# MMI513 Term Project Report – Pacman Game Enhancements

## Introduction

## Enhancements

### Maze Generation

### Strategy-AI

This part aims to regulate the strategy of the game in a way to increases the winning probability of the player. In this regard, the primary objective of the Strategy AI is to strategically position and spawn ghosts on the game board, aiming to maximize the challenge for the player (Pac-Man) and increase the game's difficulty over time. The details on design and enhancement are given below:

#### Strategic Spawn Positioning:

The AI should determine the spawn positions of the ghost based on the pattern of the maze and the player's starting position. To realize this task **Breadth First Search (BFS) Algorithm** was used to scan each unit of the maze. BFS adds the starting node to the queue and searches all the nodes by marking nodes as “Visited” and “Not Visited”. In this regard, the algorithm is designed as below:

* All the nodes are searched and the node is taken into consideration if the node is available (not wall, route).
* According to the direction of the node regarding the starting point, distance is increased by the node base. The position and the distance to Pac-Man are set to the list.
* The limit distance was set as 10, and the available nodes that are not close to 10 were added to the “Candidate Spawn Locations”.
* According to the output of the BFS algorithm, the candidate spawn location for each ghost is selected randomly.

#### New Ghost Generation:

The AI similarly works as Strategic Spawn Positioning. The only difference in spawn positioning is the location of the Pac-Man. The candidate spawn locations are regenerated by basing the current position of the Pac-Man, and the algorithm is revised as below:

* The timer is set from the starting time, and if the difference is bigger or equal to 60 seconds, the new ghost is generated.
* The current location of the Pac-Man and the generated maze is set and the BFS Algorithm is generated to obtain candidate spawn locations.
* The candidate spawn location is selected randomly from the list.
* The total number of ghosts is set in the code, and ghosts with different colors are selected respectively from the available colors.

#### Enhancement of the Strategy of AI Generation

In the base code, there was no ability in terms of strategy since the placement of ghosts for the generated maze was not available. Thus, the enhancement stands as defined below:

* The placement for spawn locations of the ghosts is generated for generic locations of the players and mazes.
* Difficulty level can be arranged strategically by setting ghost spawn distance.
* A new ghost generation structure was created.
* Ghost generation time limit can be determined and color variety is provided.

### Tactical-AI:

### Log Analytics

## Conclusion