths	If there is no database connectivity, there will be an error message displayed and *Healing Vision* will not allow you to edit patient profiles.
Post Conditions	The updated patient information is stored in the database.

Print Patient Profile	
Actors	Clinician
General Goal	Using *Healing Vision*, the clinician shall print a patient's information for the clinic's files.
Pre-Conditions	The patient's data already exists in the system. The computer running *Healing Vision* is connected to a printer. This assumes that network connectivity is present for the information to be sent over to the database.
Triggers	The clinician searches for the patient's information in the database, and once found, clicks print on the page displaying the patient's information.
Course of Events	1. The clinician opens *Healing Vision*. 2. Using the application, the clinician searches for a patient's data in the database. 3. The application queries the database for the patient's information. 4. The patient's information is displayed on the screen. 5. The clinician clicks print in the application. 6. The patient's information is printed on the connected printer.
Alternate Paths	• The clinician clicks print immediately after entering new patient data to print the information on the new patient. • If there is no database connectivity, there will be an error message displayed and *Healing Vision* will not allow you to print patient profiles. • If there is no printer connected, then it will save it to a designated folder, in the form of a Word document.
Post Conditions	The patient's data is printed out.

Generate Report	
Actors	Clinician
General Goals	A clinician shall be able to generate reports about game data that is stored in the database. These reports shall be used for comparative studies and keeping individual patient files on record.
Pre-Conditions	Data that is pertinent to the report must exist in the database. This assumes that network connectivity is present for the information to be sent over to the database.
Triggers	The clinician must select generate report from the stand alone application.
Course of Events	1. A clinician logs into *Healing Vision*. 2. A clinician selects specific items from within the database by querying the data. 3. A clinician can export the information in Excel spreadsheet format.
Alternate Paths	If there is no database connectivity, there will be an error message displayed and *Healing Vision* will not allow you to generate reports.
Post Conditions	The exported data is saved in an Excel file and is ready for analysis.
Comments	In order for a report to be generated, the game data must first be present in the database. So therefore, a patient must have played games in a previous session to create game data in the database.

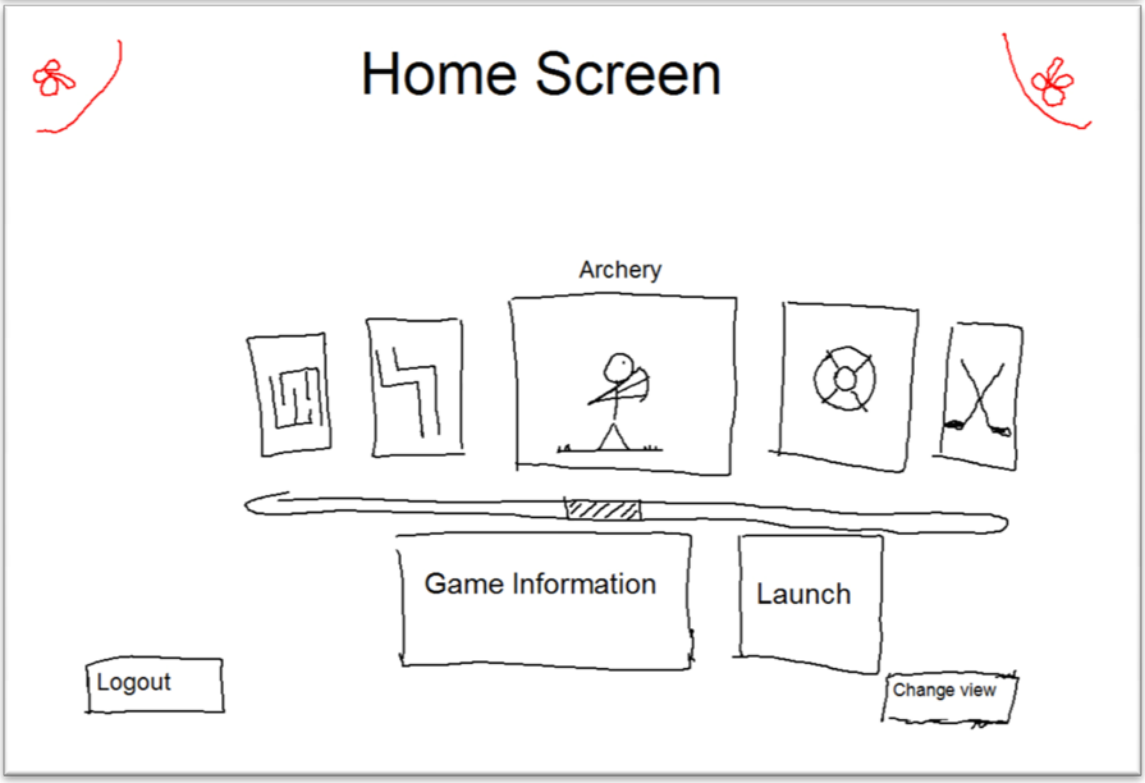
Login	
Actors	Clinician, Patient
General Goals	A patient shall be required to login to the system for Test Mode.
Pre-Conditions	A patient must be registered before they attempt to login to the system for Test Mode. If a patient is not registered, his or her clinician must create a patient profile in order to submit that patient's information into a database. This assumes that network connectivity is present for the information to be sent over to the database.
Triggers	Once the application has started, the individual will be presented with the appropriate screen to login.
Course of Events	1. A patient is registered by their clinician. 2. A clinician starts the *Healing Touch* application. 3. A patient may now login using their preferred method (using the Microsoft Surface card technology or manually entering their Patient ID).
Alternate Paths	• A patient manually enters their Patient ID. • A patient uses the Microsoft Surface card technology. • If Patient ID is not found, then an error message will be displayed saying that the Patient ID entered is either invalid and cannot be found. • If there is no database connectivity, there will be an error message displayed and *Healing Vision* will not allow you to print patient profiles.
Post Conditions	Now the patient will be at the home screen.
Comments	It is important that the patient be registered before attempting to login through the application. If the patient is not registered then there can be no storing game data relevant to that patient.

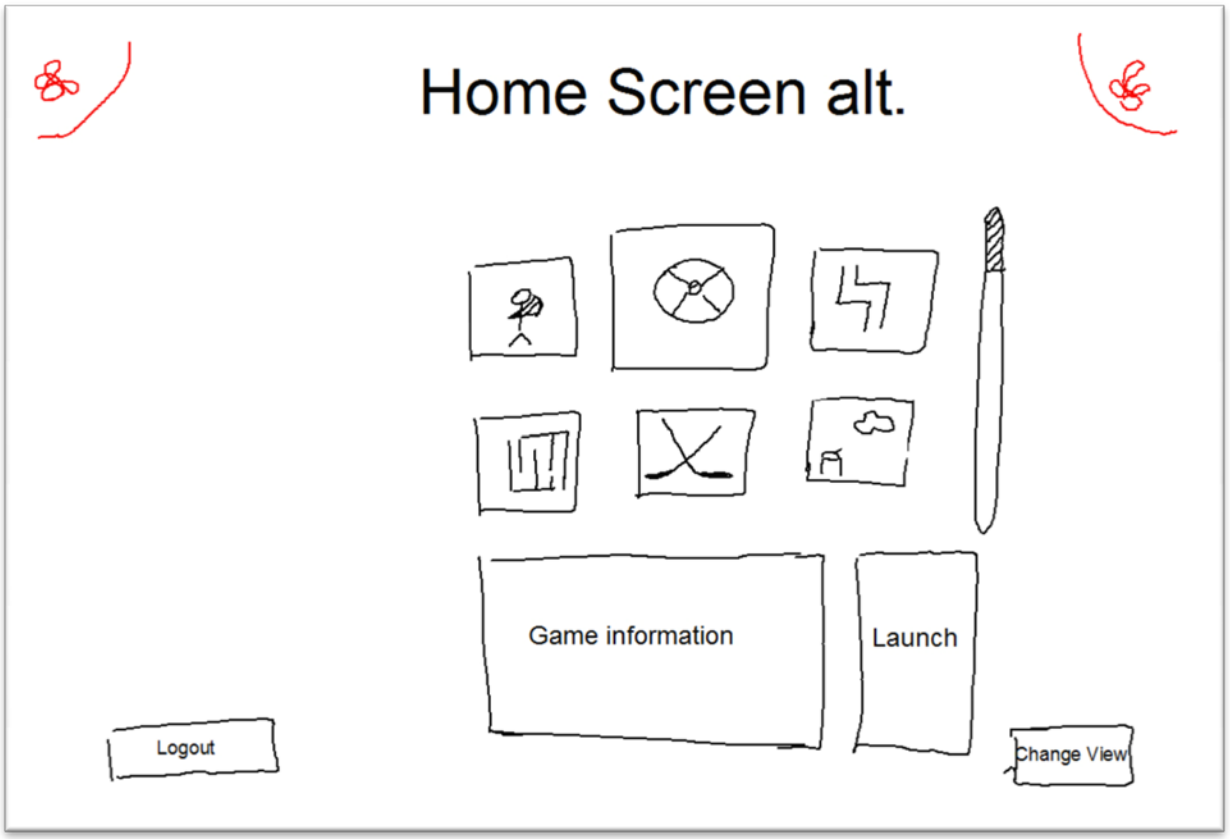
Game Select	
Actors	Patient or Guest
General Goals	A patient or guest shall be able to easily choose a game from a list from either an album flow view or a grid view.
Pre-Conditions	A patient or guest must have previously logged in, either through the Test mode or Free Play mode. This assumes that network connectivity is present for the information to be sent over to the database.
Triggers	Once the patient or guest has logged into the system, they are presented with the entire list of games in either an album flow view or in a grid view.
Course of Events	1. A patient logs into the system through Test Mode. 2. The patient is then given the list of games in one of the two views.
Alternate Paths	• A guest logs into the system through Free Play mode. • The guest is then given the list of games in one of the two views. • If there is no database connectivity, then the game data that is gathered during playtime will not be sent over.
Post Conditions	The patient or guest selects a game and selects launch to then be able to play the selected game.
Comments	The game select screen will look identical for both parties. The only differences between them are that guests will have multiplayer games listed as well.

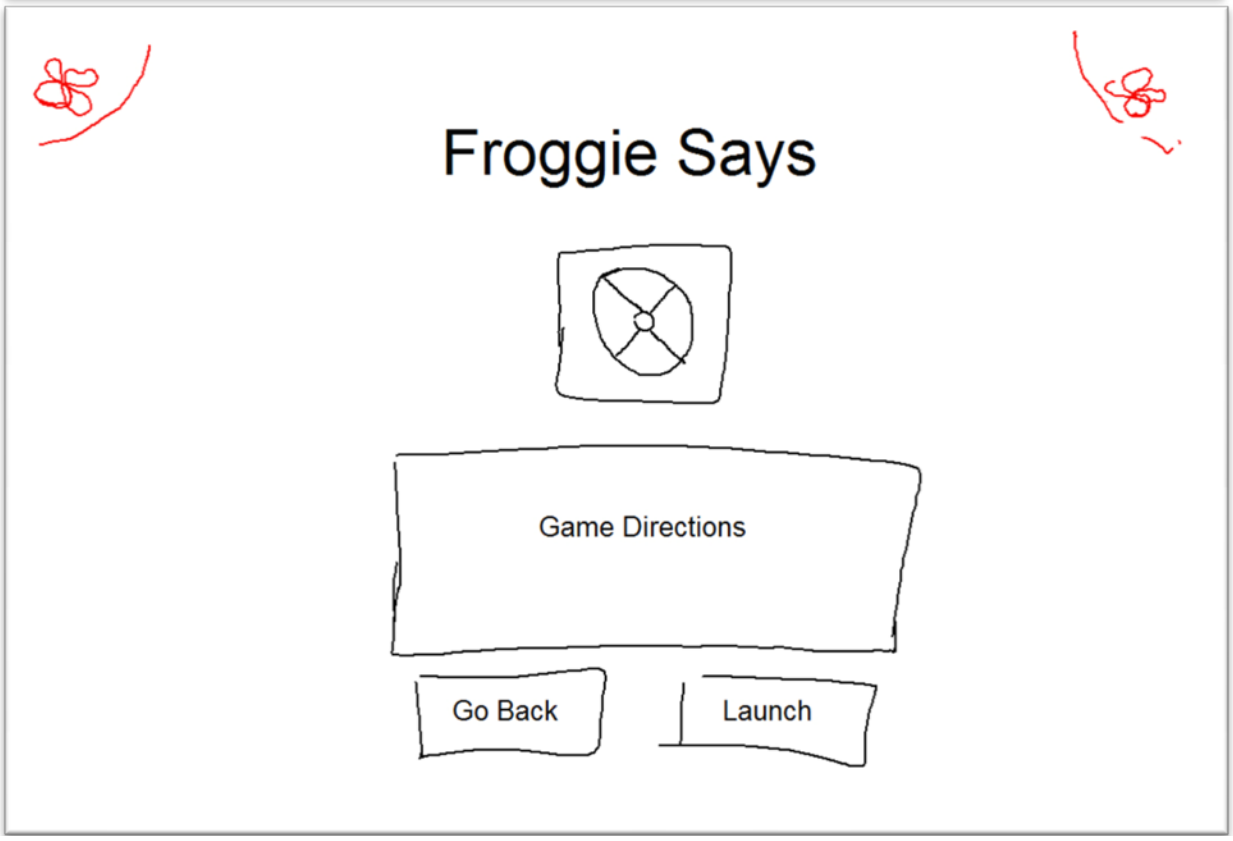
Select Game Options	
Actors	Clinician or Guest
General Goal	A clinician, or a guest in Free Play or Social Play mode, can modify the options for the desired game.
Pre-Conditions	A clinician must have previously logged in with their clinician card or ID. A guest must have previously selected Free Play or Social Play.
Triggers	When a clinician logs in, they will be presented with the ability to enter a patient ID and edit the default settings for every game for that patient. A guest will have the ability to change these options after they have chosen a game to play.
Course of Events	1. A clinician logs into the system. 2. The clinician enters a patient's ID 3. The clinician then selects the game options that they want for the patient. 4. The clinician hits save. 5. The options are sent to the database to be stored.
Alternate Paths	• A guest selects a game. • The guest then can select the options for the game selected. • The guest then presses ok to start the game with the selected options.
Post Conditions	The game options for a specific patient are stored in the database, and if on the iPad, are stored locally for use when there is no network connectivity.

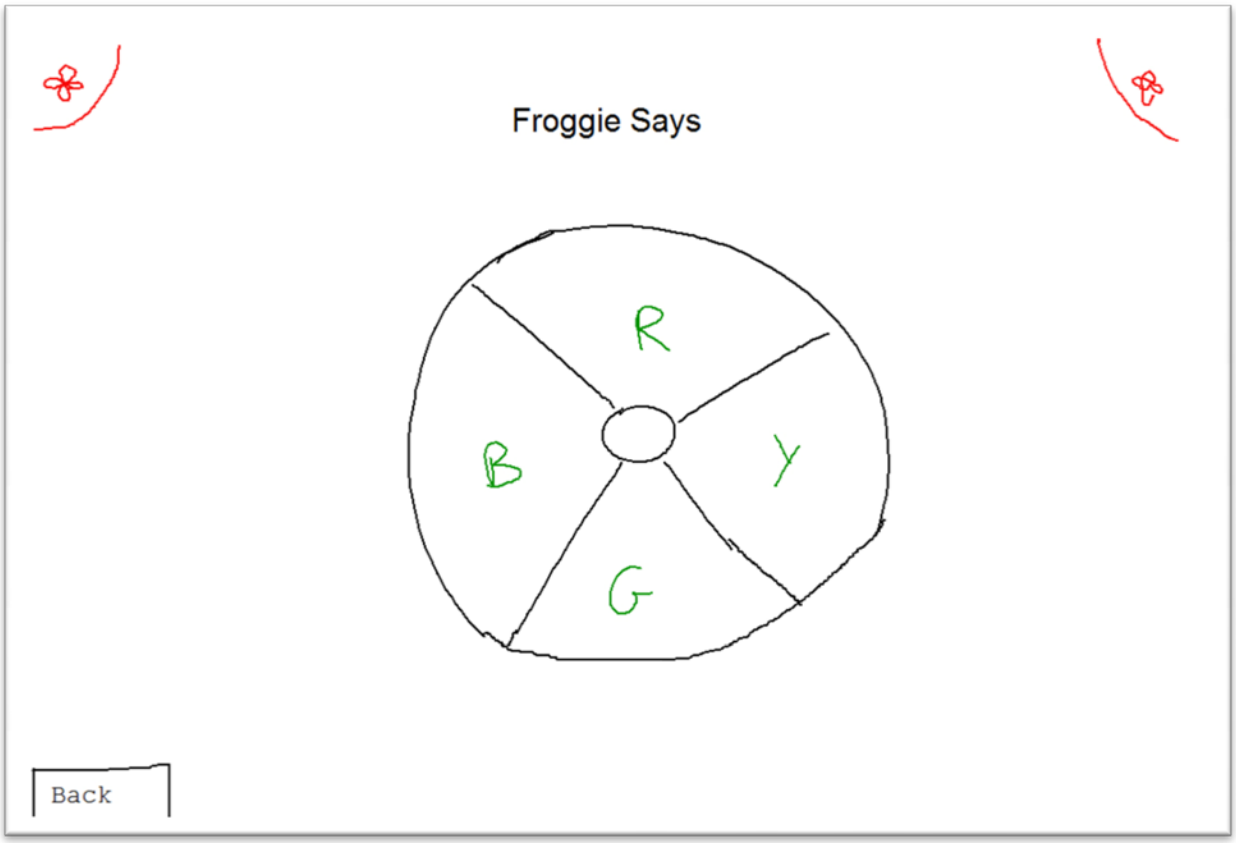
Play Game	
Actors	Patient or Guest
General Goals	The software runs a game that the patient or guest interacts with via touch interactions. The game records data that are related to key variables for each game.
Pre-Conditions	The actor must have previously selected the game from the Game Select screen.
Triggers	Once the actor has selected a game, the guest or patient will be presented with a screen describing the rules as well as a play and back button. Once the actor has selected play, the game runs until completion or cancellation.
Course of Events	1. A patient selects the game to play. 2. The rules screen is displayed to the patient or guest, and waits for a response from them. 3. The patient selects play and the game starts. 4. When the game is over, important data from the game is sent to the framework and a "score" screen is displayed. 5. The patient or guest is offered to either to replay or return to the game select screen.
Alternate Paths	• The game is quit before completion. • The patient is sent back to the game select screen. • If no database connectivity is present, the game data gathered during playtime will not be sent over.
Post Conditions	The patient or guest will be able to replay the game or return to the game select screen.
Comments	It is important that the game always sends the data back to the framework before the score screen is displayed. The score screen will vary from game to game as each game doesn't contain the same scoring values.

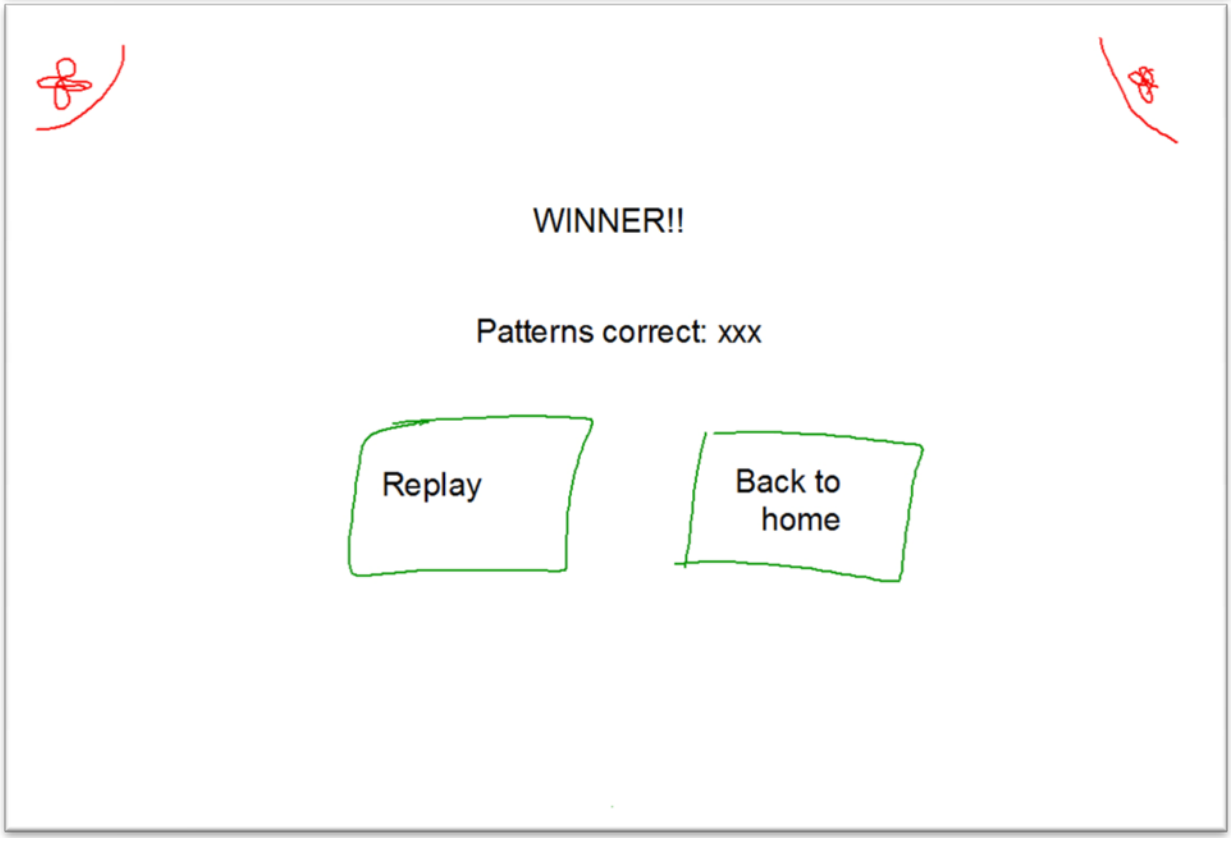
Appendix C. Prototype

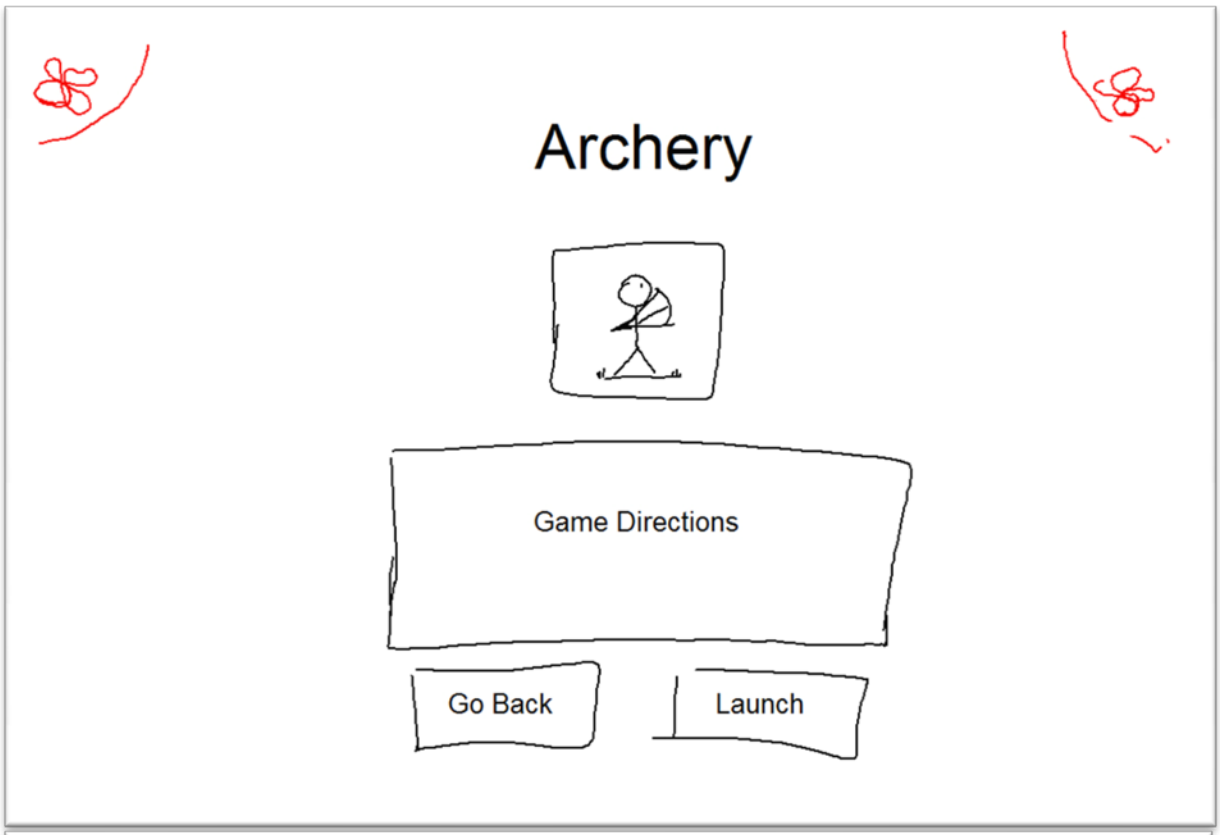


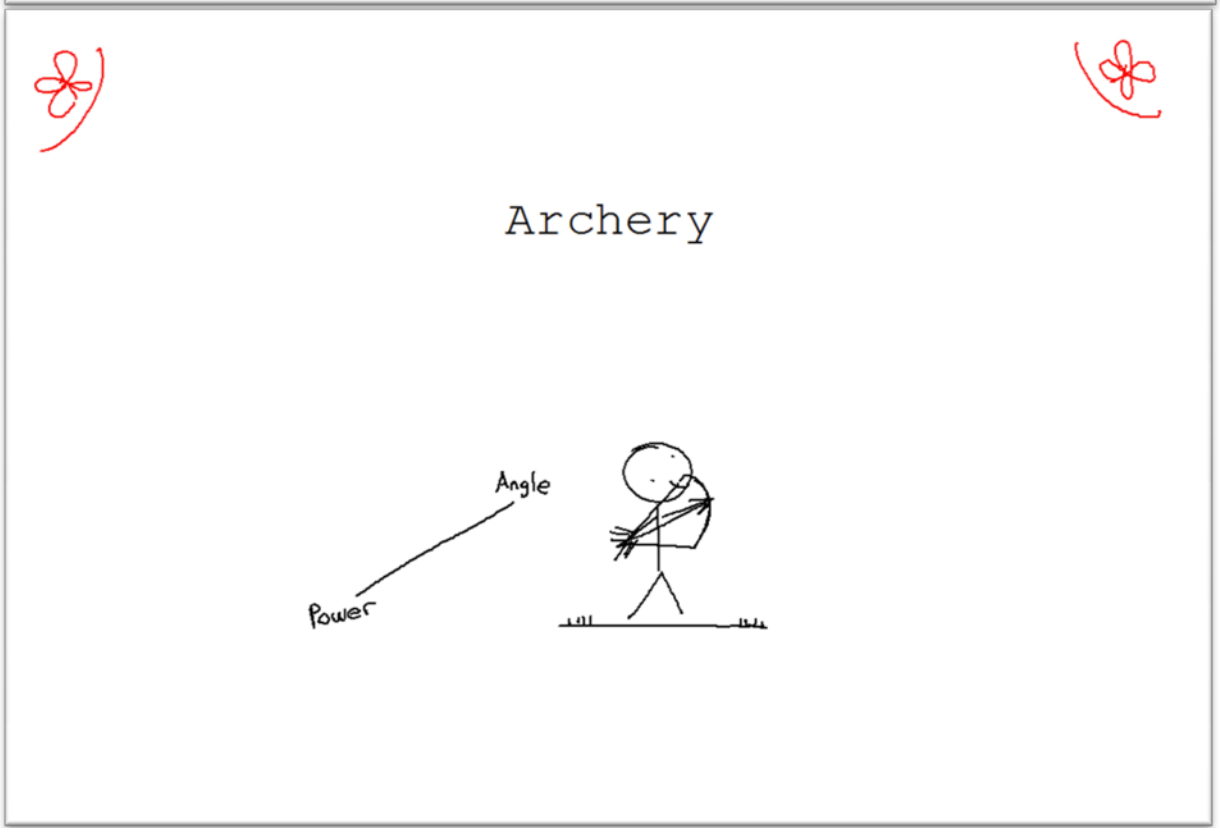

Home Screen alt.
Game information
Launch
Logout
Change View

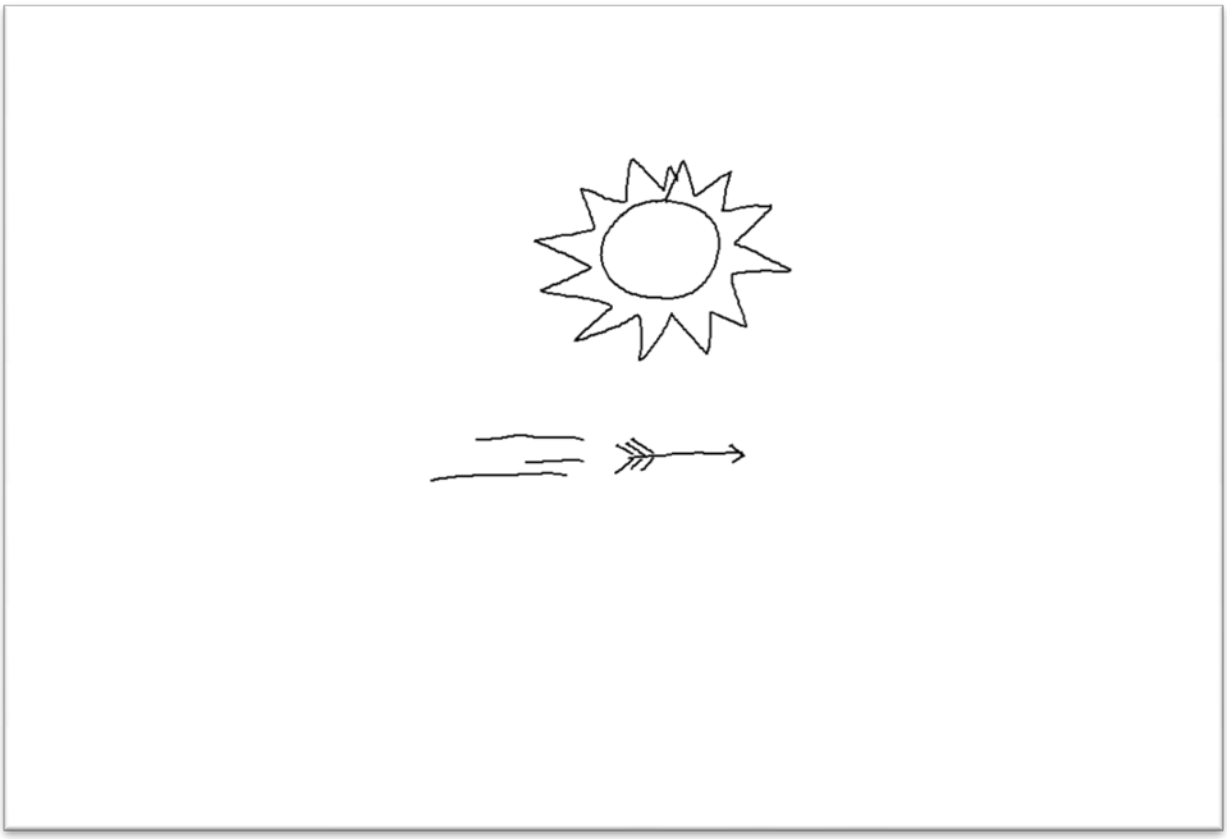

Froggie Says
Game Directions
Go Back
Launch

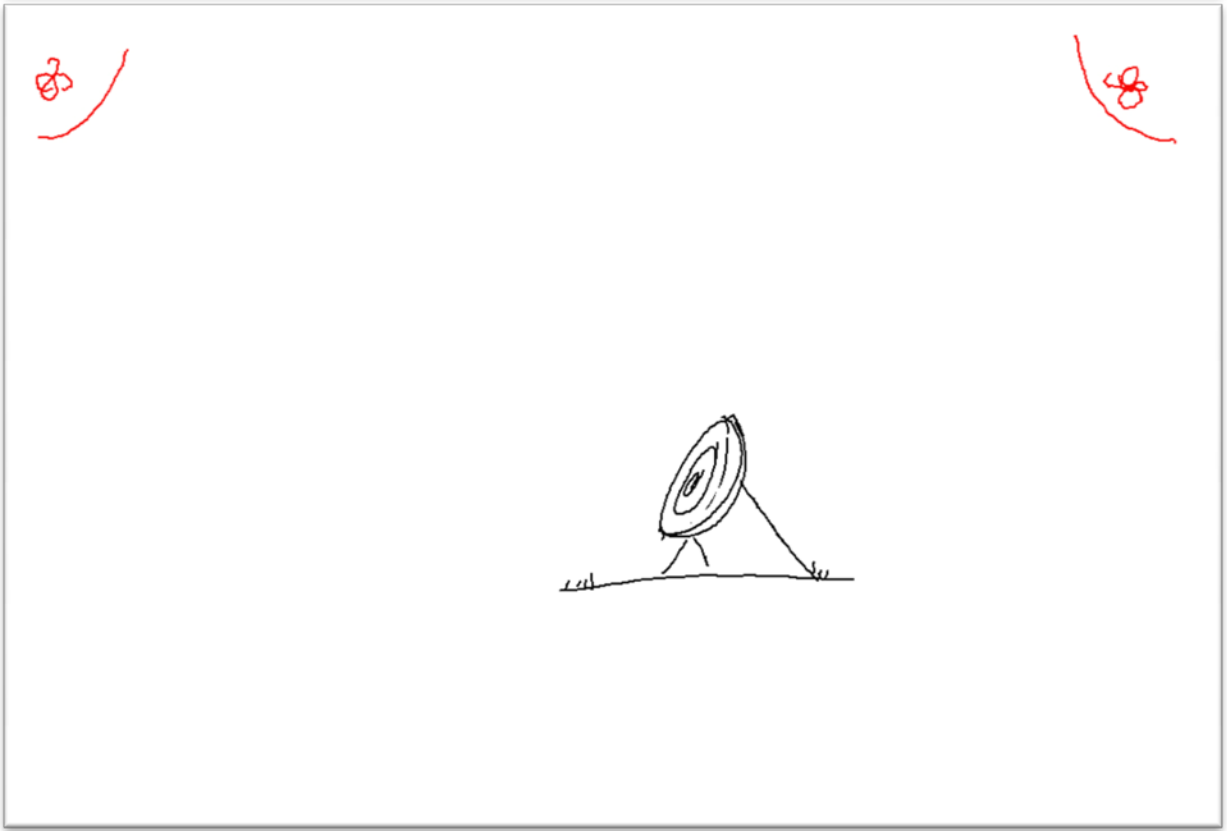

Froggie Says
R
B
Y
G
Back


WINNER!!
Patterns correct: xxx
Replay
Back to home

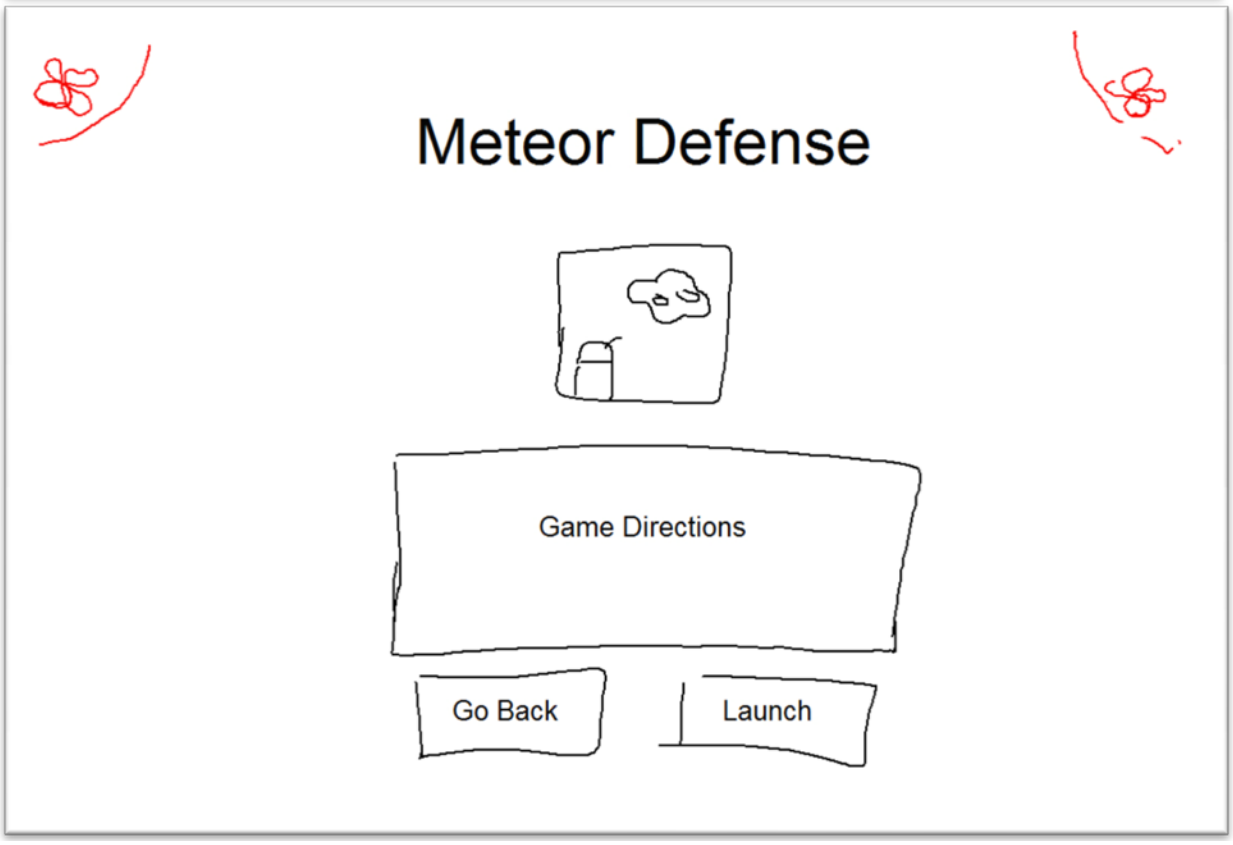

Archery
Game Directions
Go Back
Launch

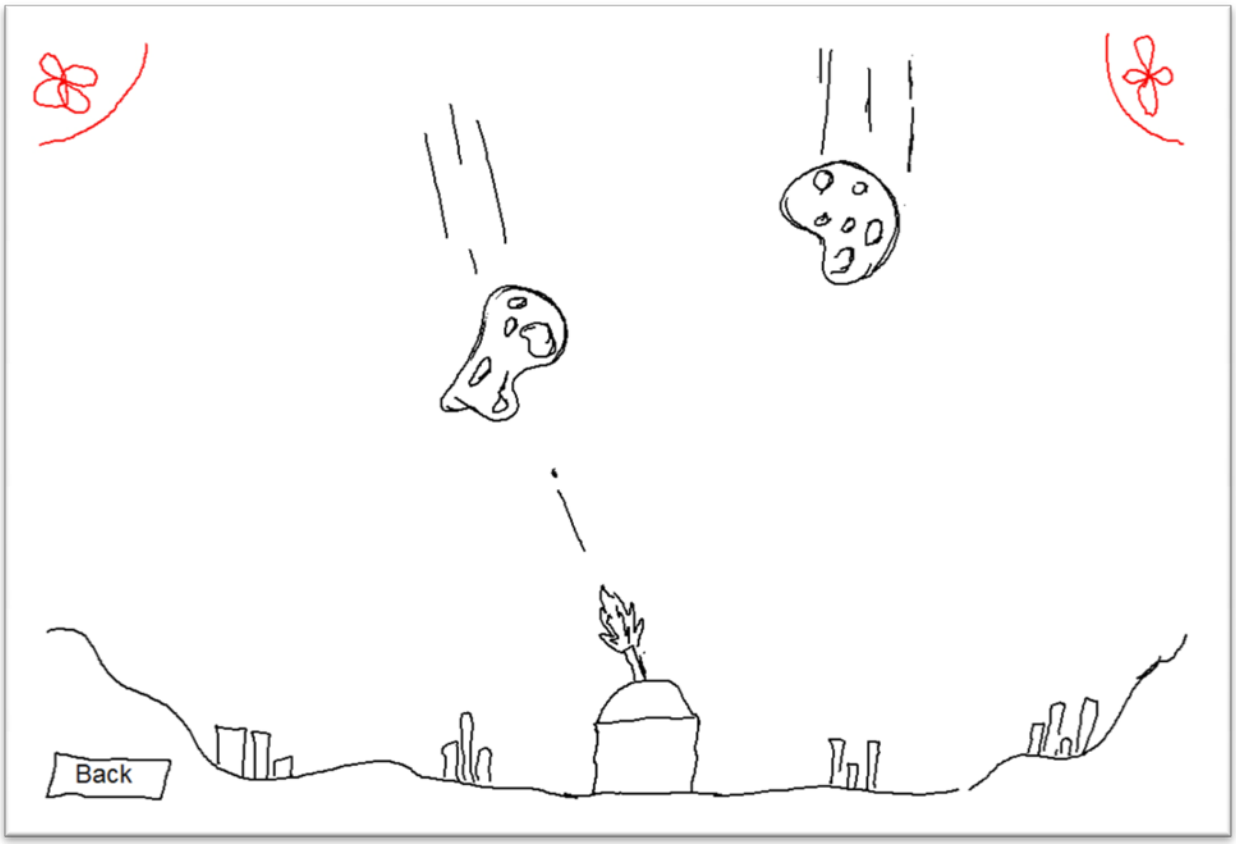

Archery
Angle
Power



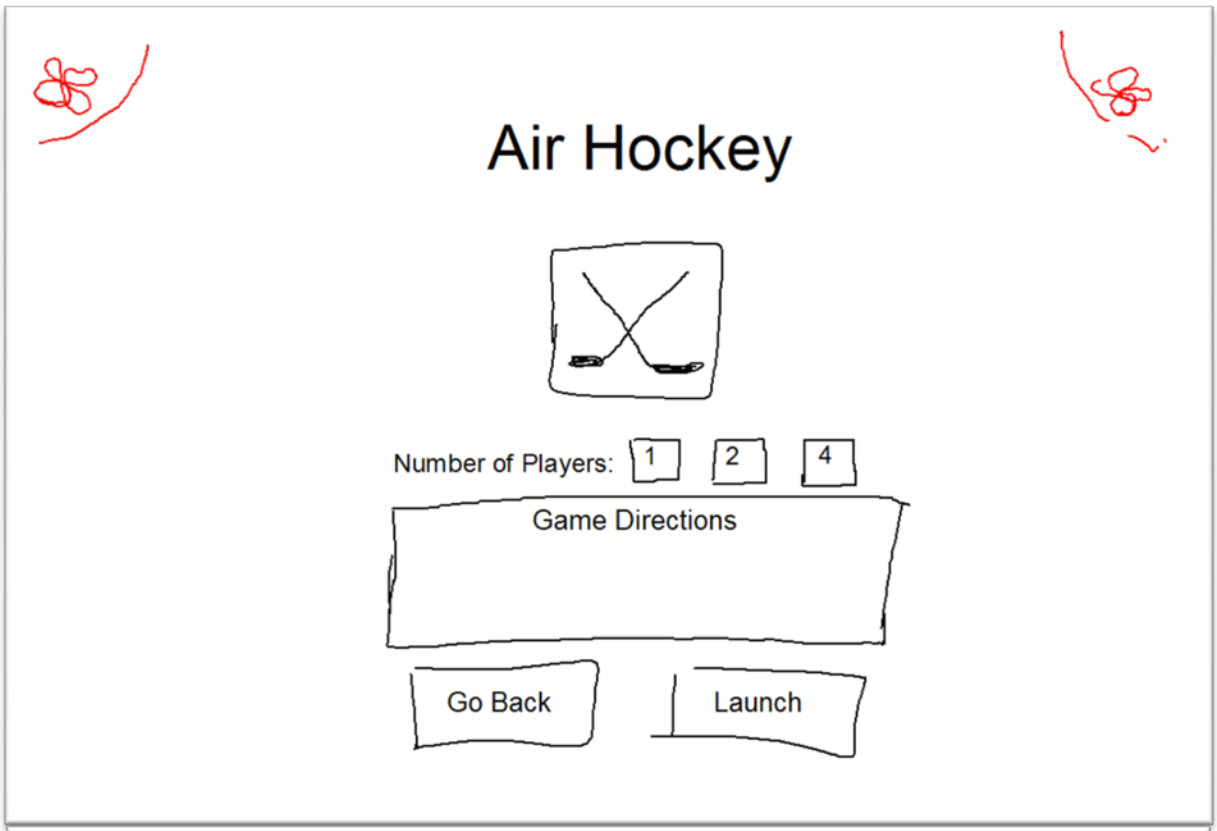


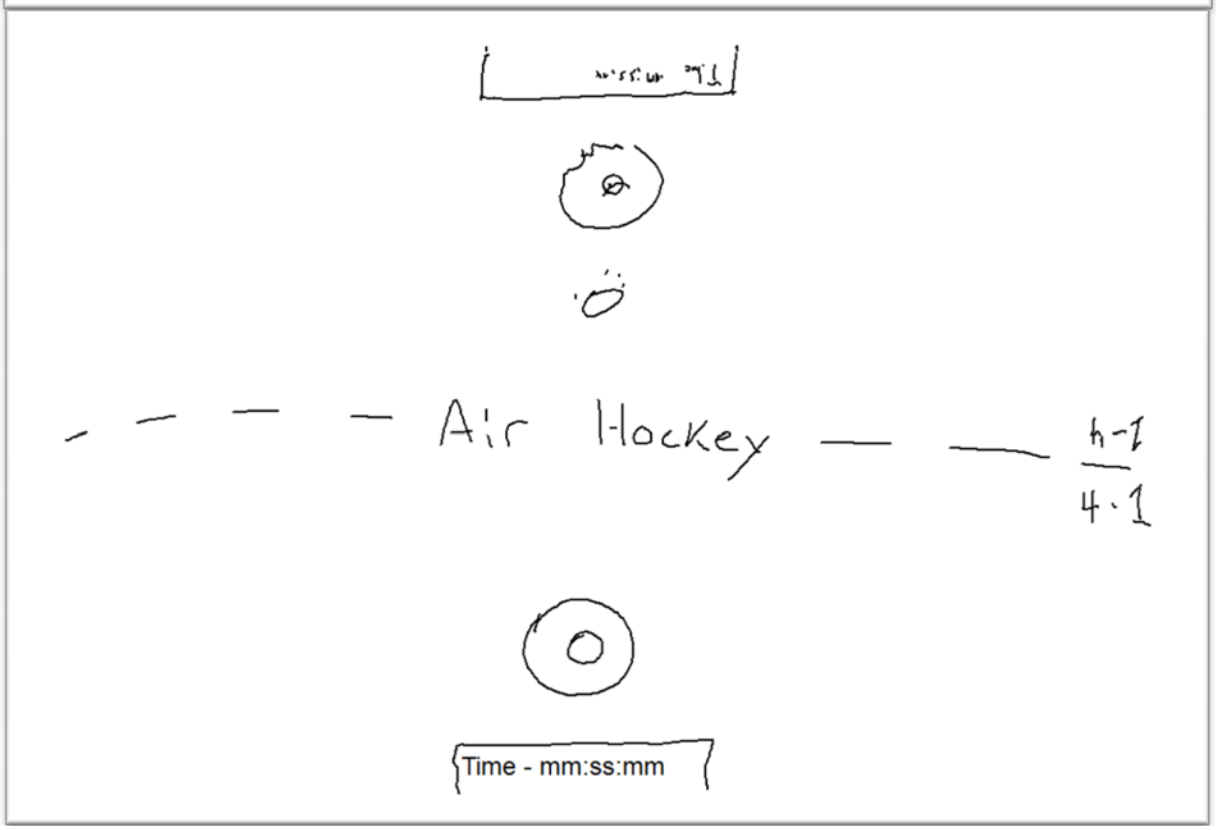

WINNER!!
Shots taken: xxx
Replay
Back to home

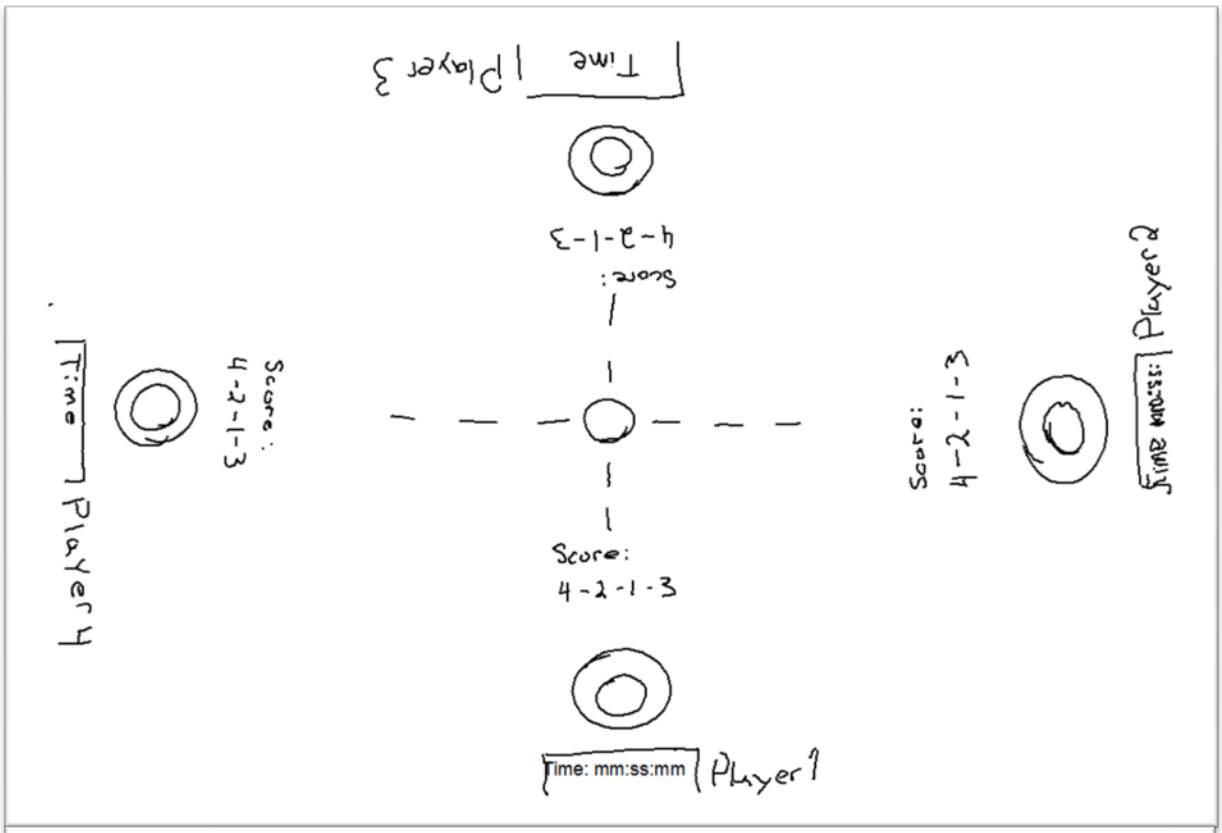

Meteor Defense
Game Directions
Go Back
Launch

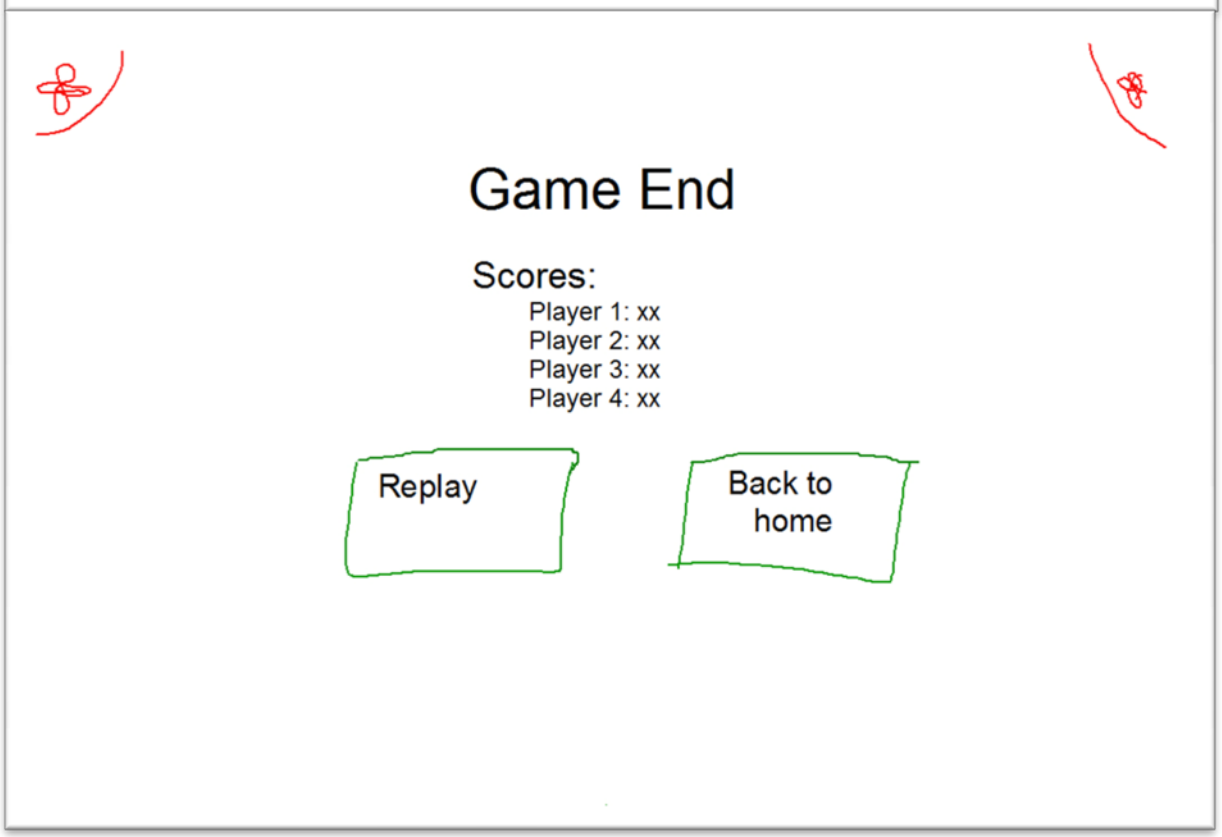

Back


WINNER!!
Meteors Destroyed: xxx
Cities Saved: xxx
Replay
Back to home


Air Hockey
Number of Players: 1 2 4
Game Directions
Go Back
Launch


Air Hockey
Time - mm:ss:mm


Time
Player 3
Score:
4-2-1-3
Time
Player 4
Score:
4-2-1-3
Score:
4-2-1-3
Time
Player 2
Score:
4-2-1-3
Time: mm:ss:mm
Player 1


Game End
Scores:
Player 1: xx
Player 2: xx
Player 3: xx
Player 4: xx
Replay
Back to home