The American University in Cairo
Computer Science and Engineering Department

Fundamentals of Computing II
Spring 2020
CSCE110101/02

Pacman Project

1. Introduction

It is required to Implement a graph-based Pacman, learn more **here** and play it **here**, where the player explores Pac-Man through a maze. This maze is loaded up with Pac-Dots (pellets) and incorporates four wandering multi-hued ghosts: Blinky, Pinky, Inky, and Clyde.

The goal of the game is for Pacman to collect all of the pellets (dots) in the maze. Once the player has collected all of the pellets, the player has won.

There are 4 ghosts that will make it difficult for the player to collect all of the pellets. They will chase the player in various ways and if the player comes into contact with any of the ghosts, the player will die (lose a life) . When the player loses all of his lives, the game is over.

There are 4 power pellets and if the player eats any of these power pellets, then the player can eat the ghosts. When the ghosts get eaten they will respawn in their original location.

There are also fruits that periodically appear in the maze for Pacman. If Pacman eats them, he collects additional points [***Bonus***].

2. Game Specifications

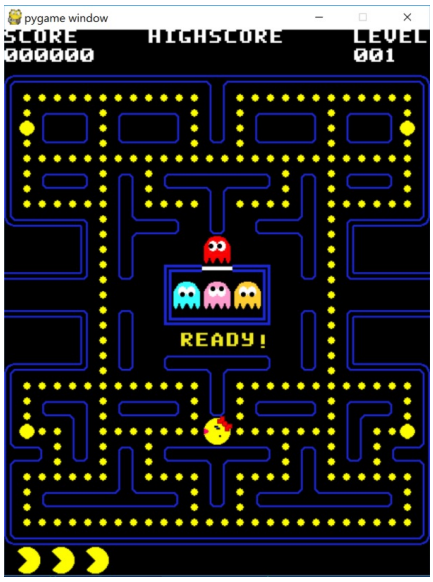
Initial State:

- The player starts with three lives, yet the player will get one additional life reward subsequent to acquiring 10,000 points.

- The game starts off in a paused state. The words "Ready" appear just below the ghost home. When the user is ready to start the game he presses the spacebar.

- The four ghosts start in and/or around the ghost home which is always located in the middle of the maze. Only three of the ghosts appear inside the ghost home since that's all the home can fit.

- Blinky starts directly above the ghost home. Inside the ghost home the ghosts are from left to right Inky, Pinky, and Clyde.



- When the game starts Blinky will automatically move towards the left. Pinky will immediately leave the home by moving up and then continue to the left. Inky and Clyde remain inside the home until some other conditions are met * allowing them to leave. In the meantime, they just bounce up and down. The initial direction for both Inky and Clyde is down.

- Close to the edges of the maze are four power pellets that permit Pac-Man to eat the ghosts and gain extra points.

  * *Inky must stay inside of the ghost home until Pacman has eaten a certain number of pellets or a certain amount of time of your choosing has passed.*

  Clyde starts to the right of Pinky inside of the ghost home. He's also not allowed to leave right away. He can't leave until after Inky has already left with a specified period of time of your choosing.

Pellets:

There are two types of pellets: regular pellets and power pellets.

- **Regular pellets** are smaller and the exact number of them will depend on the maze. The original Pacman maze has 240 of these pellets.

- **Power pellets** are larger, and each maze will only have four of these pellets usually placed in the four corners of each maze. When Pacman eats a power pellet, the ghosts enter a mode called *Freight mode* and are vulnerable to be eaten by Pacman. They turn dark blue, move towards their home instead. When Pacman comes into contact with a ghost who is in Freight mode, Pacman receives points for eating the ghost. This mode lasts for a short period of time of your choosing and then the game should turn to its original mode.

Notes:

- Pacman is controlled by the four arrows to move around the screen.

- The maze has portals so that the player can portal from one side of the screen to the other side of the screen. The ghosts are also able to use these portals. They are placed at opposite sides of the screen.

- Pacman moves to eat all pellets avoiding the ghosts. When Pacman has eaten all of the pellets including the four power pellets, the player has won.

- If Pacman gets eaten by a ghost, a life is lost. When the 3 lives are lost, the player has lost the game.

- The **game ends** if the user eats all pellets or if the 3 lives are lost.

- You can choose the scores you'd like for the game, here is an example:

  A score for eating a regular pellet is 10, a power pellet is 50. A score of 200 is scored for eating one ghost, 400 for eating a subsequent ghost, 800 for a third, and 1600 for the fourth.

- Make sure that your maze is **graph based** meaning that the player explores nodes and so do the ghosts.

- Use the ***pathfinding techniques*** that you will learn this semester to help the ghosts find the way to the player ie. The ghosts are not randomly moving.

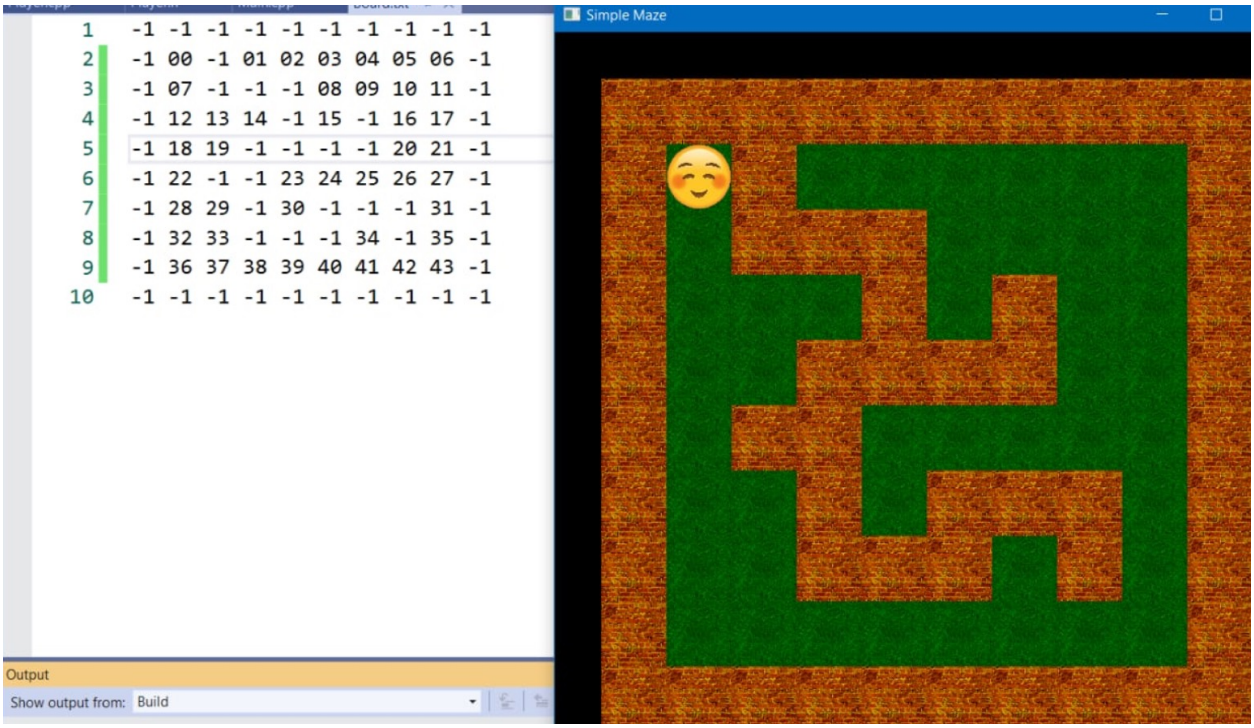
Mapping:

To create the maze, it should be represented in a text file. When the game starts, it should parse the corresponding text file to the map.
Design your own format that would satisfy the requirements described in this document.

1. A ghost home
2. The 2 portals.
3. Maze Bricks
4. Pathways for the player and the ghosts to move through, that would contain pellets as well.

Here is an example for how you can use text to generate a simple maze (that will be turned into a graph). Here, -1 represents bricks and numbers are given to the

points (rectangles) that are considered the pathways.



3. Project Statement

Build up a 2D game that satisfies the given description. Your game ought to comprise of the accompanying:

- One player. (the Pacman)
- Multiple enemies. (four ghosts)
- Pickups (regular and power pellets and may increase points, lives, etc)

4. Requirements

- **Initial Project Design Documentation : April 1st 2020**

You are required to submit a first draft document to set the basis of the project. In this document, you need to include the following:

1. Names of members
2. List of classes and the functions of each class.
3. General UML design of the game.

- **Milestone 1: April 12th 2020**

- Design the main structure of the game (the classes) of all the objects needed.

- **Milestone 2: April 26th 2020**

- Moving objects (pacman and ghosts), AI of the ghosts (pathfinding) is not required in this milestone.
- Win or lose output

- **Milestone 3: May 10 2020**

  You are required to submit the full project composed of the following:
  - A running C++ code that delivers all the required functionalities, with the AI of the ghosts added (moving according to the pathfinding algorithm).
  - The final packaged version of your game for the end user.
  - Group Demo and presentation.
  - Final report describing the application (structure is to be shared later). The report should be divided as common part like UML, test cases and specific documentation for each member of the group.

After third milestone, each student will be examined in his part individually and assigned a grade based on his/her contribution.

5. Guidelines

- You should work with your approved group on this project.
- Your code should be modular and object oriented.
- Please make your code readable.
- Add comments to your code and choose short and descriptive variable and function names.
- Kindly note that any detection of copyright violation, plagiarism or cheating will result in the cancellation of the project to the whole group and a F is earned in the total course grade.

- **Though the project is a group project, each student will be questioned and examined "individually" in his/her own part. There are common parts like UML and they will be part of the individual examination.**

- **There should be an equal distribution of the overall work in the application. All group members should collaborate in every module of the code (front end/ back end/ class designs and relations).**

6. Bonus

Suggested extra features for Bonus grades:

- Different difficulty levels.
- Any extra enemy intelligence.
- Animation in enemy movement.
- Different themes across different levels.
- There could be more pickups that increase lives, scores or both.
- You can have a separate file for each player that includes some log details: name, the high score, number of matches won and lost, etc.
- Music and sound effects.
- Be creative :)

7. Assuring Points

- All TAs are available to help you during your project at any phase. Nevertheless, they should respond to your concerns and not write the code for you.

- Groups will be allocated to TAs, to assure availability.

Best of luck