Term Paper Proposal : AI in Pac-Man Ghosts

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Abstract

This document tries to give a brief intro for our term paper which demonstrates a few ideas for controlling the ghosts in the Pac-man game. Depending on the position of the Pac-man, the ghosts will take various decisions and try to stop Pac-man before all the pellets are eaten.

1 Introduction

Pac-man is a maze arcade game released in 1980. The maze contains a number of pellets which have to be fully eaten by the Pac-man (controlled by the player) to win. However, its movement is obstructed by a few impervious walls and four ghosts. The key task of the player is to eat all pellets while preventing itself from being eaten by four ghosts. Another dimension to this gameplay is the presence of special pellets called the power pellets. When the Pac-man eats them, the ghosts enter in frightened mode and recede away from the player. In this mode, Pac-man can eat the ghosts and earn points.
All four ghosts have unique personalities. One ghost directly chases the Pac-man, while the other two try to position themselves in front of the player. The last ghost switches between chasing and fleeing from the Pac-man.

2 Methodology

In this game, the ghosts will take decision to choose their respective routes depending on some search algorithms. There will be multiple difficulty levels in this game. In the most basic level of the game, the ghosts will try to eat the Pac-man using rudimentary search algorithms to reach the Pac-man's position. As the difficulty increases, the algorithms become advanced and the ghosts will co-ordinate with each other and try to trap the Pac-man figure.

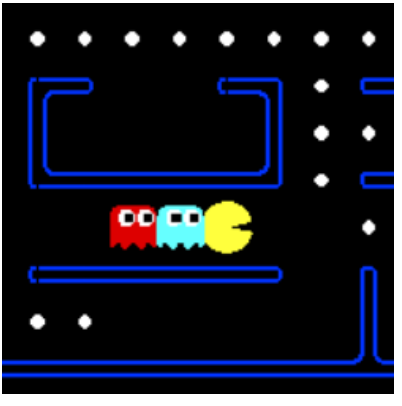
2.1 Rudimentary

In this mode, the ghosts will use A* search to reach the Pac-man. In this case, the ghosts are completely independent of each other and try to attack Pac-man without any co-ordination. However, all of them have a different goal/aim, else they will collapse to a single point. Eg:

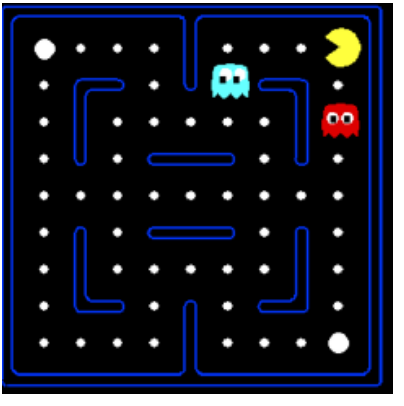
one of the ghost will try to reach the exact position of the Pac-man, whereas another one will try to reach one step ahead of the Pac-man figure. We plan to vary different parameters such as distance calculation (Manhattan, Euclidean, Chebyshev etc.) in the algorithm, type of algorithm, etc. and compare the results in each scenario.

2.2 Advanced

In this mode, the ghosts will work in pairs of 2, and plan a coordinated attack on Pac-man. The flaw in rudimentary approach was that, the Pac-man can trick the ghosts to take a particular route and can escape from the other end of the hall-way. But in the advanced mode, the ghosts can try to approach the Pac-man from both sides of the hallway, hence leaving it with no route to flee. However, in this case also, the Pac-man can escape if there is a T-point. In a much more complex mode, all four can coordinate the attack and can easily beat the player, making it unplayable.



(a) can escape



(b) is trapped

3 References

1. https://en.wikipedia.org/wiki/Pac-Man
2. https://www.youtube.com/watch?v=l7-SHTktjJc