Space INvaders Game

Yannik Nelson

Contents

[Project Proposal 5](#_Toc508608554)

[Concept: 5](#_Toc508608555)

[Target Audience: 5](#_Toc508608556)

[Requirements Met: 5](#_Toc508608557)

* [Validating inputs: 5](#_Toc508608558)
* [Interfacing with stored data: 5](#_Toc508608559)
* [Binary search or sorting algorithms: 5](#_Toc508608560)
* [Array of objects: 5](#_Toc508608561)

[Research 6](#_Toc508608562)

[Feasibility study: 6](#_Toc508608563)

* [Technical: 6](#_Toc508608564)
* [Economic: 6](#_Toc508608565)
* [Legal: 6](#_Toc508608566)

[Survey: 7](#_Toc508608567)

* [Sample survey: 7](#_Toc508608568)
* [Analysis 9](#_Toc508608569)

[Project Plan 12](#_Toc508608570)

[Gantt Chart: 12](#_Toc508608571)

[Resources: 13](#_Toc508608572)

[Requirement Specification 14](#_Toc508608573)

[Purpose: 14](#_Toc508608574)

[Scope and Boundaries: 14](#_Toc508608575)

* [Scope: 14](#_Toc508608576)
* [Boundaries: 15](#_Toc508608577)

[End Users: 16](#_Toc508608578)

[User Requirements: 16](#_Toc508608579)

[Functional Requirements: 16](#_Toc508608580)

[Inputs and Outputs: 16](#_Toc508608581)

* [Inputs (with resultant effects/outputs): 16](#_Toc508608582)
* [Outputs: 19](#_Toc508608583)
* [Section 19](#_Toc508608584)
* [Output 19](#_Toc508608585)

[Test Plan 20](#_Toc508608586)

[Home Page: 20](#_Toc508608587)

* [Looks: 20](#_Toc508608588)
* [Usability: 20](#_Toc508608589)
* [Functionality: 20](#_Toc508608590)

[Settings Page: 21](#_Toc508608591)

* [Looks: 21](#_Toc508608592)
* [Usability: 21](#_Toc508608593)
* [Functionality: 21](#_Toc508608594)

[Instructions Page: 21](#_Toc508608595)

* [Looks: 22](#_Toc508608596)
* [Usability: 22](#_Toc508608597)
* [Functionality: 22](#_Toc508608598)

[Game Page: 23](#_Toc508608599)

* [Looks: 23](#_Toc508608600)
* [Usability: 23](#_Toc508608601)
* [Functionality: 24](#_Toc508608602)

[High Score Input Page: 26](#_Toc508608603)

* [Looks: 26](#_Toc508608604)
* [Usability: 26](#_Toc508608605)
* [Functionality: 26](#_Toc508608606)

[High Score Display Page: 28](#_Toc508608607)

* [Looks: 28](#_Toc508608608)
* [Usability: 28](#_Toc508608609)
* [Functionality: 28](#_Toc508608610)

[End User Test Survey: 29](#_Toc508608611)

[UI Design 32](#_Toc508608612)

[Wireframes: 32](#_Toc508608613)

* [Home Page: 32](#_Toc508608614)
* [Settings Page: 34](#_Toc508608615)
* [Instructions Page: 35](#_Toc508608616)
* [Game Page: 37](#_Toc508608617)
* [High Score Input Page: 39](#_Toc508608618)
* [High Score Display Page: 41](#_Toc508608619)

[Pseudocode 43](#_Toc508608620)

[Code 44](#_Toc508608621)

[Basic Resources 45](#_Toc508608622)

[Button Class 46](#_Toc508608623)

[Player Class 47](#_Toc508608624)

[Alien Classes 48](#_Toc508608625)

[Home Page 49](#_Toc508608626)

[Settings Page 50](#_Toc508608627)

[Instructions Page 51](#_Toc508608628)

[Game Page 52](#_Toc508608629)

[Highscore Input Page 53](#_Toc508608630)

[Highscore Display Page 54](#_Toc508608631)

[Testing 55](#_Toc508608632)

[Home Page: 55](#_Toc508608633)

* [Looks: 55](#_Toc508608634)
* [Usability: 55](#_Toc508608635)
* [Functionality: 55](#_Toc508608636)

[Settings Page: 56](#_Toc508608637)

* [Looks: 56](#_Toc508608638)
* [Usability: 56](#_Toc508608639)
* [Functionality: 56](#_Toc508608640)

[Instructions Page: 57](#_Toc508608641)

* [Looks: 57](#_Toc508608642)
* [Usability: 57](#_Toc508608643)
* [Functionality: 57](#_Toc508608644)

[Game Page: 58](#_Toc508608645)

* [Looks: 58](#_Toc508608646)
* [Usability: 58](#_Toc508608647)
* [Functionality: 59](#_Toc508608648)

[High Score Input Page: 62](#_Toc508608649)

* [Looks: 62](#_Toc508608650)
* [Usability: 62](#_Toc508608651)
* [Functionality: 62](#_Toc508608652)

[High Score Display Page: 64](#_Toc508608653)

* [Looks: 64](#_Toc508608654)
* [Usability: 64](#_Toc508608655)
* [Functionality: 64](#_Toc508608656)

[Evaluation 65](#_Toc508608657)

[Project Plan: 65](#_Toc508608658)

[Requirement Specification: 65](#_Toc508608659)

* [Scope and Boundaries: 65](#_Toc508608660)

[Test Plan: 65](#_Toc508608661)

* [Evaluation of Reasearch: 65](#_Toc508608662)
* [Evaluation of Plan: 65](#_Toc508608663)
* [Evaluation of End-User Test Survey: 66](#_Toc508608664)
* [Results of Testing (Evaluation of Program): 66](#_Toc508608665)
* [Conclusion of Testing: 70](#_Toc508608666)

[Development Process: 70](#_Toc508608667)

[My Performance: 71](#_Toc508608668)

[Appendices 72](#_Toc508608669)

[APPENDIX A (End User Survey Results) 73](#_Toc508608670)

[APPENDIX B (End User Test Survey Results) 74](#_Toc508608671)

[APPENDIX C (Old Test Plan) 75](#_Toc508608672)

[APPENDIX D (Old Settings Page UI Design) 76](#_Toc508608673)

[APPENDIX E (Old Pseudocodes) 77](#_Toc508608674)

[APPENDIX F (Record of Progress) 78](#_Toc508608675)

Project Proposal

Concept:

This project will be a game of space invaders. A game where you control a tank at the bottom of the screen and you have to use the tank to destroy aliens that are moving from side to side and down before they reach the bottom of the screen, each time they move down, their movement speed will increase. You must also avoid the bombs and shots from the aliens that will take one of your lives away (you will only have 3), to help with this there will be 4 barriers you can hide behind, but they will slowly be destroyed as they get hit by more and more shots. Once a level has been cleared the player will gain a life and the next level will load (which will be the same but harder by having the aliens move faster). The look of this game will be accurate to the original with an option of a modern take.

Target Audience:

Age: 8-16

Gender: Any

Interests: playing video games, computers, classic arcade games.

Other: Must own a computer, will have to be relatively skilled with their computer as the game uses python to run so they will have to have python installed or be able to install it.

Requirements Met:

Validating inputs:

The player will only move on the left and right arrow presses and shoot on spacebar presses.

The scoreboard will only allow alphabetical characters the enter key and the backspace key, three characters should be input.

The mouse will also be an input but will not require validation.

There will be files that the program will take in, their presence and content should be validated

Interfacing with stored data:

The program will store the top 10 scores in a text file and will take in that data and manipulate it when displaying the scoreboard it will then also save the top 10 scores in the same file. The program will also use a text file to store the state of the settings.

Binary search or sorting algorithms:

A sorting algorithm will be used on the scores when adding a new score.

Array of objects:

An array of objects will be used to store the high score data while being manipulated.

Research

Feasibility study:

Technical:

* The game will need to be object orientated both to make it easier to program and to meet some of the requirements. Python will be used for this as it is object orientated, simple to install and I already know the syntax.
* The game will need to have a graphical interface, for this Pygame (a python library) will be used, this requires python and Pim (a software installation package) to be installed. This is feasible as Pim comes included in the most recent python package and installing Pygame and Pyganim only takes a one-line command.
* I will also require resources detailing how to use the Pygame library. This is feasible as there are many websites detailing the methods and variables provided by the libraries and how to use them. For this, I will be using the Pygame home website.

Economic:

* The Project is economically feasible as it will not cost anything to produce. The software being used to produce this project is free, the purchase of a computer to produce the project is not required and no licence is required to develop this project.

Legal:

Data Protection:

* I will be collecting high-scores
* I will be collecting names (3 characters max)

Copyright, Designs and Patents Act:

* The copyright for the original character designs Is owned by taito (a Japanese game company), this may pose an issue. This may also apply to the more modern character designs I intend to use.
* I will need to use public domain music and sound effects for the audio to avoid copyright issues.

Schedule:

* The project is of suitable complexity to be achievable in the allocated timeframe.

Survey:

Sample survey:

SPACE INVADERS END-USER SURVEY

Gender: \_\_\_\_\_\_\_\_\_\_

Age: ­­­\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Do you know the game SPACE INVADERS? | YES | NO | UNSURE |
| Do you know how to play it? | YES | NO | UNSURE |
| Do you enjoy playing it? | YES | NO | UNSURE |
| Do you play video games often? | YES | NO | UNSURE |
| Would you like for there to be a high-score table ? | YES | NO | UNSURE |
| If so how many places would you like there to be on the high-score table? | 5 | 10 | OTHER\_\_\_\_\_\_\_ |
| Would you like for there to be background music? | YES | NO | UNSURE |
| Is having the original graphics in the game important to you? | YES | NO | UNSURE |
| Would you prefer a more modern version of the graphics? | YES | NO | UNSURE |

What age-range do you think is appropriate for this game: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many devices do you own and what type are they (e.g. laptop(windows/mac/Linux), desktop (windows/mac/Linux), smartphone (what type), tablet (what type)): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What type of device to you use most: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What type of device would you play this game on: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Are there any features that you would like to see in the game:

|  |
| --- |
|  |

*See Survey results in Appendix A*

Analysis

Analysis of survey results:

Analysis:

Knowing Spaces invaders:

The majority of the people surveyed

knew about scape invaders, about 83%,

and only about 17% of the people

surveyed either didn’t know about the

game or were unsure if they knew the

game.

Playing Video Games:

Boys:

The majority of the boys surveyed play

video games, 60%, with 36% who don’t

play video games and 4% who were

unsure.

Girls:

The majority of the girls surveyed don’t

play video games, 76%, with only 24% who do play video games.

Conclusion:

While there was little to no difference between the genders when it came to knowing about the game, the difference when it came to playing video games suggests that the majority of the users for this game will be male (this does not exclude girls from the end user group).

Analysis:

Wanting high-score table:

83% of the people surveyed want a

high score table with 14% being unsure

and only 3% saying they didn’t want a

high score table.

Places on the Highscore Table:

The majority of the people surveyed

wanted 10 places on the table, 52%,

and of the people who didn’t want 10

places half wanted 5 places and the rest

wanted an other number.

Conclusion:

A high score table will be implemented with 10 places.

Analysis:

The majority of the people surveyed wanted background music, 86%, with

12% not wanting background music and 2% being unsure. Of the 86% who

do want background music a couple people noted to make sure that the

music was not too irritating.

Conclusion:

I will be implementing background music but must be careful what music I

will be using, I will be running another survey on the music choices.

Analysis:

The majority of the people surveyed wanted an option to play the game

with the original arcade graphics, 50%, with 31% not wanting the original

graphics and 19% not minding.

Conclusion:

I will be attempting to implement an option to play the game with original

arcade graphics, this may present some copyright issues.

Analysis:

Laptop:

The majority of laptop users use

windows.

Phone:

The majority of smartphone users use

an iPhone.

Desktop:

The desktop users were split 50/50

between windows and apple.

Table:

The majority of Tablet users use iPads.

Device Used:

The majority of people surveyed would use their smartphone to play the game, 49%, 36% would use their laptop, 10% would use their tablets, 2% would use their console and 3% have not device preference.

Conclusion:

The majority of people surveyed use apple products and would use their smartphone to play the game.

This suggests the I should write the program to work on an iPhone but this would require me to learn a new language and how to use a new programming environment reducing the feasibility of the project.

The second device the people surveyed said they would use was their laptop and as the percentage of laptop users who used windows was 78%, this suggests that I should write the program to work on a laptop, this is more feasible as it would not require me to learn a new language or how to use a new programming environment.

Project Plan

Gantt Chart:

Resources:

Items I will require to complete this project are:

* Pen and Paper
* Computer (with monitor, keyboard and mouse)
* A wide range of end users to survey
* SQA Project information resources
* Appropriate software:
  + Python
  + Pip
  + Pygame
  + Atom
  + Word
  + Excel
  + Balsamiq
  + Gantt Project
  + Github
* A web browser to research how to use the software I will be using.
* Audio from
  + <https://www.bfxr.net/>
  + <https://www.bensound.com/royalty-free-music/world-others>
* Webistes:
  + <http://www.cogsci.rpi.edu/~destem/gamedev/pygame.pdf>
  + The Pygame Wiki (<https://www.pygame.org/docs/>)
  + Stack Overflow

Requirement Specification

Purpose:

The program will be a game of space invaders. The purpose of this game is to entertain the users, encourage an interest on older/classic video games and possibly provoke a feeling of nostalgia in older players.

Scope and Boundaries:

Scope:

* The users will be able to control the side to side movement of a game sprite at the bottom of the ‘game page’
* The user will be able to ‘shoot aliens’ using the game sprite under their control
* The user will only be able to shoot one shot at a time
* The ‘aliens’ will attack the player using slow and fast ‘projectiles’ that the player must avoid by moving out the way or by hiding behind barriers
* These projectiles will be spawned randomly with a higher probability of spawning above the player.
* The barriers the player can hide behind will ‘wear away’ from being hit by projectiles from either side, increasing the difficulty of the game.
* There will be a special ‘alien’ that moves across the top of the ‘game page’ occasionally that awards the player more points for destroying
* As the aliens move down the screen their movement speed will increase, increasing the difficulty of the game.
* Once the player has ‘cleared the skies of aliens’ the ‘round’ will be over and the game will ‘reset’ with a now set of ‘aliens’ but the new ‘aliens’ will have a faster initial movement speed.
* There will be a scoreboard that keeps track of the 10 best scores (in order) achieved by players along with 3 characters they input on a dedicated page
* Once the game is over either the high score should be taken in or all the current high scores should be displayed
* There should be a page dedicated to taking in the high score and a page dedicated to displaying the high scores
* There implementing background music and the option to turn it off
* There will be multiple options for how the game looks, a classic version with the original graphics and a more modern version with higher quality graphics.
* There will be navigation functionality between pages such as a home page or settings page or instructions page
* On the settings page, when the mouse hovers over a setting button, a section of text that describes the function of that setting will appear.

Boundaries:

* I will not be implementing boss levels
* I will not be implementing multiplayer options
* I will not be implementing upgrades to the player character/power-ups
* I will not be implementing multiple player characters
* I will not be making the game ‘open world’
* I will not be adding ‘Easter eggs’
* I will not be adding Language options

End Users:

The users will be children/teenagers from the ages of 8-17 who enjoy video/arcade games and have an interest in old games. Nostalgic 40-50-year-olds may also be part of the end user group as the original space invaders game came out in 1978. The users must have a basic knowledge of how to use a computer and of the layout of a standard qwerty keyboard.

User Requirements:

* The game must not ‘lag’
* The game must not be too difficult to play

Functional Requirements:

* There must be a page that explains how to play the game
* Must own a modern windows computer
* Must have a keyboard, mouse and monitor
* Must have python installed
* Must have Pygame installed

Inputs and Outputs:

Inputs (with resultant effects/outputs):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Section | Dynamic Element | Types | Input | Effect/Output |
| Home Page | Buttons | Start | Mouse click on button | Switches section to the game |
|  |  |  | Mouse hover | Enlarges the button image |
|  |  | Instructions | Mouse click on button | Switches section to Instructions page |
|  |  |  | Mouse hover | Enlarges button image |
|  |  | Settings | Mouse click on button | Switches section to the settings page |
|  |  |  | Mouse hover | Enlarges button image |
| Instructions Page | Buttons | Back | Mouse click on button | Switches section to the home page |
|  |  |  | Mouse hover | Enlarges button image |
| Settings Page | Buttons | Back | Mouse click on button | Switches section to the homepage |
|  |  |  | Mouse hover | Enlarges button image |
|  |  | Graphics | Mouse click on button | Changes the button text from/to ‘classic’/’modern’.  Changes the graphics used in the game |
|  |  |  | Mouse hover | Brings up setting options at the side with a description of what they are |
|  |  | Background music selection | Mouse click on button | Changes the button text from/to ‘song1’/’song2’/’song3’… and plays a short section of it. Changes the background music used in the game. |
|  |  |  | Mouse hover | Brings up setting options at the side with a description of what they are |
|  |  | Background music on/off | Mouse click on button | Changes the button text from/to ‘On’/’Off’.  Toggles whether or not the game will have background music. |
|  |  |  | Mouse hover | Brings up setting options at the side with a description of what they are |
|  |  | Sound effects on/off | Mouse click on button | Changes the button text from/to ‘on’/’off’.  Toggles whether or not the game will have sound effects. |
|  |  |  | Mouse hover | Brings up setting options at the side with a description of what they are |
|  | File |  | Settings file | Takes in and reads the settings stored in the file mapping it to a set of variables. |
| Game Page | Player sprite | Movement | A/D or /  Will only take in one input at a time | Changes the position of the player sprite in the game field |
|  |  | Shooting | ‘SpaceBar’ | Spawns a player shot above the centre of the player sprite. |
|  | Score display |  | High scores file | Will take in the high scores file to display the highest score on the top right of the page. |
|  | File check |  | High scores file | Will take in the high scores file to check current score against, if current score is higher than any score in the file then the page will switch to the high score input page otherwise it will skip to the high score display page. |
| High score input page | Initials input | Input | Alpha keys, only 3 characters will be taken in | The character of the key pressed will be placed in the selected initial place and the next initial place will be selected, |
|  |  |  | / | Will move the selected initial place appropriately. |
|  |  |  | Enter | Will start a validation on the entire initial set to make sure all 3 characters have been used. If valid will send initials to the save high score procedure and the high score file will be updated/created. |
|  |  |  | Backspace | Removes the character from the initial place selected, if place is already empty, nothing will happen |
| High score Display Page | Score Display |  | High scores file | Will take in high scores file to produce array of objects to be displaed |
|  | Buttons | Try again | Mouse click on button | Switches section to game page and resets the game page |
|  |  |  | Mouse hover | Enlarges button image |
|  |  | Home | Mouse click on button | Switches section to the home page and resets the game page |
|  |  |  | Mouse hover | Enlarges button image |
| All Pages | Buttons | Exit | Mouse click on button | The program will end |
|  |  | Exit | The escape button is clicked | The program will end |

Outputs:

|  |  |
| --- | --- |
| Section | Output |
| Home Page | All images will display appropriately e.g. background image |
| Instructions Page | All images will display appropriately e.g. background image |
| Settings Page | All images will display appropriately e.g. background image |
|  | Audio when changing the background music/sound effects |
|  | Settings file with changed settings (if nessasary) |
| Game Page | All images will display appropriately e.g. background image |
|  | The current and top scores display at the top of the page |
|  | Background music |
|  | Sound effects |
| High score Input Page | All images will display appropriately e.g. background image |
|  | File containing high score details |
| High score Display Page | All images will display appropriately e.g. background image |

Test Plan

Home Page:

No Normal, Exceptional or Extreme data for this page

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Are the correct image used
* Are the images in the desired position (use wireframe to check)
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the text easy to understand (what is written)
* Are the images big enough to be seen clearly
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the Instructions button start the Instructions Page once clicked
* Does the New Game button start the Game Page once clicked
* Does the Settings button start the Settings Page once clicked
* Does the program stop when the exit button is clicked

Settings Page:

Normal: a comma delimited file containing the settings

Exceptional: an empty settings file

Extreme: no settings file

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the state of each setting clear from the text on each button
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the Music button change the music setting correctly when clicked
* Does the Music button change its text correctly when clicked
* Does the Music State button change the music state setting correctly when clicked
* Does the Music State button change its text correctly when clicked
* Does the Sound Effects button change the sound effects setting correctly when clicked
* Does the Sound Effects button change its text correctly when clicked
* Does the Back button start the home Page when clicked
* Does the program stop when the exit button is clicked

**Normal: a comma delimited file containing the settings**

* The page should take in the file, read the values and correctly display the state of each setting on its respective button

**Exceptional: an empty settings file**

* The page should use the default settings and fill the settings file with those values

**Extreme: no settings file**

* The page should use default settings, create a settings file and fill it with those values

Instructions Page:

No Normal, Exceptional or Extreme data for this page

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Is the Back button the correct size
* Is the Back button in the correct place

Usability:

* Is the Back button obvious in the fact it is a button
* Is the function of the Back button clear
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Does the Back button become larger when the cursor is over it
* Does the Back button return to its normal size once the cursor is no longer over it
* Does the Back button start the home Page when clicked
* Does the program stop when the exit button is clicked

Game Page:

Normal input: Space bar presses, A key, D key, Right and Left Arrow Keys, Escape Key, highscores file with 10 highscores

Exceptional input: repeated space bar presses, Any combination of A, D, Left and Right keys pressed simultaneously, empty highscores file, highscores file with less than 10 highscores

Extreme input: the press of any key that isn’t in the normal input, no highscores file

Looks**:**

* Cursor should not be visible
* Is the background image used correct
* Is the highest score displayed in the correct place
* Is the current score displayed in the correct place
* Is the number of lives displayed in the correct place
* Are the image representations of the lives left correctly displayed in the correct place
* Are the fonts and font-sizes used appropriate
* Are there the correct number of aliens
* Are the aliens in the correct places
* Are the correct types of aliens used
* Does each type of alien use the correct image
* Do the aliens change their image each time they move
* Do the aliens change to the explode image when they die
* Do the alien projectiles use the correct images
* Do the alien projectiles animate as they move
* Are the alien projectiles white when above the bunkers
* Do the alien projectiles turn green when they reach the top of the bunkers
* Do the alien projectiles use the correct image after they blow up
* Is the player in the correct starting place
* Does the player use the correct dying animation
* Do the player projectiles use the correct image
* Do the player projectiles start green while bellow the top of the bunker
* Do the player projectiles turn white when they get above the top of the bunkers
* Do the player projectiles use the correct image after they blow up
* Do the mother ships use the correct image

Usability:

* Is what each bit of text is displaying clear
* Is the font readable
* Is the font size large enough
* Are the images large enough to distinguish
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* If the sound effects setting is on sound effects should play when appropriate, is this the case
* If the music setting is on background music determined by the music type setting should play on repeat, is this the case
* Do both music types work
* The three types of alien should reward different amounts of points 10, 20 or 30, is this the case
* Mother ship should randomly reward either 50, 100, 150 or 300 points, is this the case
* Does the text at the top left of the page display the current score
* Does the text at the bottom left of the page display the number of lives the player has left
* Do the aliens all move together at regular intervals and if appropriate a sound effect should be played
* The interval between alien movements should decrease as the game progresses
* The interval between alien movements should not get smaller than a given value, is this the case
* The mother ship should appear at random intervals and move from the right to the left side of the top of the page, Is this the case
* The mother ship should appear more often as the game progresses and if appropriate a sound effect should be played, is this the case
* The time between mother ship appearances should not get any shorter than a given amount of time, is this the case
* When a player projectile comes into contact with any alien the projectile and alien should die and the alien’s points should be added to the current score also if appropriate a sound effect should be played, is this the case
* If a player projectile comes into contact with a mother ship the projectile and mother ship should die and the mother ship’s points should be added to the current score, is this the case
* If a player projectile comes into contact with a bunker it should blow up and remove a chunk from the bunker, where it came into contact, is this the case
* There should be 2 types of alien projectiles a fast Bolt and a slower Arrow, is this the case
* The alien projectiles should be shot at random intervals with arrow appearing more often than the bolt, is this the case
* The rate at which the alien projectiles are shot should increase as the game progresses, is this the case
* The alien projectiles should be shot from the lowest alien from a random column with the columns close to the player being more common, is this the case
* If an alien projectile comes into contact with a bunker it should blow up and remove a chunk from the bunker, where it came into contact, is this the case
* If an alien projectile comes into contact with a player projectile both should disappear, is this the case
* When an alien projectile comes into contact with the player the projectile should disappear and the player should die (playing the animation), is this the case
* When the player dies the number of lives the players have left should decrease by 1 and the text at the bottom left should update to reflect this as well as the number of images at the bottom left, is this the case
* Does the game stop while the player animation plays
* If the number of lives the player has left is 0 the game should end, is this the case
* Does the program stop when the exit button is clicked

**Normal input: Space bar presses, A key, D key, Right and Left Arrow Keys, Escape Key, highscores file with 10 highscores**

* Does the player move in the correct direction when A, Left (to the left) or D, Right (to the right) is pressed
* The player should stop moving if it reaches the edge of the page, is this the case
* Does a player projectile appear in the correct place when the space bar is pressed and if appropriate a sound effect should be played
* Does the game switch to the home page when the escape key is pressed
* Does the text at the top left of the page display the highest score
* When the game ends if the player has a score greater than any of the highscores the game should switch to the highscore input page if not to the highscore display page, is this the case

**Exceptional input: repeated space bar presses, Any combination of A, D, Left and Right keys pressed simultaneously, empty highscores file, highscores file with less than 10 highscores**

* Only one player projectile should ‘exist’ at any time, is this the case even when the space bar is being pressed repeatedly
* When more than one movement key is pressed the player should not ‘glitch out’ (repeatedly change direction) and should move at the same speed as if only one key were pressed, is this the case
* If the highscores file is empty, no score should be displayed at the top right of the page, is this the case
* When the game ends if there are less than 10 highscores (including 0) the game should switch to the high score input page, is this the case

**Extreme input: the press of any key that isn’t in the normal input, no highscores file**

* Nothing should happen when any other key is pressed, is this the case
* If there is no highscores file, an empty one should be created and used, is this the case
* When the game ends the game should switch to the high score input page, is this the case

High Score Input Page:

Normal input: Highscores object with 10 highscores and a current score that is greater than at least one of the current highscores, alpha key presses, enter key press when there are 3 initials, backspace key press

Exceptional input: Highscores object with 10 highscores and a current score that is greater than all of the current highscores, Highscores object with 0 highscores and a current score, more than 3 key presses, backspace pressed when there are no initials, enter pressed when there are less than 3 initials

Extreme input: no Highscores object, Highscores object with 10 highscores and a current score that is smaller than all current highscores, non-alpha key presses (excluding backspace or enter)

Looks**:**

* Cursor should be visible
* Is the background black
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are there three underlines
* Are the underlines in the correct places
* Are the initials displayer in the correct places
* Is the button the correct size
* Is the button in the correct place

Usability:

* is the button obvious in the fact it is a buttons
* Is the function of the button clear
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is the currently selected initial place clear
* Is it clear how to submit the initials
* Is it clear how to skip inputting the new highscore
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Does the button become larger when the cursor is over it
* Does the button return to its normal size once the cursor is no longer over it
* Does the underline of the currently selected initials place flash on and off
* When the skip button is pressed the highscore should not be added to the highscores file and the game should switch to the Highscore Display Page.
* Does the program stop when the exit button is clicked
* The highscores file output should hold no more than 10 highscores, is this the case

**Normal input: Highscores object with 10 highscores and a current score that is greater than at least one of the current highscores, alpha key presses, enter key press when there are 3 initials, backspace key press**

* When an alpha key is pressed is that character added to the currently selected initials place and the next initials place should become selected, is this the case
* When the backspace key is pressed the initial in the last filled place should be removed, if there is note, nothing should happen, is this the case
* When the enter key is pressed, if there are three initials, the highscore should be added and the game should switch to the Highscore Display Page.
* The new Highscores file output should have the new highscore in the correct place, is this the case

**Exceptional input: Highscores object with 10 highscores and a current score that is greater than all of the current highscores, Highscores object with 0 highscores and a current score, more than 3 key presses, backspace pressed when there are no initials, enter pressed when there are less than 3 initials**

* Only 3 alpha key presses should be taken in and stored any after that should be ignored unless the backspace is pressed and a stored initial is removed, is this the case
* If the backspace is pressed when there are no initials nothing should happen, is this the case
* If enter is pressed when there are less than 3 initials the text underneath the display should change to say “please input 3 characters”, is this the case
* The new Highscores file output should have the new highscore in the correct place no matter the state of the highscores object passed in, is this the case

**Extreme input: no Highscores object, Highscores object with 10 highscores and a current score that is smaller than all current highscores, non-alpha key presses (excluding backspace or enter)**

* The Highscore Input Page should never start without a highscores object passed into it, check the game page to ensure this
* The Highscore Input Page should never start with a current score smaller than all current highscores, check the game page to ensure this
* When a non alpha key is pressed (excluding backspace or enter) nothing should happen

High Score Display Page:

Normal: Highscores file with 10 highscores

Exceptional: Highscores file with no highscores

Extreme: No Highscores file

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the text easy to understand (what is written)
* Are the images big enough to be seen clearly
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the New Game button start the Game Page once clicked
* Does the Home button start the Home Page once clicked
* Does the program stop when the exit button is clicked

**Normal: Highscores file with 10 highscores**

* The highscores should be displayed in order (highest at the top, lowest at the bottom) in the text, is this the case

**Exceptional: Highscores file with no highscores**

* No highscores should be displayed, is this the case

**Extreme: No Highscores file**

* A new empty highscores file should be created then the page should behave as if an empty highscores file was passed into it, is this the case

End User Test Survey:

SPACE INVADERS END-USER SURVEY

Gender: \_\_\_\_\_\_\_\_\_\_

Age: ­­­\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| QUESTION | YES | KIND OF | NO |
| Are the Buttons clear (can you tell they are buttons)? |  |  |  |
| Is the function of each button easy clear (can you easily tell what the button does from context/the text on it)? |  |  |  |
| Is the wording of the text on each page easy to understand? |  |  |  |
| Is the font readable, is the font size large enough? |  |  |  |
| Are the images large enough to be seen clearly? |  |  |  |
| Are the instructions clear, is there enough detail in them and are they easy to understand? |  |  |  |
| Is the state of each setting clear on the settings page? |  |  |  |
| In the game, is it clear what all three text elements are displaying? |  |  |  |
| In the highscore input page is the currently selected initial clear? |  |  |  |
| Is it clear how to submit the highscore? |  |  |  |
| Is it clear how to skip inputing the highscore? |  |  |  |
| In the highscore display page is it clear how to start a new game |  |  |  |
| Is it clear how to return to the main menu |  |  |  |

What age-range do you think is appropriate for this game: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Did you find anything you think might be a bug while playing the game, if so what was it:

|  |
| --- |
|  |

Are there any features that you would like to see in the game:

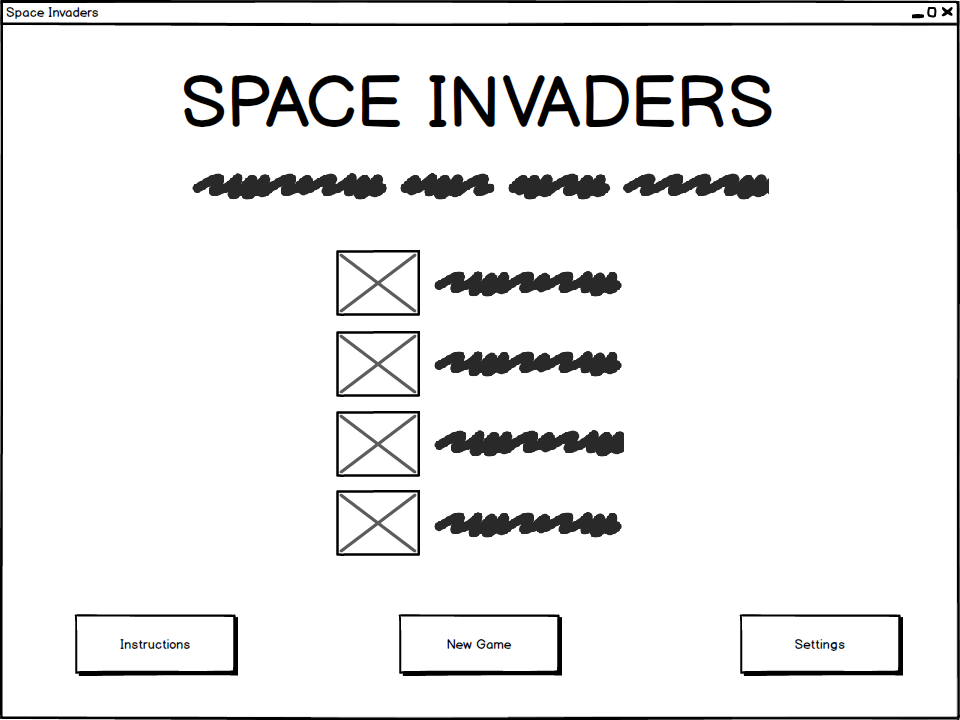
|  |
| --- |
|  |

*See Survey results in Appendix B*

UI Design

Wireframes:

Home Page:



Title

Sub-title

Alien images

Alien details

Background

Buttons

Title:

Font-size: 72px

Colour: white

Font-family: cosmic-aliens (ca)

Content: “SPACE INCADERS”

Sub-title:

Font-size: 32px

Colour: white

Font-family: cosmic-aliens (ca)

Content: description of below (what is being shown)

Alien images:

Number: 4

Content: respective alien sprite images

Alien details:

Font-size: 28px

Colour: white

Font-family: cosmic-aliens (ca)

Content: the point value of respective aliens

Background:

Size: 960x720px

Image: black with white spots to mimic stars

Buttons:

Size: 164x62px (normal), 184x78px (large)

Content: 1-2 word description of function.

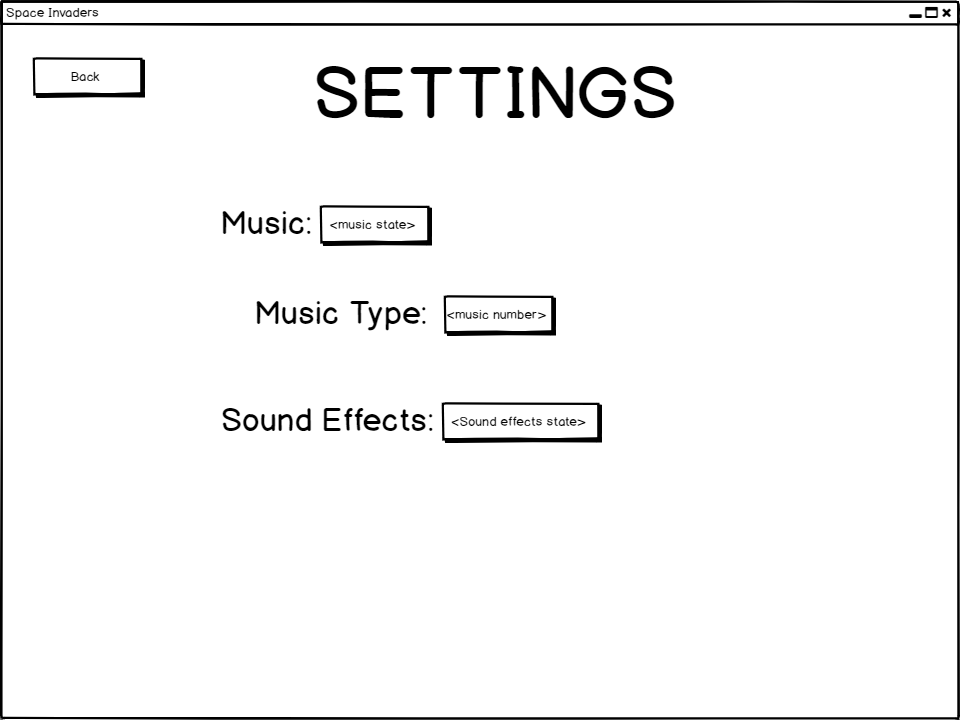
Font-size: 16px

Font-family: cosmic-aliens (ca)

Input: click detection, hover detection.

Output: size will change size when cursor is hovering over it, will change the page when clicked (to appropriate respective page).

Settings Page:



Buttons

Title

Labels

Title:

Font-size: 72px

Colour: White

Font-family: cosmic-aliens (ca)

Content: “SETTINGS”

Labels:

Font-size: 32px

Colour: white

Font-family: cosmic-aliens (ca)

Content: name of respective setting

Buttons:

Size: 113x42px (normal), 133x58px (large)

Content: 1-2 word description of function.

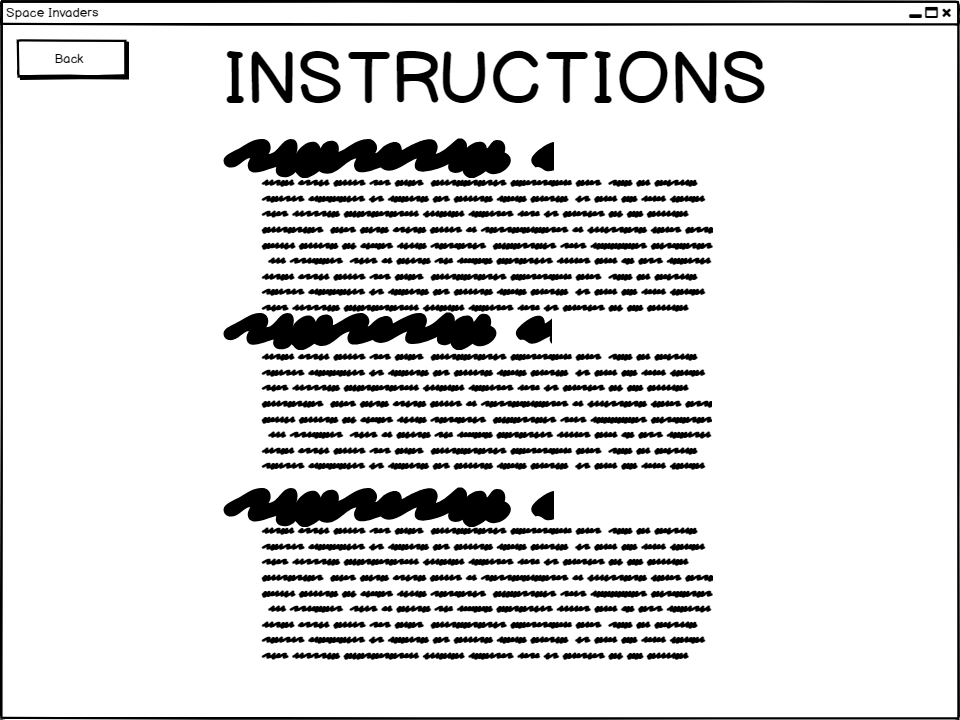
Font-size: 16px

Font-family: cosmic-aliens (ca)

Input: click detection, hover detection.

Output: size will change size when cursor is hovering over it, will change the sate of its respective setting/ change the page to the homepage (back button).

Instructions Page:



Title

Button

Instruction headers

Instruction body texts

Background

Title:

Font-size: 72px

Colour: white

Font-family: cosmic-aliens (ca)

Content: “INSTRUCTIONS”

Button:

Size: 113x41px (normal), 133x57px (large)

Content: “Back”

Font-size: 16px

Font-family: cosmic-aliens (ca)

Input: click detection, hover detection.

Output: changes the page to the homepage.

Instruction Headers:

Font-size: 32px

Colour: white

Font-family: cosmic-aliens (ca)

Content: summary of what is being explained below.

Instruction Body Texts:

Font-size: 16px

Colour: white

Font-family: cosmic-aliens (ca)

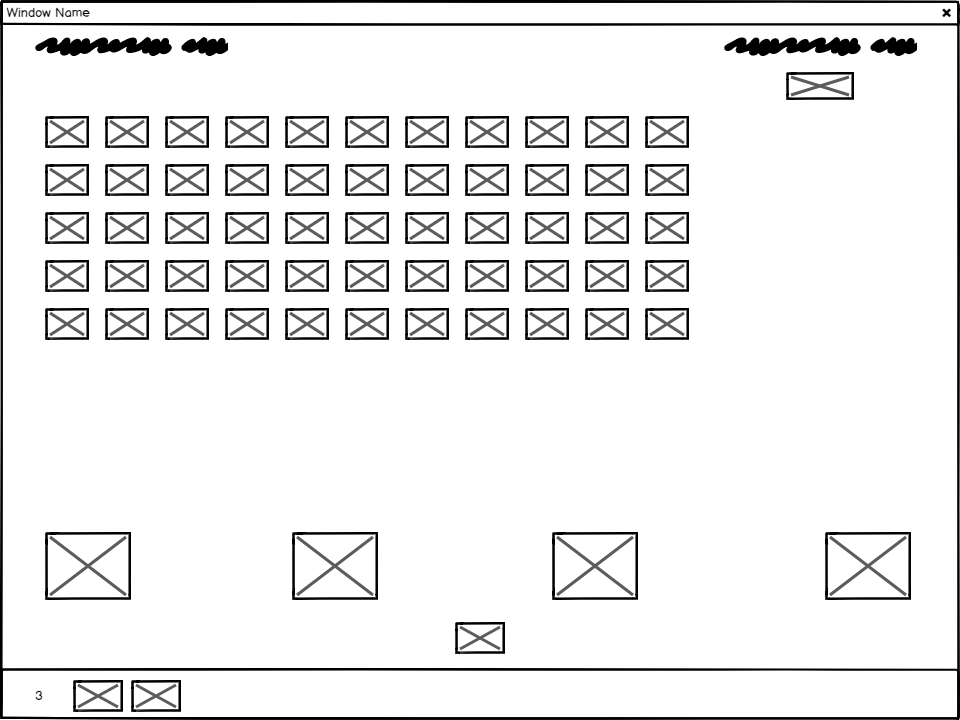
Content: explanation of controls or game mechanic.

Background:

Size: 960x720px

Image: black with white spots to mimic stars

Game Page:



Current score Highest score

Mothership

Aliens Background

Bunkers

Player Sprite

Lives indicator

Current score:

Font-size: 16px

Colour: white

Font-family: cosmic-aliens (ca)

Content: displays the current score

Highest score:

Font-size: 16px

Colour: white

Font-family: cosmic-aliens (ca)

Content: displays the highest score

Input: high score file

Background:

Size: 960x720px

Image: black with the bunkers on it

Input: settings variables

Output: background music

Bunkers:

Size: 86x68px

Special: will be part of the background for easier implementation

Mothership:

Size: 68x28px

Image: mothership sprite image

Output: sound effects

Aliens:

Size: 44x32px

Total number: 55

Separation (X): 16px

Separation (Y): 21px

Output: sound effects

Player Sprite:

Size: 50x32px

Image: player sprite image

Input: ‘A’, ’D’, left key and right key

Output: sound effects

Player Shot (not shown):

Size: 10x40px

Image: player shot

Output: sound effects

Lives indicator:

Font-size: 16px

Colour: white

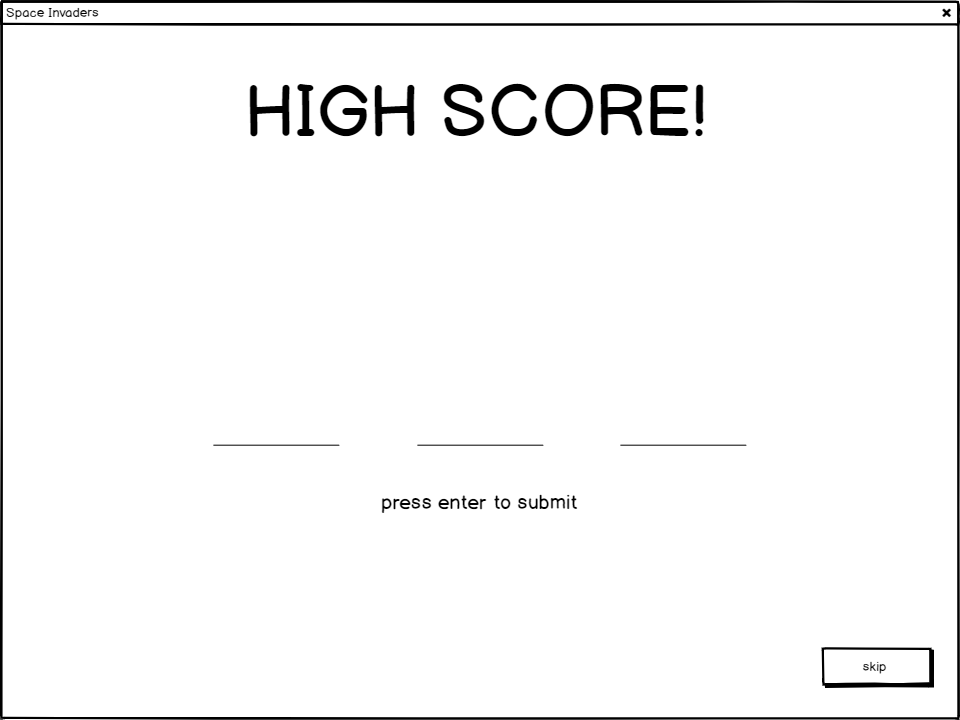
Font-family: cosmic-aliens (ca)

Content: the number of lives left

Image Size: 50x32px

Number of images: number of lives left

High Score Input Page:



Title

Background

Initial spaces

Enter text

Skip button

Title:

Font-size: 72px

Colour: white

Font-family: cosmic-aliens (ca)

Content: “HIGH SCORE!”

Background:

Size: 960x720px

Image: black with white spots to mimic stars

Input: enter key press, high score file

Output: high score file

Initial spaces:

Font-size: 180px

Font-family: cosmic-aliens (ca)

Underline size (width): 125px

Colour: white

Input: alpha key presses

Enter Text:

Font-size: 18px

Colour: white

Font-family: cosmic-aliens (ca)

Content: “press enter to submit”

Skip Button:

Size: 113x42px (normal), 133x58px (large)

Content: “skip”

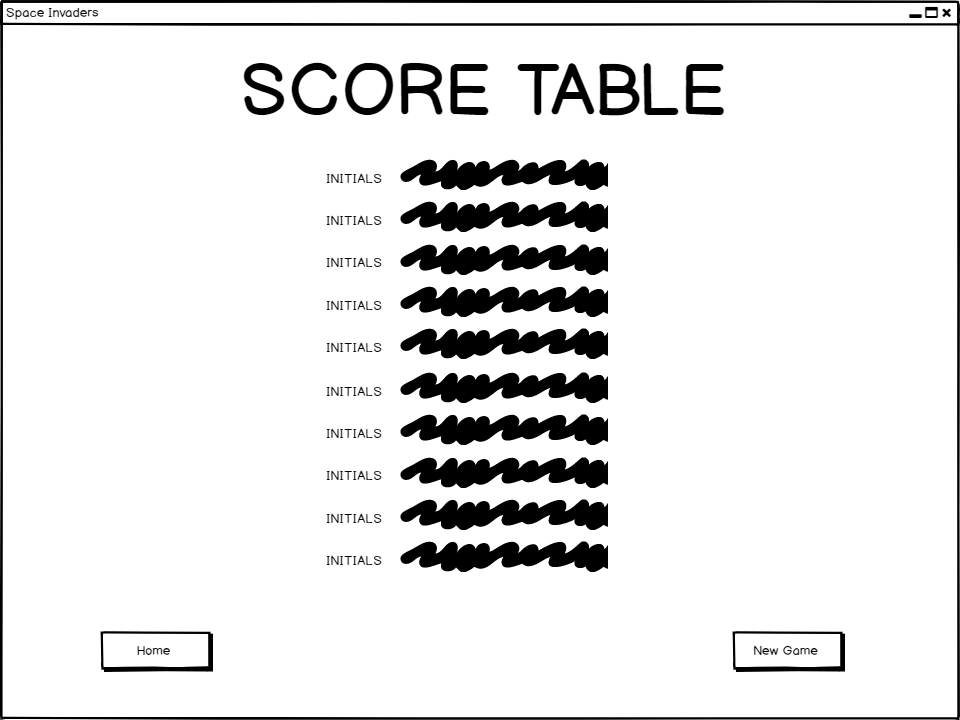
Font-size: 13px

Font-family: cosmic-aliens (ca)

Input: click detection, hover detection.

Output: changes the page to the high score display page.

High Score Display Page:



Title

High score table

Background

Buttons

Title:

Font-size: 72px

Colour: white

Font-family: cosmic-aliens (ca)

Content: “HIGH SCORE!”

High Score Table:

Font-size: 25px

Font-family: cosmic-aliens (ca)

Content: a sorted list of the top ten highest score along

with their corresponding initials

Background:

Size: 960x720px

Image: black with white spots to mimic stars

Input: high score file

Buttons:

Size: 113x42px (normal), 184x78px (large)

Content: 1-2 word description of function.

Font-size: 13px

Font-family: cosmic-aliens (ca)

Input: click detection, hover detection.

Output: size will change size when cursor is hovering over it, will change the page when clicked (to appropriate respective page).

Pseudocode

Code

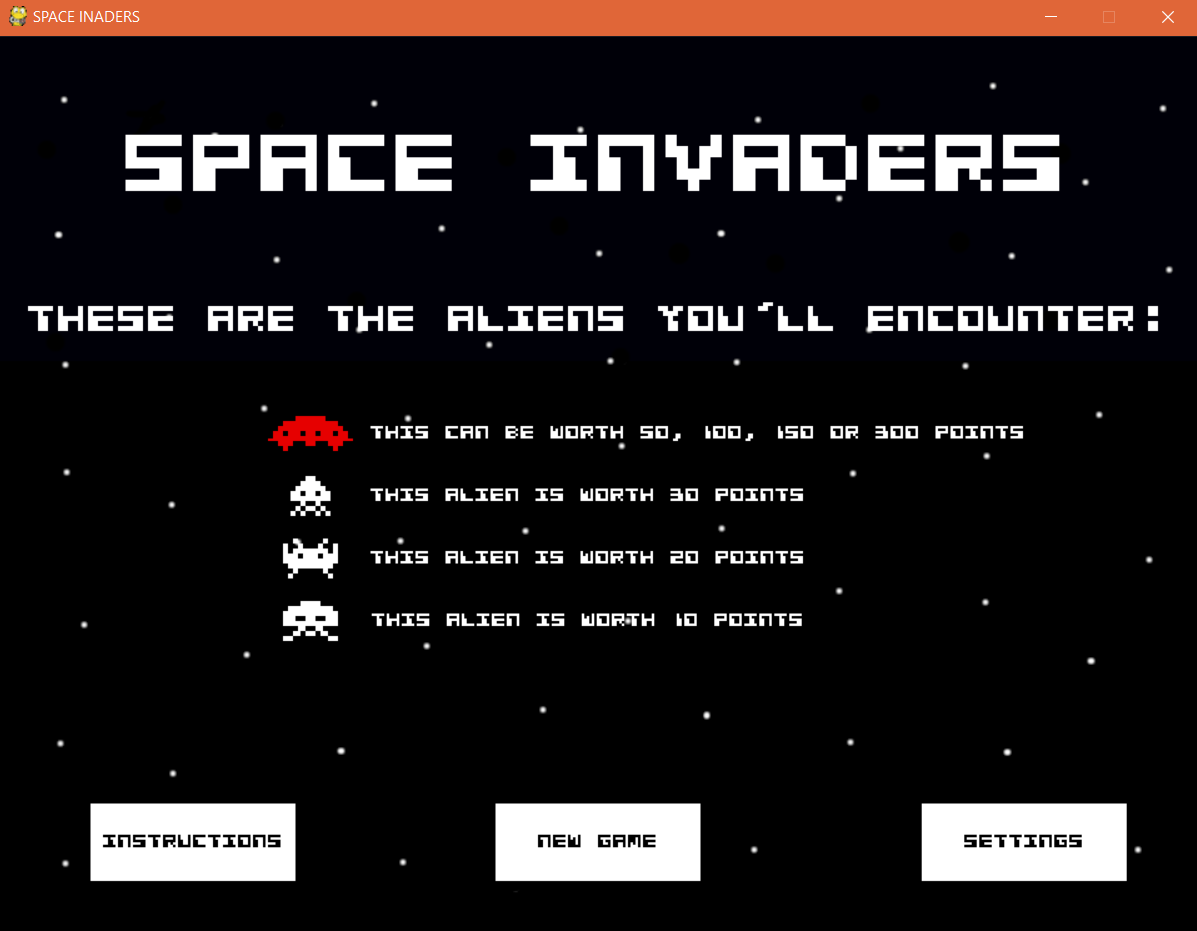
Basic Resources

Button Class

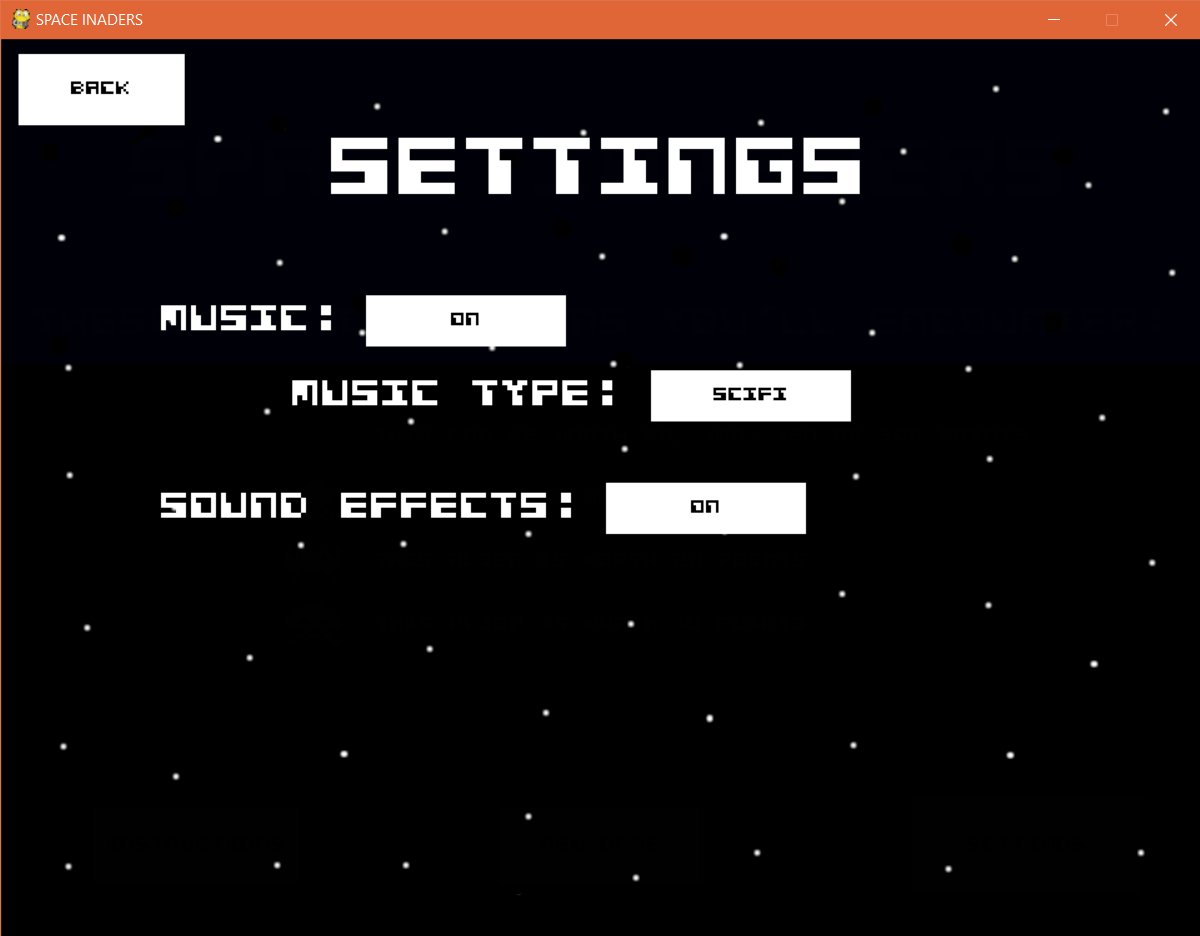
Player Class

Alien Classes

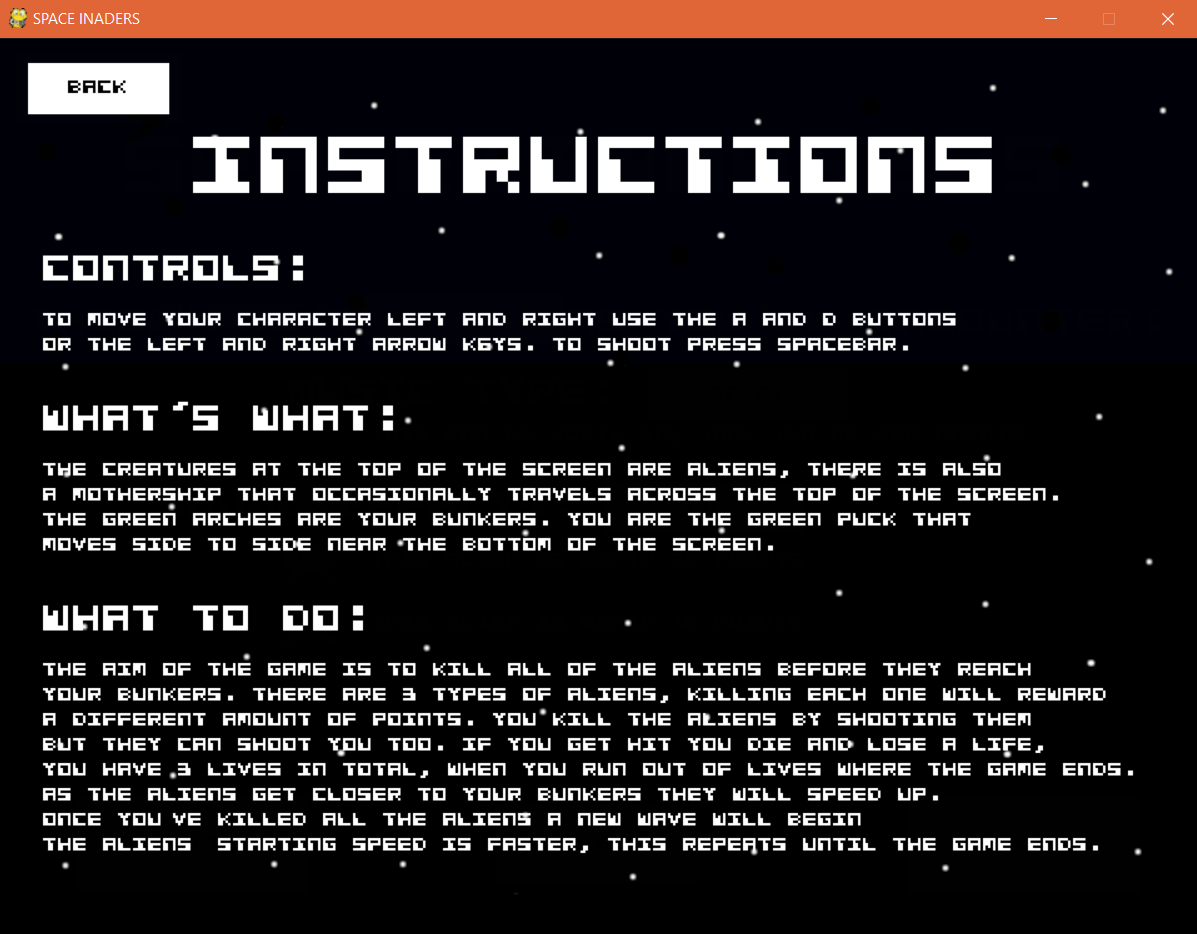
Home Page



Settings Page



Instructions Page



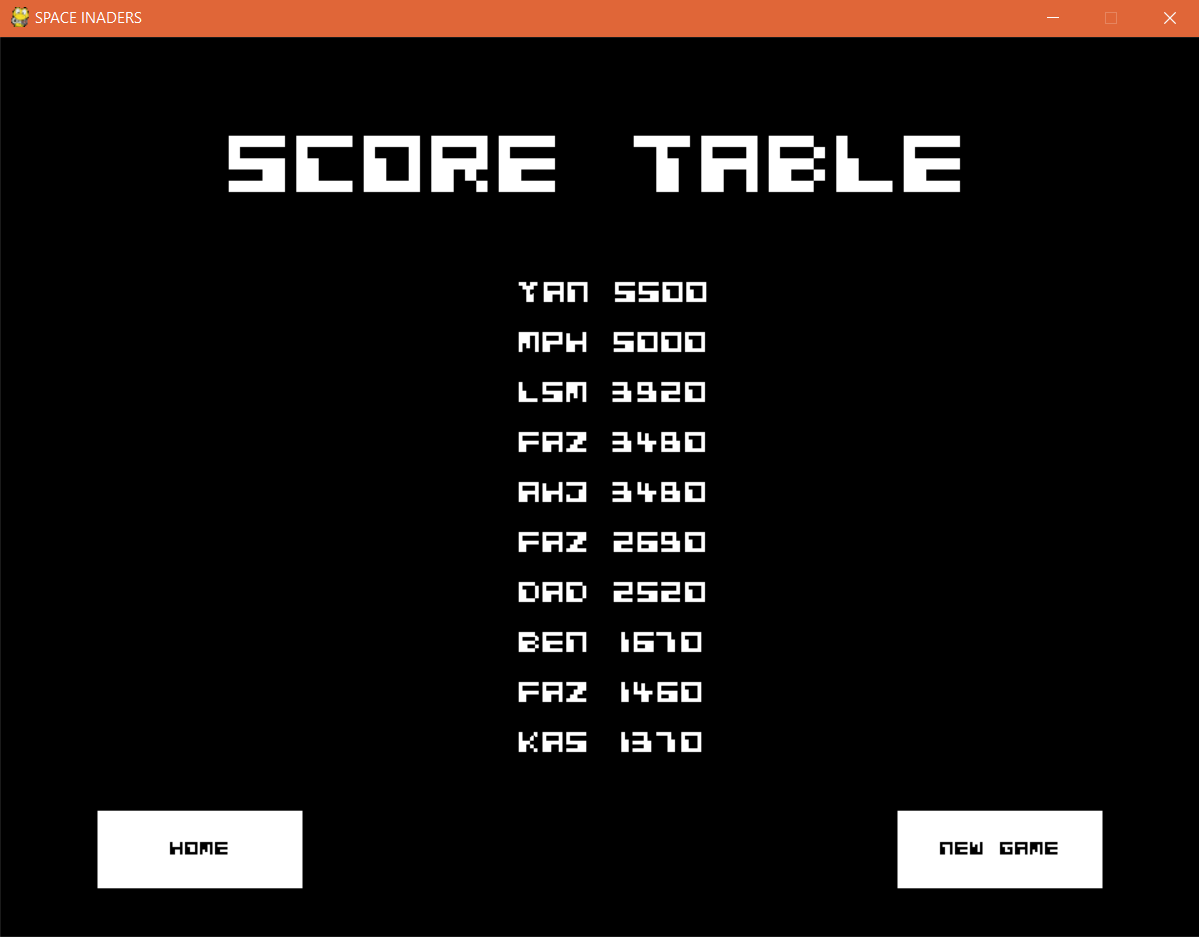
Game Page



Highscore Input Page



Highscore Display Page



Testing

Home Page:

No Normal, Exceptional or Extreme data for this page

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Are the correct image used
* Are the images in the desired position (use wireframe to check)
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the text easy to understand (what is written)
* Are the images big enough to be seen clearly
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the Instructions button start the Instructions Page once clicked
* Does the New Game button start the Game Page once clicked
* Does the Settings button start the Settings Page once clicked
* Does the program stop when the exit button is clicked

Settings Page:

Normal: a comma delimited file containing the settings

Exceptional: an empty settings file

Extreme: no settings file

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the state of each setting clear from the text on each button
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the Music button change the music setting correctly when clicked
* Does the Music button change its text correctly when clicked
* Does the Music State button change the music state setting correctly when clicked
* Does the Music State button change its text correctly when clicked
* Does the Sound Effects button change the sound effects setting correctly when clicked
* Does the Sound Effects button change its text correctly when clicked
* Does the Back button start the home Page when clicked
* Does the program stop when the exit button is clicked

**Normal: a comma delimited file containing the settings**

* The page should take in the file, read the values and correctly display the state of each setting on its respective button

**Exceptional: an empty settings file**

* The page should use the default settings and fill the settings file with those values

**Extreme: no settings file**

* The page should use default settings, create a settings file and fill it with those values

Instructions Page:

No Normal, Exceptional or Extreme data for this page

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Is the Back button the correct size
* Is the Back button in the correct place

Usability:

* Is the Back button obvious in the fact it is a button
* Is the function of the Back button clear
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Does the Back button become larger when the cursor is over it
* Does the Back button return to its normal size once the cursor is no longer over it
* Does the Back button start the home Page when clicked
* Does the program stop when the exit button is clicked

Game Page:

Normal input: Space bar presses, A key, D key, Right and Left Arrow Keys, Escape Key, highscores file with 10 highscores

Exceptional input: repeated space bar presses, Any combination of A, D, Left and Right keys pressed simultaneously, empty highscores file, highscores file with less than 10 highscores

Extreme input: the press of any key that isn’t in the normal input, no highscores file

Looks**:**

* Cursor should not be visible
* Is the background image used correct
* Is the highest score displayed in the correct place
* Is the current score displayed in the correct place
* Is the number of lives displayed in the correct place
* Are the image representations of the lives left correctly displayed in the correct place
* Are the fonts and font-sizes used appropriate
* Are there the correct number of aliens
* Are the aliens in the correct places
* Are the correct types of aliens used
* Does each type of alien use the correct image
* Do the aliens change their image each time they move
* Do the aliens change to the explode image when they die
* Do the alien projectiles use the correct images
* Do the alien projectiles animate as they move
* Are the alien projectiles white when above the bunkers
* Do the alien projectiles turn green when they reach the top of the bunkers
* Do the alien projectiles use the correct image after they blow up
* Is the player in the correct starting place
* Does the player use the correct dying animation
* Do the player projectiles use the correct image
* Do the player projectiles start green while bellow the top of the bunker
* Do the player projectiles turn white when they get above the top of the bunkers
* Do the player projectiles use the correct image after they blow up
* Do the mother ships use the correct image

Usability:

* Is what each bit of text is displaying clear
* Is the font readable
* Is the font size large enough
* Are the images large enough to distinguish
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* If the sound effects setting is on sound effects should play when appropriate, is this the case
* If the music setting is on background music determined by the music type setting should play on repeat, is this the case
* Do both music types work
* The three types of alien should reward different amounts of points 10, 20 or 30, is this the case
* Mother ship should randomly reward either 50, 100, 150 or 300 points, is this the case
* Does the text at the top left of the page display the current score
* Does the text at the bottom left of the page display the number of lives the player has left
* Do the aliens all move together at regular intervals and if appropriate a sound effect should be played
* The interval between alien movements should decrease as the game progresses
* The interval between alien movements should not get smaller than a given value, is this the case
* The mother ship should appear at random intervals and move from the right to the left side of the top of the page, Is this the case
* The mother ship should appear more often as the game progresses and if appropriate a sound effect should be played, is this the case
* The time between mother ship appearances should not get any shorter than a given amount of time, is this the case
* When a player projectile comes into contact with any alien the projectile and alien should die and the alien’s points should be added to the current score also if appropriate a sound effect should be played, is this the case
* If a player projectile comes into contact with a mother ship the projectile and mother ship should die and the mother ship’s points should be added to the current score, is this the case
* If a player projectile comes into contact with a bunker it should blow up and remove a chunk from the bunker, where it came into contact, is this the case
* There should be 2 types of alien projectiles a fast Bolt and a slower Arrow, is this the case
* The alien projectiles should be shot at random intervals with arrow appearing more often than the bolt, is this the case
* The rate at which the alien projectiles are shot should increase as the game progresses, is this the case
* The alien projectiles should be shot from the lowest alien from a random column with the columns close to the player being more common, is this the case
* If an alien projectile comes into contact with a bunker it should blow up and remove a chunk from the bunker, where it came into contact, is this the case
* If an alien projectile comes into contact with a player projectile both should disappear, is this the case
* When an alien projectile comes into contact with the player the projectile should disappear and the player should die (playing the animation), is this the case
* When the player dies the number of lives the players have left should decrease by 1 and the text at the bottom left should update to reflect this as well as the number of images at the bottom left, is this the case
* Does the game stop while the player animation plays
* If the number of lives the player has left is 0 the game should end, is this the case
* Does the program stop when the exit button is clicked

**Normal input: Space bar presses, A key, D key, Right and Left Arrow Keys, Escape Key, highscores file with 10 highscores**

* Does the player move in the correct direction when A, Left (to the left) or D, Right (to the right) is pressed
* The player should stop moving if it reaches the edge of the page, is this the case
* Does a player projectile appear in the correct place when the space bar is pressed and if appropriate a sound effect should be played
* Does the game switch to the home page when the escape key is pressed
* Does the text at the top left of the page display the highest score
* When the game ends if the player has a score greater than any of the highscores the game should switch to the highscore input page if not to the highscore display page, is this the case

**Exceptional input: repeated space bar presses, Any combination of A, D, Left and Right keys pressed simultaneously, empty highscores file, highscores file with less than 10 highscores**

* Only one player projectile should ‘exist’ at any time, is this the case even when the space bar is being pressed repeatedly
* When more than one movement key is pressed the player should not ‘glitch out’ (repeatedly change direction) and should move at the same speed as if only one key were pressed, is this the case
* If the highscores file is empty, no score should be displayed at the top right of the page, is this the case
* When the game ends if there are less than 10 highscores (including 0) the game should switch to the high score input page, is this the case

**Extreme input: the press of any key that isn’t in the normal input, no highscores file**

* Nothing should happen when any other key is pressed, is this the case
* If there is no highscores file, an empty one should be created and used, is this the case
* When the game ends the game should switch to the high score input page, is this the case

High Score Input Page:

Normal input: Highscores object with 10 highscores and a current score that is greater than at least one of the current highscores, alpha key presses, enter key press when there are 3 initials, backspace key press

Exceptional input: Highscores object with 10 highscores and a current score that is greater than all of the current highscores, Highscores object with 0 highscores and a current score, more than 3 key presses, backspace pressed when there are no initials, enter pressed when there are less than 3 initials

Extreme input: no Highscores object, Highscores object with 10 highscores and a current score that is smaller than all current highscores, non-alpha key presses (excluding backspace or enter)

Looks**:**

* Cursor should be visible
* Is the background black
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are there three underlines
* Are the underlines in the correct places
* Are the initials displayer in the correct places
* Is the button the correct size
* Is the button in the correct place

Usability:

* is the button obvious in the fact it is a buttons
* Is the function of the button clear
* Is the text easy to understand (what is written)
* Is the font readable
* Is the font size large enough
* Is the currently selected initial place clear
* Is it clear how to submit the initials
* Is it clear how to skip inputting the new highscore
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Does the button become larger when the cursor is over it
* Does the button return to its normal size once the cursor is no longer over it
* Does the underline of the currently selected initials place flash on and off
* When the skip button is pressed the highscore should not be added to the highscores file and the game should switch to the Highscore Display Page.
* Does the program stop when the exit button is clicked
* The highscores file output should hold no more than 10 highscores, is this the case

**Normal input: Highscores object with 10 highscores and a current score that is greater than at least one of the current highscores, alpha key presses, enter key press when there are 3 initials, backspace key press**

* When an alpha key is pressed is that character added to the currently selected initials place and the next initials place should become selected, is this the case
* When the backspace key is pressed the initial in the last filled place should be removed, if there is note, nothing should happen, is this the case
* When the enter key is pressed, if there are three initials, the highscore should be added and the game should switch to the Highscore Display Page.
* The new Highscores file output should have the new highscore in the correct place, is this the case

**Exceptional input: Highscores object with 10 highscores and a current score that is greater than all of the current highscores, Highscores object with 0 highscores and a current score, more than 3 key presses, backspace pressed when there are no initials, enter pressed when there are less than 3 initials**

* Only 3 alpha key presses should be taken in and stored any after that should be ignored unless the backspace is pressed and a stored initial is removed, is this the case
* If the backspace is pressed when there are no initials nothing should happen, is this the case
* If enter is pressed when there are less than 3 initials the text underneath the display should change to say “please input 3 characters”, is this the case
* The new Highscores file output should have the new highscore in the correct place no matter the state of the highscores object passed in, is this the case

**Extreme input: no Highscores object, Highscores object with 10 highscores and a current score that is smaller than all current highscores, non-alpha key presses (excluding backspace or enter)**

* The Highscore Input Page should never start without a highscores object passed into it, check the game page to ensure this
* The Highscore Input Page should never start with a current score smaller than all current highscores, check the game page to ensure this
* When a non alpha key is pressed (excluding backspace or enter) nothing should happen

High Score Display Page:

Normal: Highscores file with 10 highscores

Exceptional: Highscores file with no highscores

Extreme: No Highscores file

Looks**:**

* Cursor should be visible
* Is the background image used correct
* Is the correct text used
* Are the fonts and font-sizes used appropriate
* Are the buttons the correct size
* Are the buttons in the correct place

Usability:

* Are the buttons obvious in the fact they are buttons
* Is the function of each button clear
* Is the text easy to understand (what is written)
* Are the images big enough to be seen clearly
* Is the font readable
* Is the font size large enough
* Is there any Lag after interacting with the Page (no lag)

Functionality:

* Do the buttons become larger when the cursor is over them
* Do the buttons return to their normal size once the cursor is no longer over them
* Does the New Game button start the Game Page once clicked
* Does the Home button start the Home Page once clicked
* Does the program stop when the exit button is clicked

**Normal: Highscores file with 10 highscores**

* The highscores should be displayed in order (highest at the top, lowest at the bottom) in the text, is this the case

**Exceptional: Highscores file with no highscores**

* No highscores should be displayed, is this the case

**Extreme: No Highscores file**

* A new empty highscores file should be created then the page should behave as if an empty highscores file was passed into it, is this the case

Evaluation

Project Plan:

I did not end up adhering to the specific timeline set out by the original gantt chart. I ended up writing the pseudocode and implementing the code concurrently as I would design each object in pseudocode, then implement and test it to ensure that each piece would work at least on its own to make debugging the code easier later in the design and implantation phases. I also ended up starting the end user testing and evaluation a week later than set out.

Requirement Specification:

Scope and Boundaries:

I was able to implement most of the intended features. The features I was unable to implement or had to remove were:

* Projectiles being more likely to appear over the player.
  + I was unable to implement this due to the complexity and the time it would have required to research and learn about and implement would have been too long.
* The multiple graphics options.
  + I was able to implement this feature but the modern graphics option caused the game to lag (run slowly) and it became unplayable. Because of this I removed the feature
* The description of the functions of the settings
  + I decided this feature was unnecessary and that it would require too much time to design and implement.

All the other features were implemented as described. None of the features from the boundaries were implemented.

Test Plan:

Evaluation of Reasearch:

To get an in depth understanding of the end users a survey was created. The results of this survey were analysed and evaluated to make decisions about what would be added to the game, for example how many high scores should be stored on the score board. I wasn’t able to follow the survey’s results exactly though, for example I did not follow the results of the section outlining what device the game should be developed for. Though when I was not able to follow the survey’s results I provided sufficient reasoning as to why it was the case.

Evaluation of Plan:

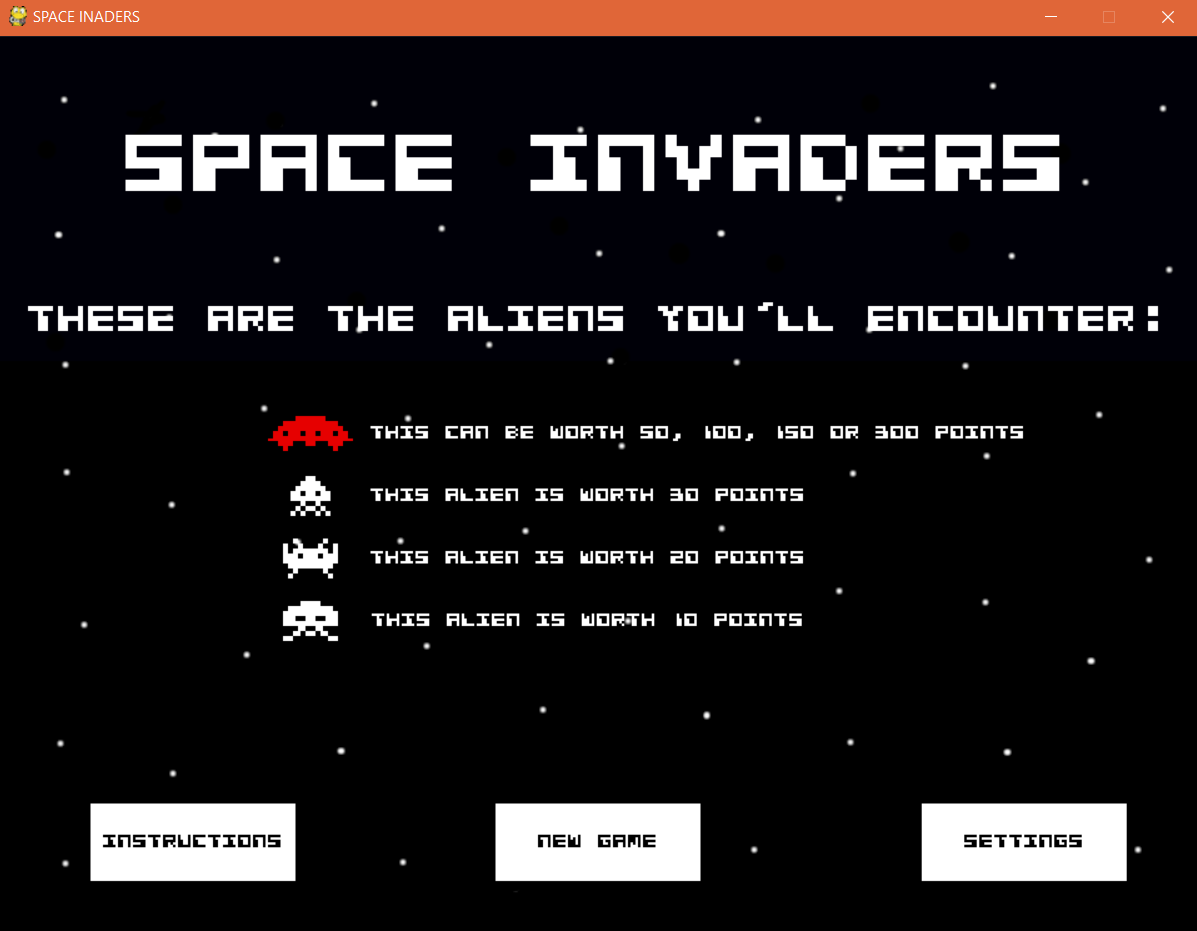
My first test plan was made before I started designing the program, at that point I realised that I needed to redesign my test plan. The second test plan was in the form of a checklist with space added/removed for notes on bugs and errors found. I filled out the functionality section of the original test plan (as well as all of the second test plan) to ensure the program was thoroughly tested.

To test the usability of the program I created an end user survey and had people use the program and fill out the survey. The effectiveness of this testing was reduced on the high score input page as most users did not achieve a high score.

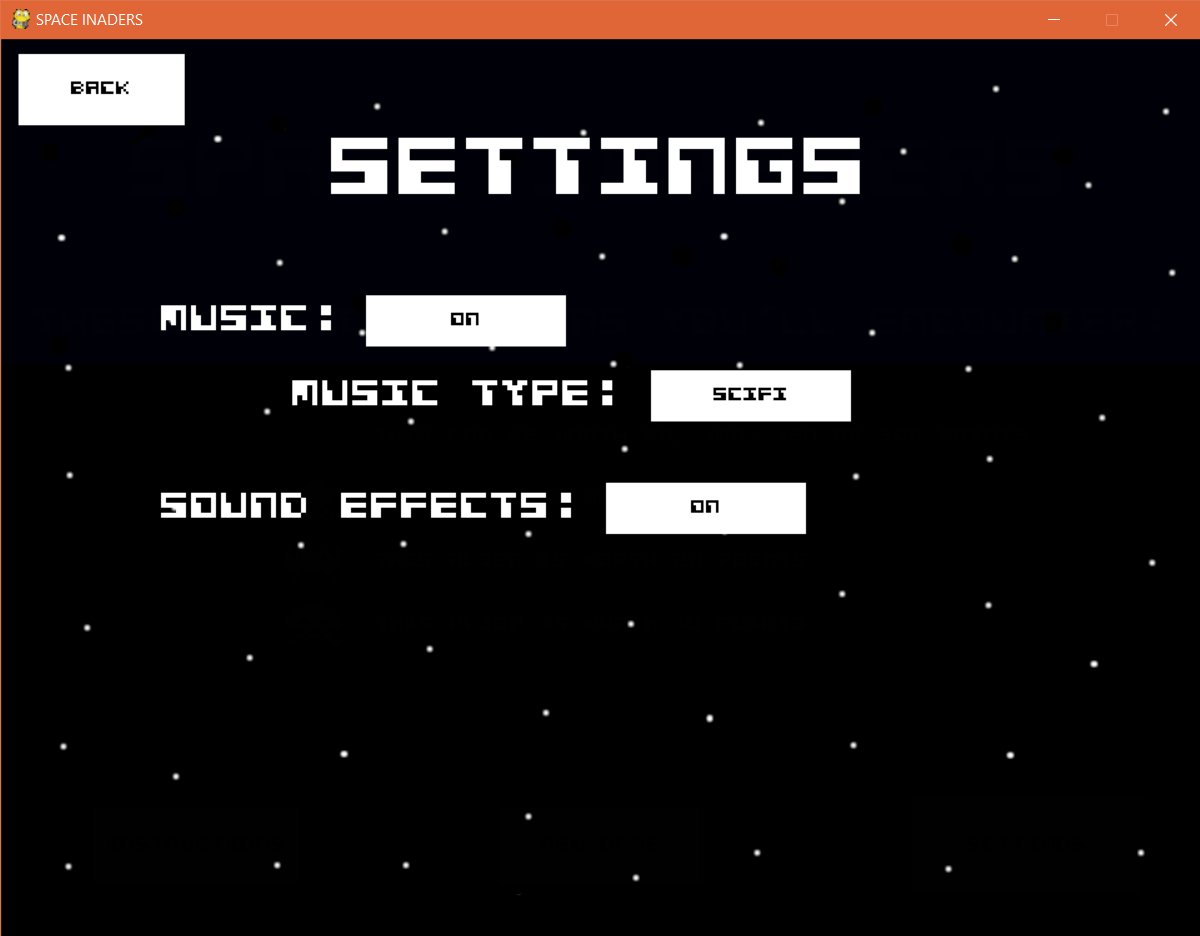
Evaluation of End-User Test Survey:

The end user survey was created to get a good idea of how usable the program is for its potential users, as my view of the usability is not accurate as I wrote the program and therefore already understand how to use it. The end user survey was also used to find bugs that I missed as these users are more likely to input more rapid and unpredictable inputs. The biggest issues the survey highlighted were that the text used on the instructions page was hard to read as the font size was too small and sometimes when projectiles collided with other elements the projectile and elements would not disappear as they should. These issues were not addressed due to the time constraints and the complexity of the solutions to these issues, this is gone into more detail on the testing.

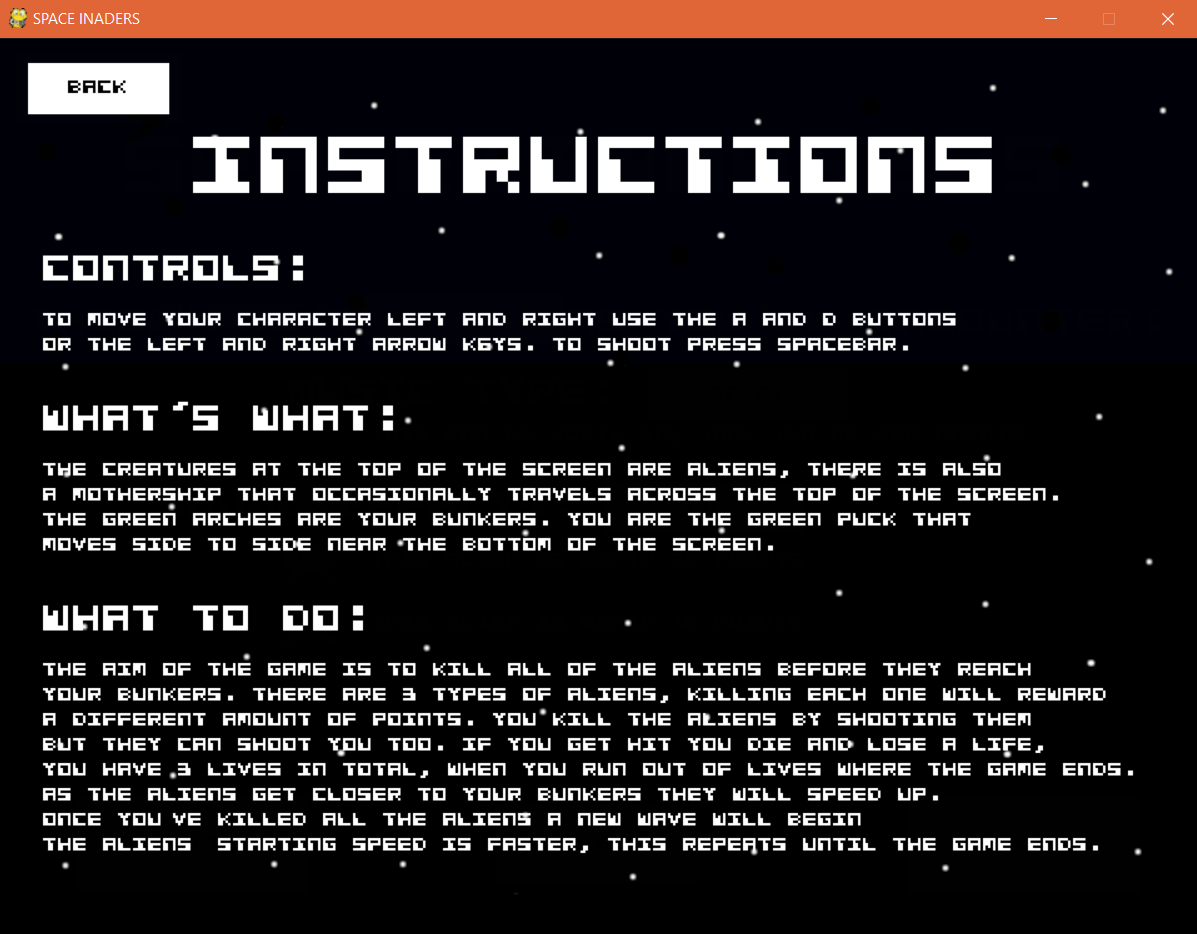
Results of Testing (Evaluation of Program):

Home Page:

The page is accurate to the Wireframe and fits the ‘retro’ look. All the functionality works as expected, no bugs were discovered. The buttons on the homepage were clear both in what clicking them achieves and the fact they are buttons. All text on the homepage was large and clear enough to be readable.

Settings Page:

The page is accurate to the Wireframe and fits the ‘retro’ look. One bug was found in this page, when an empty settings file is passed into it the program crashes, this was not fixed as this error would only occur if a user intentionally removes all the data from the file and would never ‘naturally’ occur. The buttons on the settings page were clear both in what clicking them achieves and the fact they are buttons. All text on the settings page was large and clear enough to be readable and the text on the buttons clearly describes the state of it’s corresponding setting.

Instructions Page:

The page is accurate to the Wireframe and fits the ‘retro’ look. All the functionality works as expected, no bugs were discovered. The button on the instructions page was clear both in what clicking it achieves and the fact it’s a buttons. The text on the instructions page is not very clear, the font and it’s size meant that the text isn’t very reasonable and one end user said that the wording was too long. This would require a substantial amount of work to address as if the font size is made bigger the text won’t all fit on the page requiring scrolling to be implemented.

Game Page:

The page is accurate to the Wireframe and fits the ‘retro’ look. Not all the functionality works as expected:

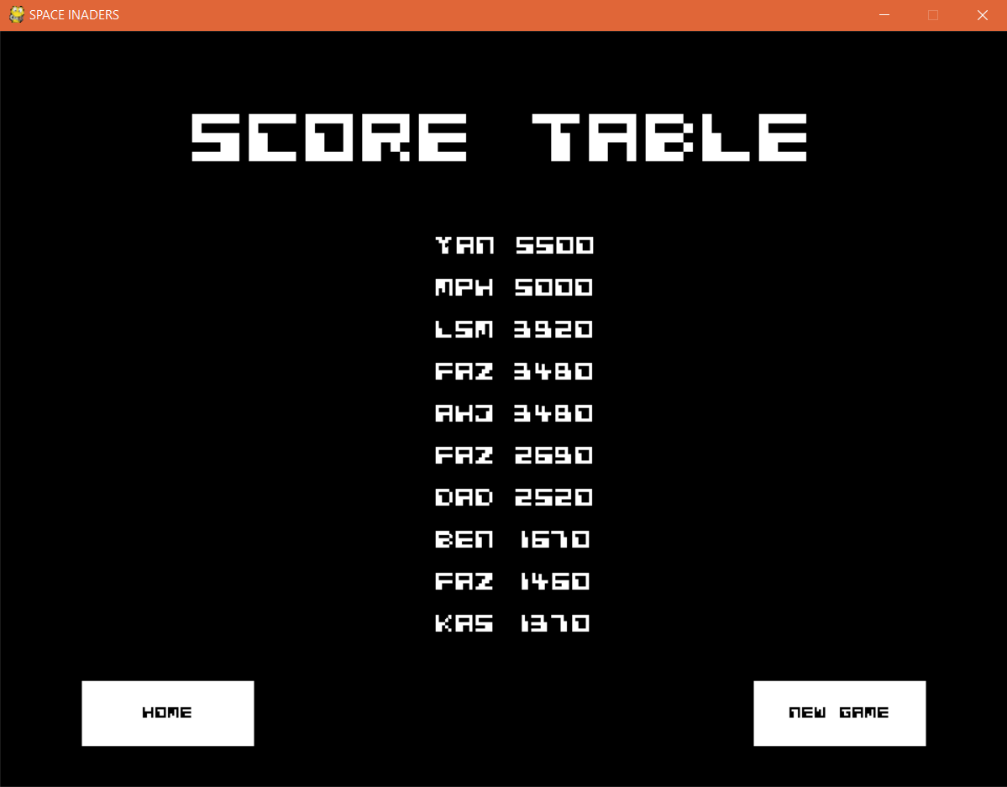
* When starting a new game, sometimes the player doesn’t start in the correct position. This was fixed.
* Collision detection between aliens, mothership, player projectiles, alien projectiles and bunkers occasionally would not occur and the aliens wouldn’t die, the projectiles wouldn’t disappear or the projectiles wouldn’t blow up the bunkers. This tends to occur when the projectiles come into contact with the edge of an alien or bunker. This was not fixed.
* The projectiles are shot from the alien columns randomly as opposed to being more likely to be shot above the player. This was not fixed.

The font and font sized used for the text on the game page was clear and readable. The positioning of the current score and highest score text and their content is clear but one user said that the lives text was unclear, they did not elaborate on why this is. As only one user made this complaint this was not changed.

High Score Input Page:

The page is accurate to the Wireframe and fits the ‘retro’ look. All the functionality works as expected, no bugs were discovered. The button on the high score input page was clear in the fact it’s a buttons but some users accidentally clicked it when trying to enter the initials. The text on the high score input page is not very clear, the change in font size cause the text instructing how to enter the high score makes it seem unimportant so users were ignoring it and getting confused.

Highs Score Display Page:

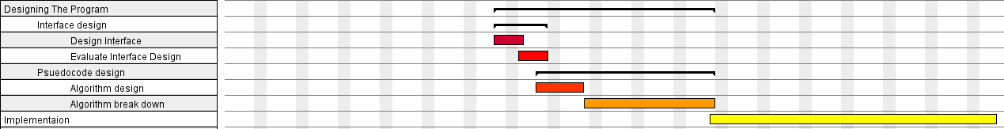
The page is accurate to the Wireframe and fits the ‘retro’ look. All the functionality works as expected, no bugs were discovered. The buttons on the high score display page were clear both in what clicking them achieves and the fact they are buttons. All text on the high score display page was large and clear enough to be readable.

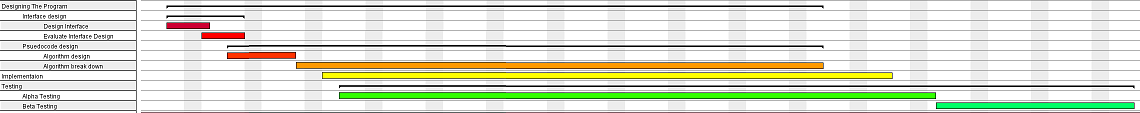
Conclusion of Testing:

Over-all the program stayed accurate to the initial concept and fulfilled all the requirements. All but one of the features mentioned in the scope were implemented (multiple graphics options was not) and none of the features mentioned in the boundaries were implemented. The user interface had all of the necessary elements without feeling cluttered at all and for the most part was easy to understand for all users (one user didn’t understand the text displaying the number of lives the player has and a few users mentioned that the settings page was hard to read).

The program itself has a couple small bugs that I was unable to fix, all of these bugs are to do with collision detection between elements which is a built in function of Pygame, and one bug that I decided was acceptable as I didn’t have time to fix it and would never occur ‘naturally’, the program crashes if the settings file is empty. The game runs reliably, without lag (when the laptop I run it on does not have low battery) and has an appropriate difficulty curve (starts of simple enough for anyone to play and steadily gets harder to challenge more skilled players).

Development Process:

Over-all my development process was net very efficient and I didn’t stick very closely to my gantt chart.

When designing the program I would implement each class/section immediately after they were designed to ensure they worked correctly (also both of these tasks took much longer than initially expected). 

I did this to make debugging the program easier as I knew any errors that were occurring were caused by the class/section I was currently working on rather than possibly being any of the backing classes. This resulted in my pseudocode looking very similar to my actual code as there was constant refinement of the pseudocode to address issues in the actual code.

There were also a couple inefficiencies in the way the code was designed, for example when changing page the program never ends the loop running the last page, I decided this was not a big issue as it had little to no impact on how well the game ran.

My Performance:

Over-all my performance was adequate but could have been better. At the begging of the project I worked quite slowly and didn’t fully understand what was required to complete the program. This improved as I worked more on the project but there was a period of about a month over which little to no work was done on the project, this was due to revision for prelims. As the project progressed though I started doing more work in longer ‘sprints’ which end up with the record of progress having sections describing work over a relatively long period of time (anywhere form 2 day to a week). My record of progress was not extremely detailed as I didn’t understand how to properly evaluate the work done though notes on the how well the program was implemented were taken for to make writing this evaluation slightly easier. I also found starting the pseudocode quite difficult as I couldn’t decide on how to approach the implementation resulting in multiple attempts (see APPENDIX F). I eventually settled on a method for implementing the program where different classes, resources and pages were in different files to make them more organised.

Appendices

APPENDIX A (End User Survey Results)

APPENDIX B (End User Test Survey Results)

APPENDIX C (Old Test Plan)

APPENDIX D (Old Settings Page UI Design)

APPENDIX E (Old Pseudocodes)

APPENDIX F (Record of Progress)