

Pac – Man A.I.

1.0 About

This is an A.I. Agent which can play 'pac – man' game. The game is played on a 20 x 20 grid (maze) against two ghosts. Ghosts are toggled eatable and alive states in every 20 moves. And pac man has three lives.

2.0 Implementation

The Pac - man is moved according to the A* search algorithm [\[1\]](#). When the ghost are not eatable the algorithm uses the nearest ghost as the target. When the ghosts are not eatable the nearest pill will be the target.

In A* algorithm,

$G(x) = 0$ for pill , 500 for empty block

when ghost are not eatable ,

$H(x) = (40 - g1x - g1y)^3 * 800 + (40 - g2x - g2y)^3 * 800 + (tx - x)*10 + (ty - y) * 30$

when the ghosts are eatable,

$H(x) = (tx - x)*10 + (ty - y) * 30$

(g1x , g1y , g2x, g2y – x and y distance between ghosts and the pac - man, tx, ty – distance between target and the pac – man)

```
int get_f(int x, int y){
    int dx;
    int dy;
    dx = tx - x;
    dy = ty - y;
    if(dx < 0) dx = -dx;
    if(dy < 0) dy = -dy;

    int dx1;
    int dy1;
    int dx2;
    int dy2;
```

```

dx1 = g1 -> x - x;
dy1 = g1 -> y - y;
dx2 = g2 -> x - x;
dy2 = g2 -> y - y;

if(dx1 < 0) dx1 = -dx1;
if(dy1 < 0) dy1 = -dy1;
if(dx2 < 0) dx2 = -dx2;
if(dy2 < 0) dy2 = -dy2;
int g = 0;
if(grid[y][x] == '2'){
    g = 0;
}else{
    g = 500;
}
int g1 = (40 - dx1 - dy1)*(40 - dx1 - dy1)*(40 - dx1 - dy1)*800;
if(dx1 > 10 && dy1 > 10) g1 = 0;
int g2 = (40 - dx2 - dy2)*(40 - dx2 - dy2)*(40 - dx2 - dy2)*800;
if(dx2 > 10 && dy2 > 10) g2 = 0;
int f;
if(!is_sleep)
    f = g + g1 + g2 + (dx + dy) * 30;
else
    f = g + (dx + dy) * 30;
return f;
}

```

the ghosts are also traveling using A* algorithm but towards random x, y points.

In every move the pac – man is find the best path towards the target and moves one unit according to path. This processing is repeated in every frame until the pills are over.

3.0 Compilation And Running

You need 'openGL' and glut to compile . Install them by running,

```

sudo apt-get install freeglut3-dev
sudo apt-get install libgl1-mesa-dev

```

on terminal. Then use make command to compile.

Now run it using,

`./[executable]`

command on the terminal. Use following keyboard commands control.

- p - pause / resume
- e - close

4.0 ScreenShots

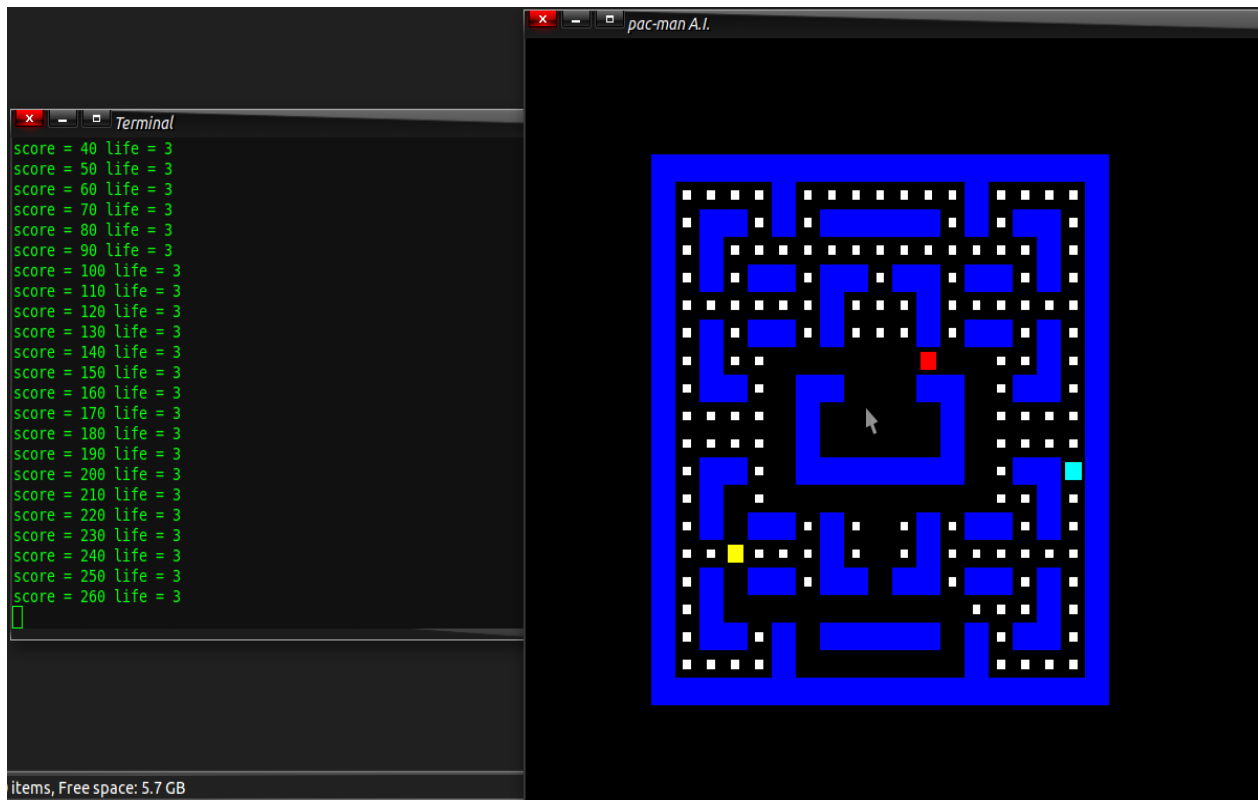


figure 4.0 (light blue and red – ghosts , yellow – pac man)

5.0 Reference

- [1] http://en.wikipedia.org/wiki/A*_search_algorithm
- [2] <http://www.policyalmanac.org/games/aStarTutorial.htm>

6.0 More Info

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