Software Requirements Specification for Slither: A Game of Strategy

Version 1.0 approved

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February 1, 2019

1. Introduction

1.1. Purpose

The purpose of this document is to specify all requirements for a game of Slither. These requirements relate to the game's functionality, performance, system interface, and constraints.

1.2. Document Conventions

Every requirement statement has its priority, regardless of level of detail.

1.3. Intended Audience and Reading Suggestions

The intended audience of this SRS are developers, users, testers, project managers and documentation writers. The document is written in this order: introduction, overall description, functional requirements, non-functional requirements and design/implementation constraints. The introduction should be read first, followed by each of the following listed groups reading their recommended section. Developers should read the external interface requirements, system features, and nonfunctional requirements. In each section they will find interfaces and features of the game. Users and testers should read the system features, where they will find the game's features and interactions between players or Artificial Intelligence (AI). Documentation writers and project managers should read the overall description.

1.4. Product Scope

Slither is a web-based application that allows a user to play a real-time game of strategy. The primary goal is to create a web-based game that is functional and entertaining to all users. The user shall be able to play with another user on the same system or play against AI.

1.5. References

1.5.1. "IEEE Guide for Software Requirements Specifications." *IEEE Std 830-1984*, 1984, p. 1. *EBSCOhost*, DOI:https://doi.org/10.1109/IEEESTD.1984.119205
1.5.2. "Writing Software Requirements Specifications (SRS)." *TechWhirl*, 14 Feb. 2016, techwhirl.com/writing-software-requirements-specifications/.
1.5.3. https://www.addictinggames.com/
1.5.4. https://www.addictinggames.com/io-games/little-big-snakeio
1.5.5. https://play.google.com/store/apps/details?id=com.amelosinteractive.snake&hl=en_US
1.5.6. https://pages.nist.gov/800-63-3/sp800-63b.html
1.5.7. https://developers.google.com/recaptcha/

1.6 Definitions

NPC	Non-Player Character
AI	Artificial Intelligence
Slither	The name of our variant of the snake game.

Anonymous user	Unregistered visiter of the web page
Registered user	A user who has an account
A-Team	Our team name (developers of Slither). Also serves as the name of the website.
NIST	National Institute of Standards and Technology

2. Overall Description

2.1. Product Perspective

Slither is a web-based application that provides users an environment for real-time gameplay. Slither allows for single player. Slither will allow user customizations to enhance gameplay such as level of difficulty, choice of snakeskin color, change background, etc. Any users that choose to create an account will have the opportunity to provide an image for their profile.

2.2. Product Functions

2.2.1. Slither shall allow the user to play a game of Slither against the computer (AI).
2.2.2. Slither shall allow the user to make game customizations such as change the snakeskin color or select a background theme.
2.2.3. Slither shall allow the user to choose a difficulty level they wish to play at whenever they are playing against the computer.
2.2.4. The website should allow users to create profiles in order to track player scores and compare stats against other players.
2.2.5. The website should allow users who have created a profile to see their performance via a leaderboard.

2.3. User Classes and Characteristics

Slither will be easy to use by any user through a browser. No special or previous knowledge will be necessary for the user to use Slither. As such, Slither shall provide three user classes:

1. Anonymous user: user with no account. Only has the ability to play the game. No statistics on the user's game shall be recorded and saved to the database.
2. Registered user: user has an account and has the associated features with that account. User's game statistics shall be collected and used for comparison against other registered players for the user's reference.
3. Administrator: User shall be able to delete and manage user accounts.

2.4. Operating Environment

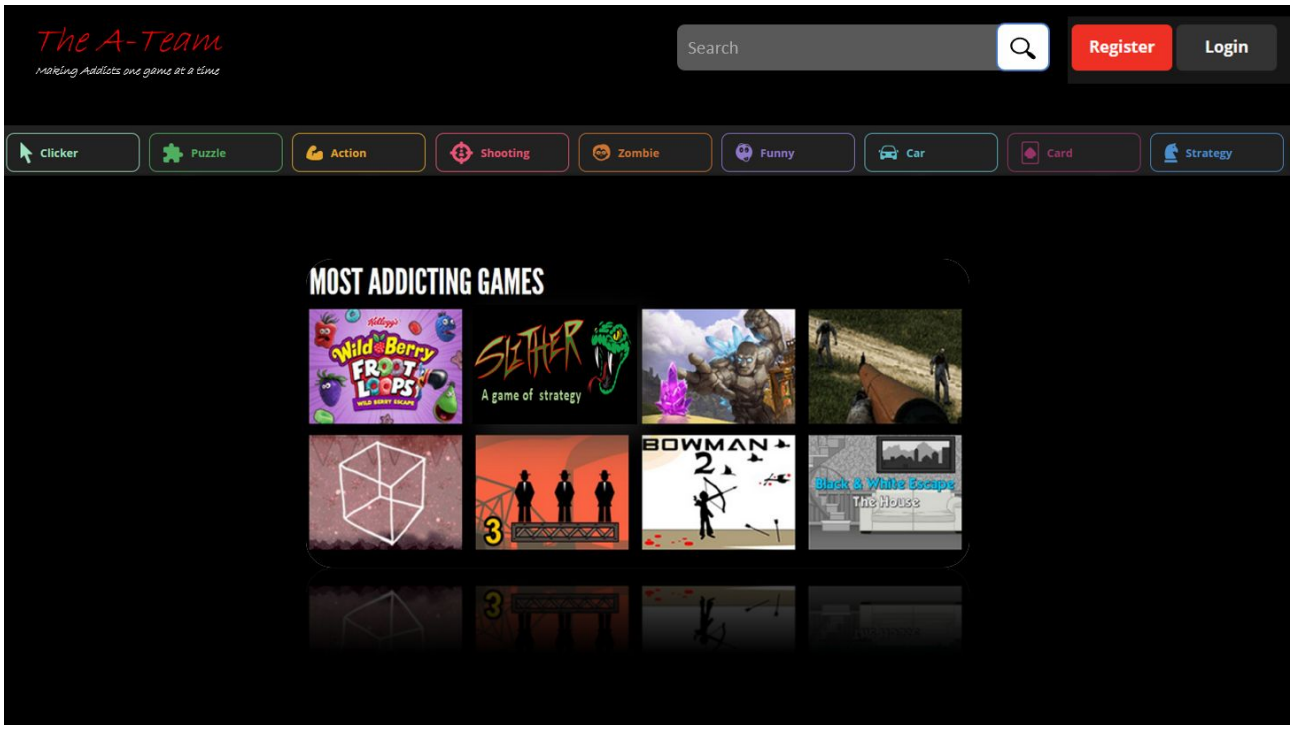
Slither will be a Python web-based application. The user will not need any previously installed software or any specific hardware in order to use Slither.

3. External Interface Requirements

3.1. User Interfaces

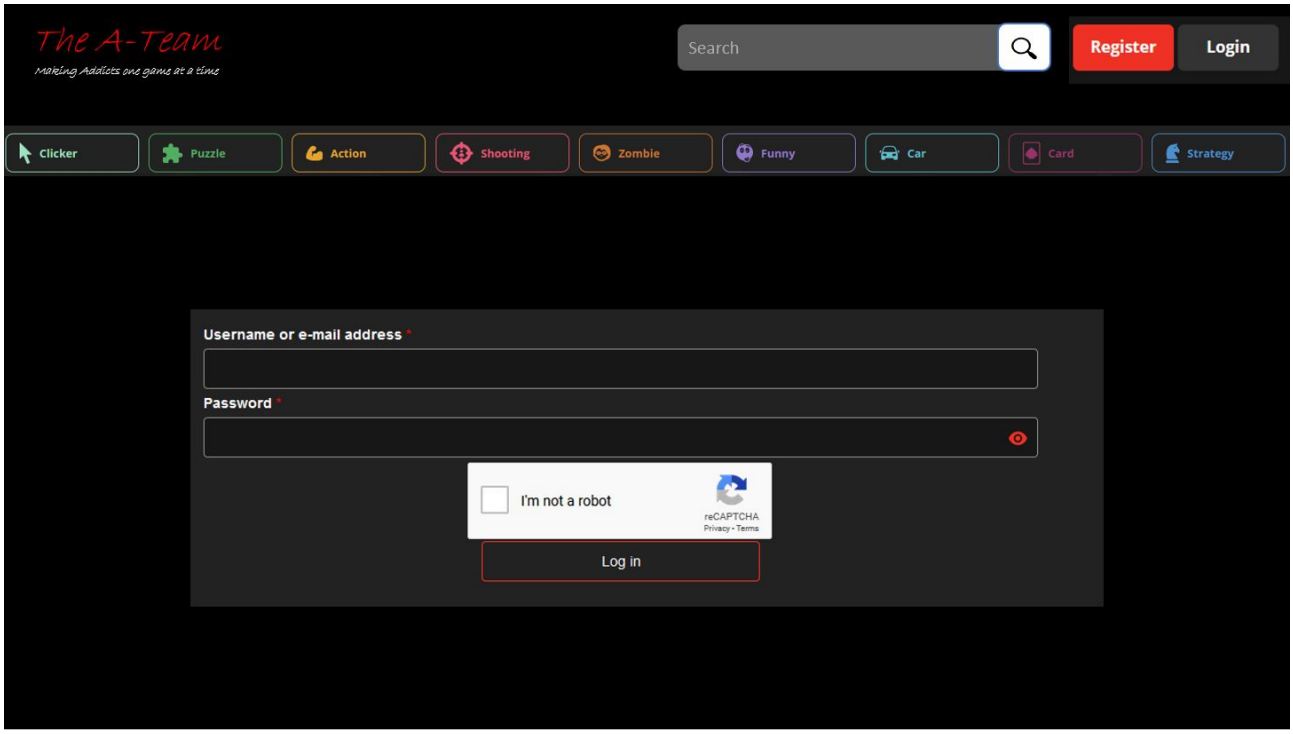
The images provided will depict the core functionalities that will be included for each interface. These images serve only as a prototype to help visualize how the game will look like. A brief description in each section is provided in regard to the subject being presented.

3.1.1. Website Landing Page



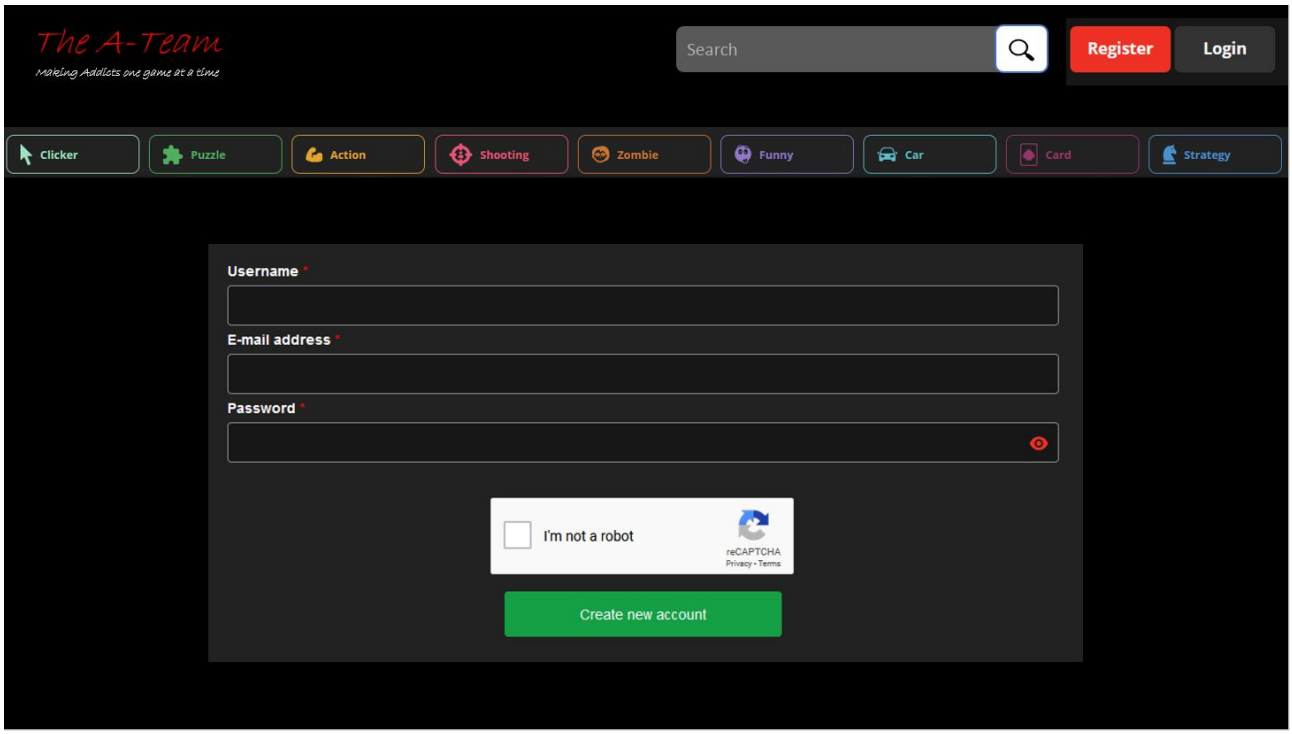
The Website Landing Page will be the entry point for the user to explore various game titles given there are other future works to be presented by The A-Team. Slither is given its own tile for users to select and initiate gameplay. The Website Landing Page provides the users the ability to navigate to Register or Login pages. Additional links which are currently inactive are provided as placeholders for future games. Search box provided to search game titles.

3.1.2. Website Login Page



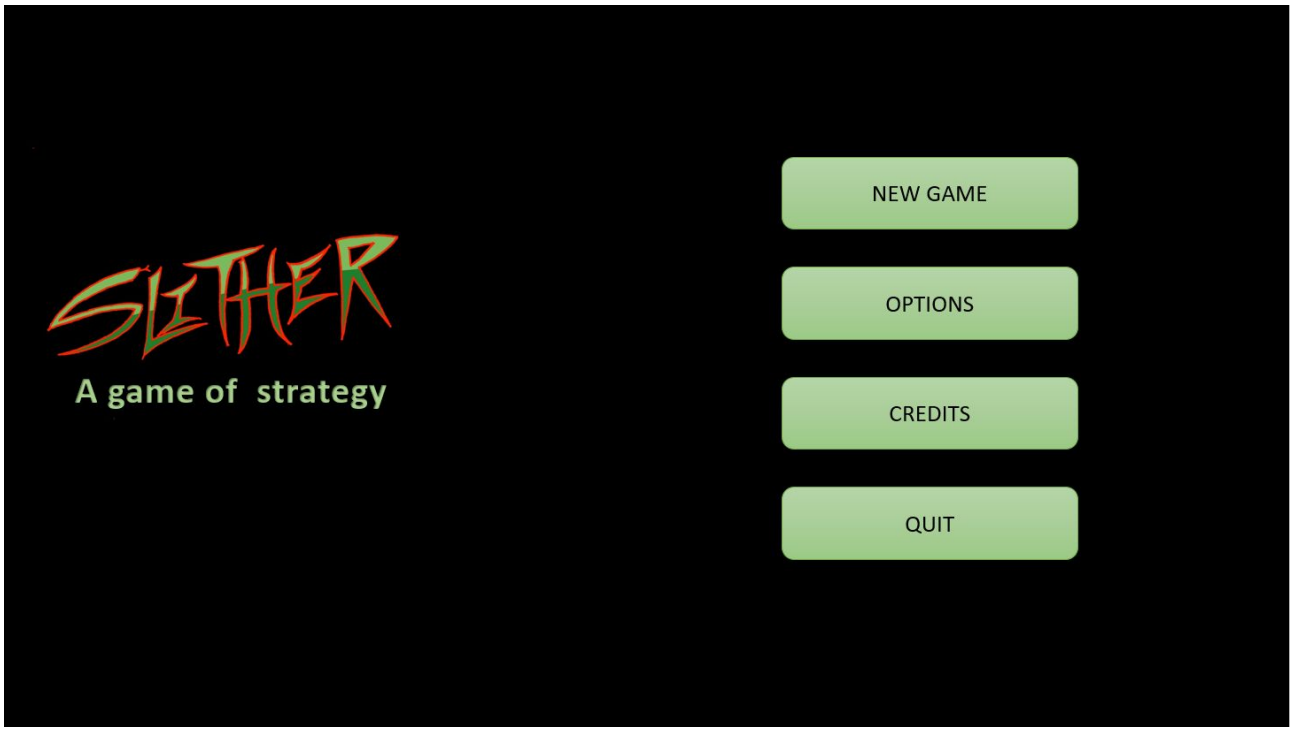
The Website Login Page provides the user the ability to input their email address or username then password to gain access to their profile. Logging in will allow user access to Leaderboard along with potential other statistics as game development evolves in future releases.

3.1.3. Website Register Page



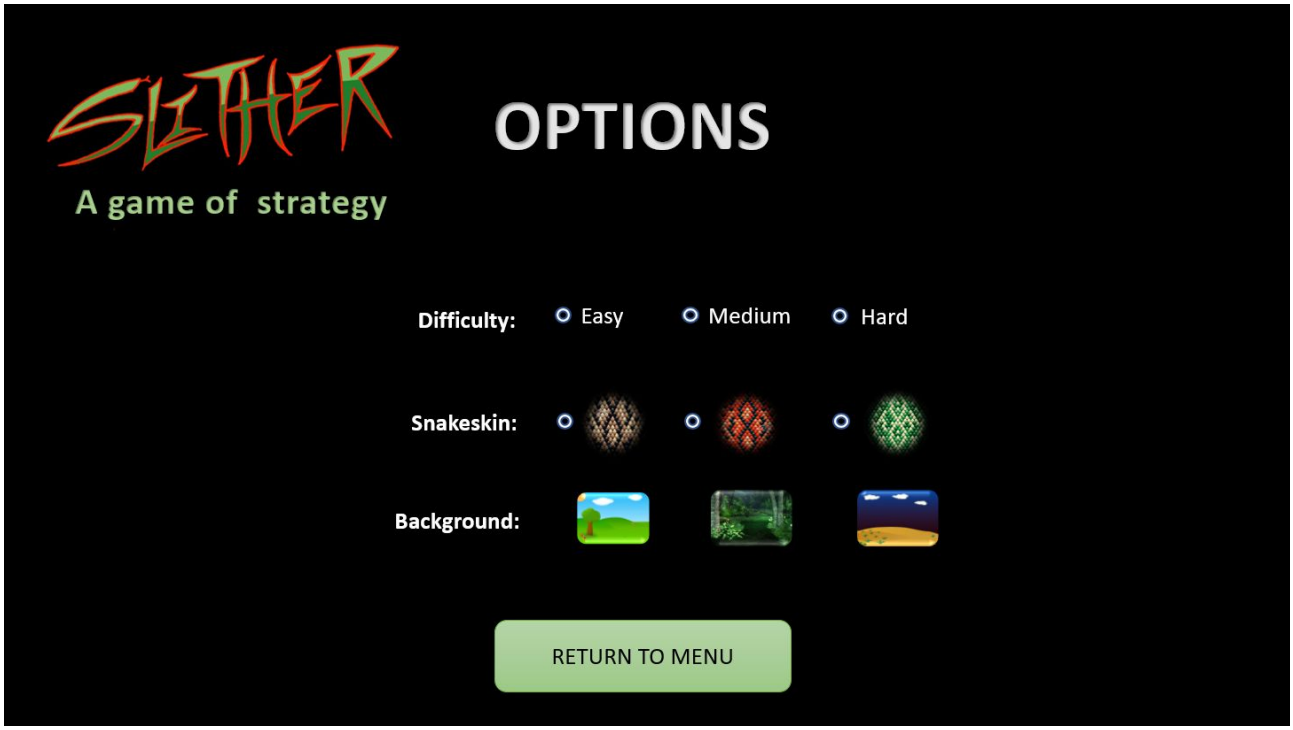
The Website Register Page gives users the ability to register as a user for retention of gameplay statistics. The user is prompted to enter a username, email address and password. The system will verify the user is not a robot through reCaptcha which ensures web traffic from only desired sources.

3.1.4. Game Menu



The Game Menu provides the user the ability to select “Options” to make customizations to the game before game play is initiated. Additionally, the user can navigate to “Credits” to view a list of developers who contributed to the creation of Slither. The user can click “Quit” and be returned to the Website Landing Page. The user can click “New Game” and game play will begin.

3.1.5. Game Options Menu



The Options Menu provides the user the ability to make selections to customize gameplay. Users are provided an option to change the level of difficulty, color of snakeskin and background.

3.1.6. Game Screen

The Game Screen is the container for the gameplay. The system will have defaults in place for gameplay but users can always use “Options” from the Game Menu to customize gameplay.

4. System Features

4.1. Game Menu Navigation

4.1.1. Description and Priority

Slither shall provide the user a graphical interface, Game Menu, with which to navigate to various aspects of the game. The user can mouse over the buttons to make a selection. The user can click a button and the system shall navigate to the selection. The system shall provide the user the ability to navigate back to Game Menu from any screen.

Priority: Essential

4.1.2. Pre-condition: The user has selected Slither from website homepage

4.1.3. Post-condition: The user is presented with Game Menu graphical interface

4.1.4. Stimulus/Response Sequences

1. The User selects Slither from the website homepage by clicking on its respective tile.
2. The System navigates to the Game Menu for Slither
3. The User is able to click on buttons to navigate to subsequent screens as desired within the game.

4.1.5. Functional Requirements

R1.1 Game Menu	Slither shall provide users with a graphical interface with which to navigate to new game, options, and credits screens.
R1.2 Quit	Slither shall provide the user the ability to quit the game from Game Menu.
R1.3 Credits	Slither shall provide the user the ability to view the credits.

4.2. Variable Difficulty (AI Opponent)

4.2.1. Description and Priority

The user may play a game of Slither against an AI opponent. The AI will have Easy, Medium, and Hard difficulty modes.

Priority: Essential

4.2.2. Pre-condition: The game is set at default difficulty level of Easy

4.2.3. Post-condition: The game is set at a difficulty level selected by the user for that instance of gameplay.

4.2.4. Stimulus/Response Sequences

1. The User selects Slither from the website homepage by clicking on its respective tile.
2. The user clicks on the menu options. The user selects options.
3. The user selects the difficulty option menu option and selects easy, medium or hard for the game mode they have selected.
4. Difficulties are as follows:
    a. Easy: The game will run like a classic game of snake. The player will have to navigate a confined space and collect food to increase their score. As they collect food, their body's length will increase, making it difficult for the player to navigate. The game will end once the snake dies by hitting a wall.
    b. Medium: The game will run with the above conditions but with the addition of randomly placed obstacles, variants on prey creatures, variants on static food items, and variants on enemy non-player characters. The AI of the NPC characters will be set to the lowest setting.
    c. Hard: The game will run like the above but with a higher quantity of said npcs and with their AI set to be more aggressive towards the player character. Additional food variants will be introduced as well, such as an insta-kill food item and a length shortening food item.
5. Following game will run at the level of difficulty selected by the user.

4.2.5. Functional Requirements

R2.1 Game mode : Default(Easy)	Slither shall provide a default difficulty that will be auto selected. It is devoid of all AI opponents and entities and shall consist of only the player character, static food, and a fixed arena.
R2.2 Variable-difficulty	Slither shall allow the user the ability to select a difficulty level for the AI.
R2.3 Medium difficulty	Slither shall provide the user with a medium difficulty mode that shall consist of a fixed arena that will be filled with a moderate amount (or spawn rate) of both friendly and enemy NPCs and obstacles.
R2.4 Hard difficulty	Slither shall provide the user with a hard difficulty mode that shall consist of a fixed arena filled with an amount of NPCs that is greater than the amount or rate used in the medium difficulty mode. Different variants of food will also be introduced. The difficulty of the NPC's AI will also be increased.

4.3. Variable Snakeskin Color

4.3.1. Description and Priority

While presenting the pregame options to a user, Slither shall present the user with the option to choose different predetermined skins for the player character. Skin colors will feature both primary colors and designs.

Priority: Minimal
4.3.2. Pre-condition: The user will start out with the default skin auto selected. Skin will be used on player character during game play.
4.3.3. Post-condition: The user will select the skin from a predefined set of skins for use on the player character during gameplay.
4.3.4. Stimulus/Response Sequences

1. The User selects Slither from the website homepage by clicking on its respective tile.
2. The user clicks on the menu option to begin a new game. The user is present with the pregame options.
3. The user will select from a menu the predetermined skin they would like to use.
4. Following game will run with the player selected skin on the player character.

4.3.5. Functional Requirements

R3.1 Default skin	Slither shall provide the player character with a default skin.
R3.2 Selected skin	Slither shall allow the user the ability to select a skin of their choosing from a set of provided skins. Skin is used on the player character during game play.

4.4. Variable Background Display

4.4.1. Description and Priority
Slither shall allow registered users to upload images for use as the background display of their game. Non-registered users will only be allowed to select a different background from a set of predefined background images/colors. Registered users shall only be allowed to submit one image for their own personal use while logged in and playing. Images will be associated with their account and be replaced via an upload of a different image by the user.

Priority: Minimal
4.4.2. Pre-condition: The user has selected to play the game with the default background.
4.4.3. Post-condition: The user will select to play the game with a custom background image.
4.4.4. Stimulus/Response Sequences

1. Non-registered user
    a. The user selects Slither from the website homepage by clicking on its respective tile.
    b. The user clicks on the menu option to begin a new game. The user is present with the pregame options.
    c. The user is presented only with the predetermined selection of background images. The user selects one of their choosing.

   d. Following game will run with the player selected background.
2. Registered user
   a. The user logs in or is logged in and selects Slither from the website homepage by clicking on its respective tile.
   b. The user clicks on the menu option to begin a new game. The user is present with the pregame options.
   c. The user is presented with the additional option of choosing their uploaded image. If no image is associated with their account, they will have the option to upload one.
   d. Following game will run with the player selected background.
3. Registered user attempts to upload unsupported file type
   a. User performs a-c of number 2 of 4.4.4.
   b. User attempts to upload an unsupported file type.
   c. System presents an error message stating the file type was invalid. User is prompted to try again.

4.4.5. Functional Requirements

R4.1 Default background image	Slither shall provide users with a default background for the snake game.
R4.2 Custom background image	Slither shall provide the user with the ability to change the background image.
R4.3 Uploading an background image	Slither shall allow registered users to upload an image of their choice to serve as the background for gameplay.
R4.4 System shares invalid file type error message	If an unsupported file type is uploaded, an error message will be served up to the user and they will be prompted to try again.

4.5. User Registration

4.5.1. Description and Priority

Users will be able to create an account that will provide a number of additional features for the user. A user with an account will have their best game score saved and added to a leaderboard, they will have the option to upload their own image for the background, and they'll be able to upload an avatar image.

Priority: Essential

4.5.2. Pre-condition: The user will be an anonymous user with limits to the functionality available to them.

4.5.3. Post-condition: The user will change user class becoming a registered user and will have access to other functions while logged in.

4.5.4. Stimulus/Response Sequences

1. User arrives at the site.

2. User selects the register button and fills out the form with the needed information to create an account. Information is as follows:
    a. Email
    b. User name
    c. Password and re-typed password
3. If the user enters an invalid email, they will be presented with an error message and be asked to try again.
4. User passes reCaptcha authentication.
5. User confirms their registration form.
6. User's new account is added to the system and a notification email is sent to the user's email.

4.5.5. Functional Requirements

R5.1 Anonymous User	Anonymous users will be able to use basic site functionality such as playing the level game mode without saves or extended customization.
R5.2 Registered Users	Registered users will be able to use extended site functionality such as playing the level game mode with saves or extended customization while logged in.

4.6. User Login

4.6.1. Description and Priority

Users with accounts will be able to log in one they visit the site.

Priority: Essential

4.6.2. Pre-condition: User enters the site as an anonymous user.

4.6.3. Post-condition: User is now treated as a registered user since they have logged into their account.

4.6.4. Stimulus/Response Sequences

1. User navigates to the site.
2. User selects the login option from the front page.
3. User is presented with the login form and is asked to enter the following information to log into their account:
    a. User name/email
    b. password
4. Three things may occur:
    a. User successfully logs in the correct information and has access to their account and the associated features.
    b. User has forgotten their password:
        i. Users may select an option on the form to change their password.
        ii. User email is used to send a code to change their password.
        iii. User then inputs the code into the page.
        iv. If the incorrect code is entered, the page will present an error message and allow the user to re-enter the code. Code is valid until the page expires.

v. If the correct code is entered, the user will be presented with a page to change their password.
vi. Once the password has been entered and submitted, the associated account will be updated and the user will be kicked back to the home page to log in again.

c. User enters an invalid email or username that does not have an account. The user will be presented with a new form prompting informing them of the error and providing a link to register.

4.6.5. Functional Requirements

R6.1 Anonymous User	The website shall provide the anonymous users with access to the basic features.
R6.2 User logs into their account	The website shall provide the user the ability to log in and access an existing account, there by accessing extra functionality of the site.
R6.3 Registered users will have the ability to change password	The website shall provide the user the ability to reset their password if their account exists.
R6.4 Unrecognized emails or usernames shall be rejected	The website shall prompt users to re-enter their username or email if no account is found to be associated with the entered username or email.

4.7. User Searches for game

4.7.1. Description and Priority

Users will be able to search for a game they would like to play on the site. Other than Slither, the other titles shall be placeholders.

Priority: Minimal

4.7.2. Pre-condition: User enters the site.

4.7.3. Post-condition: User has selected the game they would like to play via search.

4.7.4. Stimulus/Response Sequences

1. User navigates to the site.
2. User selects the search box.
3. User searches for the game they would like to play.
4. Site attempts to guess what game they would like to play as they enter their search query
5. Site returns the game they have searched for or returns a “none found” message.

4.7.5. Functional Requirements

R7.1	The website shall provide any user the ability to search for what game they would like to play.

5. Non-Functional Requirements

5.1. Performance

The game should run at a smooth and steady frame per second during all game modes and variants. Menu pages should transition without a delay greater than 1 second. Creating an account should not create any lag greater than 1 second and the results should be viable after the user logs in.

5.2. Security Requirements

Website will implement reCaptcha to authenticate users. Users will be required to login with email address or user name and password. Website will use encryption methods to secure passwords. The Website will require strong password creation from users per NIST guidelines.

5.3. Software Quality Attributes

5.3.1. Reliability/Robustness

The application while in game should not have a response time of any longer than 1 second. The user should be able to navigate throughout the website and play the game and create an account while connected to the internet.

5.3.2. Maintainability

New game modes should be added without significant changes to the website itself. The database should be maintained and have modules installed to handle possible data overflow of player data.

5.3.3. Usability

The website in its entirety should be accessible to a general abled audience. The reading level of the text should be at a fifth grade level. A new game should be able to be initiated in no longer than a minute.

5.3.4. In-Program Help

The application will provide some means for the play to check how to play the game (button or link to controls). Additionally, the website will provide instruction on how to carry out the extra non-game related functions of the website.

6. Design/Implementation Constraints

6.1. Standards of Compliance

The website will require strong password creation from users per NIST guidelines.

6.2. Development Constraints

Due to the program being coded in python, there might be a problem with having it running on a website since most are javascript based. But it is a problem that can be overcome to have the game running online. The game should be able to save data about scores therefore it needs to be attached to a MongoDB database. The user must have access to an internet connection via a service provider to initiate gameplay in the web browser.

7. Appendix I - Sprites

7.1 Mobs

Mongoose - actively hunt the snake.

Big Bird - Appears on the grid as a shadow and if the player comes across it would swoop down at the snake.

Bomb Turtle - Angry turtle that is also a bomb, moves slow, and destroys obstacles.

7.2. Prey

Bird - When in flight can't be eaten. Lands and rest for a period of time before taking flight again.

Mouse - Moves randomly and fast.

Cow - Slow moving.

Ruby - Static prey that does not move, the most common kind of prey in the game.

7.3 Obstacles