*Snake Hunt: A Competitive Multiplayer Game in Python*

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GitHub Repository Link: <https://github.com/cis3296f22/01-snakehunt>

GitHub Project Board Link: <https://github.com/orgs/cis3296f22/projects/97/views/1>

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## Project Abstract

*A picture containing light

Description automatically generated This document proposes a fun new competitive multiplayer 2D game called Snake Hunt, inspired by the multiplayer web game Agar.io and the classic snake game. Users can log into an online server where they can play against other users. Each user takes the form of a snake. The user’s goal is to consume food pellets and other snakes in order to grow in length. Once consumed by another snake, the user dies and their score (length of their snake) is added to a leaderboard.*

*Sample mockup of what gameplay might look like to the user.*

## Conceptual Design

*A player starts the game as a client connecting to the game server. The player begins the game by entering a temporary username (to be used for the leaderboard and for player identification). Upon entering the game, they are assigned a randomly colored snake. Once the player begins moving, they cannot stop moving. The player’s snake is always positioned at the center of the screen (POV perspective) and the background  changes as the player moves around using the up, down, left and right arrow keys.*

*The player begins with a snake that is 1x1 pixel in size and is safe from being consumed (a grace period) until having grown at least to a size of 1x2. To add length to their snake, they must consume food pellets or the remains of other players. The snake turns the same color as the pellet or snake it consumes. With each loop of the game, it is checked whether the player’s snake’s head is touching a food pellet in which case, the snake feeds on the pellet. As a snake grows, every 10th body segment will be labeled as a weak-point.  If a second snake eats the weak point of the first snake, the first snake loses all body segments between the weak point and the tail piece, and the body segment just above the weak point becomes the first snake’s new tail piece. The remains of the removed portion of the first snake are now pellets that can be eaten by any snake on the field.  If the second snake collides with any part of the first snake that isn’t a weak point, it loses for the round and the player is ejected from the game. If both snakes run into each other head on, they both lose for the round and the players are ejected from the game. In both cases, the snakes turn into pellets. When a snake dies, its score (length) is added to a leaderboard which is displayed to the user. The option to play again appears in the form of a clickable button*

*The hardware requirement to play this game is any computer with a working keyboard, screen and mouse. Speakers for audio functionality is preferred but not required.*

*To build the Snake Hunt Multiplayer Game project, my teammates will need a working computer and GitHub account. The necessary programming language (Python) and libraries are compatible with Windows XP or newer, Linux/UNIX, and macOS. To work on this project, teammates will need to* [*download Python*](https://www.python.org/downloads/) *(preferably version 3.7 or newer) and* [*install Pygame*](https://www.pygame.org/wiki/GettingStarted)*.*

*To create simple graphics for the game, I will use the* [*Pygame*](https://www.pygame.org/docs/) *library. According to the creators, Pygame is a “free and open-source cross-platform library for the development of multimedia applications like video games using Python. It uses the* [*Simple DirectMedia Layer library*](https://www.libsdl.org/) *and several other popular libraries to abstract the most common functions”.*

*Snake Hunt will be a multiplayer game. Eventually, the goal for a complete and finished project will be hosting the game a webserver for anyone to connect, but this is outside the scope of the project for this class. Until then, the game will run on a local network, meaning no one outside the network will be able to connect. To do this, I will create a server to which multiple clients can connect. One computer will need to run the server code and any client will need to connect to the appropriate IP address and port. To implement this, I will be using Python’s* [*socket module*](https://docs.python.org/3/library/socket.html)*, which provides an interface to the* [*Berkeley sockets API*](https://en.wikipedia.org/wiki/Berkeley_sockets)*. Please reference the Proof of Concept section for an explanation of how this will work with some example code.*

*Some other built-in Python modules to be used are random, time, and math.*

## Proof of Concept

*The public git repository provides a proof of concept. To create the code for these files, we referenced Python’s* [*socket module*](https://docs.python.org/3/library/socket.html) *documentation and* *a YouTube tutorial by the channel* [*Tech With Tim*](https://www.youtube.com/watch?v=F257x_E6H4k)*. Running this code provides a proof of concept for how Python, Pygame, and sockets will all be able to work together in the creation of a more complicated multiplayer game. Executables have been created for both Windows and Mac operating systems. Running it demonstrates a simple version of a single-player snake game. It demonstrates simple game logic and classes that will be built upon. Please see the readme file for further information on requirements on how to run the code.*

## Background

*A simpler version of the original* [*Agar.io game*](https://agar.io/#ffa) *was remade* [*on GitHub*](https://github.com/Viliami/agario/blob/master/agar.py)*. Some of this code can be referenced or reused, especially the way in which the classes are laid out. Many tutorials and versions of the* [*snake game*](https://www.edureka.co/blog/snake-game-with-pygame/) *exist online in Python using Pygame and will be referenced for game logic. This game will be very similar to Agar.io in that it is multiplayer and competitive and consists of players trying to eat one another. It will be different because it will use snakes that grow in length instead of circles that grow in diameter. Also, whenever the player’s snake consumes a food pellet or other snake, it will turn the color of the object consumed.*

## Required Resources

*Necessary background information includes Python and Pygame as well as resources and information on using Python’s socket library to allow clients to connect to a server. I anticipate race conditions coming up and so we will need to learn more about this as well.*

*It is also worth discussing here the relevance of this project to the Software Design class. In class, we have discussed multiple topics such as teamwork, version control, testing, and UML diagrams. This project is linked to the educational goals of this class in many ways. It will result in students gaining experience with working in small teams to build a larger project composed of many parts. We will be using Git as version control, so students will become proficient in managing and keep track of modifications to the code using GitHub branching, merging and commit history. It will also give students practice in testing since many tests are going to need to be documented to ensure the code is working in all cases, and TDD may be used for this. Lastly, UML diagrams are a way for students to communicate ideas and the way that all the project pieces will work together, and so we will gain practice in constructing UML class and sequence diagrams.*

## Vision Statement

*For casual and serious gamers who love to play retro games updated to modern standards, Snake Hunt is a game based on the classic Snake-genre that allows multiple players to play against each other online. Unlike other games in the Snake-genre, Snake Hunt is free-to-play and open-source, allowing anyone with an internet connection to start playing and adding modifications as they see fit.*

## Personas

***Persona 1:***

*Clayton is a 19 year old college student from Swampscott Massachusetts. He currently goes to Arcadia University and is on their League of Legends and Hearthstone teams. He is a competitive gamer who tries his absolute best to win against other players with his high end pc. The Snake Hunt game is perfect for Clayton because he can strive to be at the top of the global leaderboards by defeating all other opponents.*

***Persona 2:***

*Thomas is 52 years old and has just been gifted a computer by his son-in-law, Jim, who has shown Thomas how to play a new game called Snake Hunt. Nostalgic for the snake game he grew up with, he enjoys the new multiplayer version which still gives a nod to the retro feel and that he can play with his son-in-law. Thomas looks forward to playing with his future grandchildren one day.*

***Persona 3:***

*Rachel is a 15 year old who usually plays single-player games. She has tried out a few multiplayer games but most of them were too competitive and difficult for her taste. She is looking for a multiplayer game that has minimal competition. Snake Hunt is perfect for that, because she can choose to play passively by avoiding other snakes and looking around for pellets.*

***Persona 4:***

*Jimmy is a 12 year old from Seattle Washington who is just getting into video games. He plays on a fairly out of date laptop that his mom used to have. He has found a new online multiplayer computer game from his new friends at school. When he needs a break from homework, he can relax by playing this easy-to-learn, beginner-friendly game.*

## Initial User Features

* *Change Background*
* *Leaderboard*
* *Multiplayer*
* *Naming*
* *Pellet Consumption*
* *Shed Skin*