

# PACMAN VS. GHOSTS – Report

## Assignment 1

### **Traditional Ghost AI**

Following are the details on how I implemented each of the 3 different modes.

Scatter mode:

Scatter mode is triggered when a Global Reversal occurs in the game. At the time a variable timer is initialized to 210 game ticks (which is about 7seconds). When in scatter mode, each of the ghosts ignores Pacman and each head to their corresponding corners of the maze. Blinky to the top-right, Pinky to the top-left, Sue to the bottom-left and Inky to the bottom-right. The timer decreases with each game tick and eventually after reaching 0, the ghosts exit Scatter mode and enter Chase mode.

The game initializes with Scatter mode. If during a scatter mode a reversal occurs, the timer is again reset to the 270 ticks.

Chase mode:

The game enters chase mode whenever the timer value is 0. During chase mode, each of the ghosts performs actions based on their traditional personalities.

Frightened mode:

The way frightened mode is implemented, is to do a check at the end and check for each ghost if it is edible. If it is edible I feed a random move to the ghost and overwrite whatever previous move value that might have been in the Enum.

### **Limitations faced:**

The limitations faced were mainly causes of the framework. The framework's global Reversal interfered with the way I planned on programming Scatter mode. As a result I decided to trigger Scatter mode whenever a global-reversal occurred and have it last for 270game ticks since a reversal.

Another limitation was that the walls did not have a NodeIndex associated with them. As a result behaviors for Pinky and Inky required conversion back and forth from the coordinate system to nodes and vice versa.

## **Custom Ghost AI**

I'd like to call my custom AI, Goldfish Guard Ghosts (G3?).

Goldfish because each of the Ghosts remember Pacman's last-seen location only for about 2 to 3 seconds before they give up the pursuit.

Guard because each of the Ghosts exhibit behaviors of security guards. They are always in one of two modes, PATROL or CHASE. They start of in PATROL mode and when in this mode each of the ghosts patrol around the power pills and survey that area. As soon as Pacman appears in their line of sight (including left and right) they notify all the other ghosts of Pacman's location and start CHASE mode where they being pursuing him. Every ghost is notified of Pacman's position he was last seen at for 2 to 3 seconds even after he leaves their line of sight. If they lose sight of Pacman for more than 3 seconds, they resume their PATROL mode.

To implement these behaviors, I implemented a combination of an FSM and Decision trees.

The FSM had 2 major states which were CHASE and PATROL. Each of these states then had 3 actions available to them, 'checkPacmanInSight()', 'transitionState()' and 'getTarget()'.

Inside these methods I implemented decision trees so as to decide which states to transition to or what moves to make.

### **Limitations faced:**

After several playtests I realized it would be nice to have additional sprites to indicate which modes the Ghosts were in. Maybe a thought bubble to indicate when they are out of CHASE mode or a flashing red light to indicate Pacman was seen and that a pursuit is in progress.

A quirk of the AI I noticed was, in level 3 there are very few routes with long paths and most of the map has only around 5-6 pill-length-alleys. As a result Pacman can easily navigate without coming into sight since there are several hiding places. However because of the maze layout, it turns out that the patrol radii of the ghosts are also increased.

## **Play testing Report:**

I had several friends of mine play both the versions of the game. For the custom AI, I improved parts of the game after their feedback. Below I go over these interesting points.

In the first iteration of my custom AI, the ghosts had no 'memory' and as soon as they lost sight of Pacman the ghosts would resume to their PATROL modes and end the pursuit.

As a result, initially players found the traditional AI a lot more challenging than the custom AI. Consequently they also enjoyed it a lot more.

After adding the 3 second 'memory' to the ghosts, the players complained that the custom AI was now a lot harder as compared to the traditional AI. They complained about all the ghosts constantly hounding the Pacman whereas in the traditional AI, some of the ghosts appeared to be doing their own thing.

However, I manufactured a story line as follows for the custom AI as follows:

*"Pacman is now being hounded by the ghosts of Goldfish security Guards with walkie-talkies. As a result, they each have their own region of surveillance which they constantly patrol. However as soon as one of them gets sight of Pacman, they notify all the others of Pacman's last seen whereabouts and they all head towards the target. However, being the ghosts of goldfishes, they have memories of only a few (2-3 seconds) and once they've lost sight of Pacman for more than 3 seconds they forget all about him and get back to guarding their precious power-pills."*

After presenting the play-testers with this information, players had a LOT of fun playing the custom AI. This was because they now had to watch out for ghosts at all times would come out of their hiding place to eat as many pills as possible before heading back to hide from the ghosts' sight. An element of "stealth" was introduced into the game and this greatly increased the level of engagement.

The added surprise element of Global-Reversals increased the tension at times and provided for a fun experience.

## **Research References:**

- <http://pacman.shaunew.com/play/index.htm#learn>
- [http://home.comcast.net/~jpittman2/pacman/pacmandossier.html#CH2\\_Scatter\\_Chase\\_Repeat](http://home.comcast.net/~jpittman2/pacman/pacmandossier.html#CH2_Scatter_Chase_Repeat)
- <http://gameinternals.com/post/2072558330/understanding-pac-man-ghost-behavior>