CSCI3100 Project: Pac-Man

High-Level Design Document

Group A8

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1 Introduction

1.1 Project Overview

In this project, we will create our own version of Pac-Man, one of the most classic games, which is a maze action chase video game developed by Namco and first released in 1980. Our game will keep the core design of original Pac-Man while adding more advanced functions to enhance players' experience and bring more fun.

In this game, players will control the Pac-Man to go through different mazes level by level. At each maze, Pac-Man tries to eat all of the dots placed in the the maze while several ghosts move around and pursue him. If all the dots are eaten, Pac-Man advances to the next level. If he is caught by a ghost, he will lose a life, given that Pac-Man has limited number of lives. Overall there will be the "high score" and "highest level reached" data to record and evaluate players' performances.

Our project will stand out as an advanced version by several additional functions. For the game content, there will be richer items like power pellets to collect, more environment elements like teleport tunnel to interact, and several fun modes like rouge-like mode to try. Beyond it, we will provide the user management system to keep each player's records. The user can sign up and log in to check his/her highest score and achievements at any time and any supported platforms.

Hopefully, our game can make players relax from the busy life and introduce the classic game back to public.

1.2 System Features

Our design mainly needs the following four features to achieve expectations:

Simple and understandable interface.

An important goal is to make it easy for users to understand how to play the game. For this reason, the interface in the game should be elaborately designed. Players can find interactive buttons with reasonable positions on the interface. For example, in the initial interface on title screen, this may include vertically placed buttons for playing games, setting, scoring boards, and help.

Reasonable difficulty level setting.

Players will be able to choose between several game difficulty levels. The lowest level of difficulty should ensure that every player can play and complete easily. The higher level of difficulty will be challenging, which provides space for players who want to prove themselves.

Interesting game content.

First, we will retain the classic Pac-Man game content. On top of this, some new elements will be added to the design to expand the game experience. This includes a variety of items that can be used by game characters, diversified style maze design, and special game modes for attack and defense conversion and other fun game designs. These new game contents will play an important role in attracting players.

Reliable account system.

Players can create their own account in the game. These accounts will be used to store player's game data in the remote global database.

2   System Architecture

2.1   Technologies

The game will be mainly designed using python language, and the main framework of the game comes from the Pygame package. In the game, we will design two types of ghosts using real-time search algorithms and deep learning algorithms respectively, so as to make the game levels and enemy designs more varied and more interesting. This also means we will refer to the Pytorch framework to train the model based on reinforcement learning. This is a framework transplant and improvement based on a related program from UC Buckley. (http://ai.berkeley.edu/project_overview.html)

For the selection of the database, we mainly consider the cost, including economic cost and machine cost. Therefore, we chose the lightweight open-source free database Mysql (Community Edition), which is easy to use and more friendly to developers and subsequent maintenance.

At the early period, we will mainly rely on the pygame package to design the user interface. After the main body of the game is built, our team will optimize the UI and illustrations; and select appropriate music to improve the player's game experience. Eventually, of course, we also conduct a copyright check on all material. At this stage, we will mainly use Pixso for refining design and multi-person collaboration; we will keep data private to protect our data security.
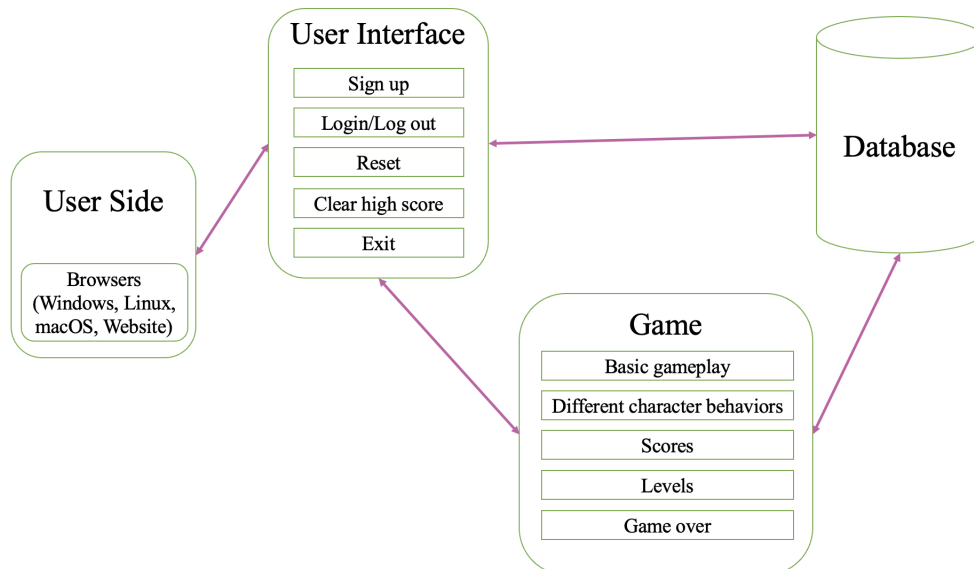
Finally, we use Git for version control.

Programming Language: Python, Pygame package, Pytorch package

Database: MySQL

UI: Pygame package, Pixso

CM: Git

2.2   Architecture Diagram

2.3   System Components

2.3.1   Basic Technologies

In our software, we plan to use Python as our primary programming language, MySQL for our database and some UI and CM technique to improve the software.

2.3.2   User account management

Users can sign up and login their own account. Users' game data and records will be reserved. Thus users can check their highest score, highest level reached, and achievements at any time. When user exits game, his account will be logged out automatically.

2.3.3   User view and game process

In the User Interface, users can sign up and login first. After that, users can reset the high score or restart playing the game from the easiest level. And for the game part, there are a number of levels pacman game to play and users can play the basic gameplay at the beginning. After one level is completed, users will go to the next level, and the difficulty of game will increase. When all lives have been lost, the game will restart from the easiest level.

2.3.4   Storage of game data

At the same time, our application will store the user data such as user account and their highest score.