Labreport project

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1 Introduction

In game 2048. You merge similar tiles by moving them in any of the four directions to make "bigger" tiles. After each move, a new tile appears at random empty position with a value of either 2 or 4. The game terminates when all the boxes are filled and there are no moves that can merge tiles, or you create a tile with a value of 2048. This lab is about developing AI that outperforms to solve a game 2048.

2 Del 1

In This task I will use the agents (AI) that I developed in Lab 3. And I will describe in detail all the lines that I AI executes (in project).

2.1 Code

The code used:

```
function direction = project(A)
B = convertToLogBoard(A);
d = {'up', 'down', 'right', 'left'};
heuristicValues = zeros(1,4);
for i = 1:length(d)
    Bnew = slide(B,d{i});
    if isequal(Bnew ,B);
        heuristicValues(i) = -Inf;
    else
        heuristicValues(i) = ...
            heuristic0(Bnew);
    end
end
[valueMax, iMax] = max(heuristicValues);
direction = d{iMax};
end
function u = heuristic0(B)
u = sum(B(:) == 0);
end
function u = heuristic1(B)
u  =  - sum(B(:));
end
function u = heuristic2(B)
alpha = 0.25;
u =(1-alpha)*heuristic0(B) + alpha*heuristic1(B);
end
function u = heuristic4(B)
u = heuristic0(B)+heuristic1(B)+heuristic2(B);
end
function B =convertToLogBoard(B)
B(isnan(B)) = 1;
B = log2(B);
end
```

2.2 Code explanation

The code explanation:

```
function direction = project(A)
```

Define function of direction and at each step the game ask of the input of direction from this function and the A here is the board.

```
B = convertToLogBoard(A);
```

Here it convert A to another representation

```
d = {'up', 'down', 'right', 'left'};
```

The set of actions in the game to select from

```
heuristicValues = zeros(1,4);
```

Making a vector of four values computing the heuristic values of four direction in for loop repeating some action over and

```
for i = 1:length(d)
```

i is the counter of for loop which is here four

```
Bnew = slide(B,d{i});
```

Predictive state from action i which is from slide code and d direction

```
if isequal(Bnew ,B);
```

if action i does not change the state

```
heuristicValues(i) = -Inf;
```

Put heuristic to be -infinity

```
else
```

Otherwise, evaluate the state.

```
heuristicValues(i) = ...
```

To take the i value from

```
heuristic0(Bnew);
```

To give Bnew a heuristic0

```
end
end
```

```
[valueMax, iMax] = max(heuristicValues);
```

Find the action of the maximum heuristic value

```
direction = d{iMax};
```

Output the string

```
end
```

```
function u = heuristic0(B)
u = sum(B(:) == 0);
end
```

The number of bricks that are zero

```
function u = heuristic1(B)
u  =  - sum(B(:));
end
```

the negative sum of the values of the bricks (remember they are in logarithm, so its not the original values being summed)

```
function u = heuristic2(B)
alpha = 0.25;
u =(1-alpha)*heuristic0(B) + alpha*heuristic1(B);
end
```

In the new function we define a new heuristics which is a mix of heuristic 0 and heuristic 1

```
function u = heuristic4(B)
u = heuristic0(B)+heuristic1(B)+heuristic2(B);
end
```

In the new function we define a new heuristics which is a mix of heuristic0, heuristic1 and heuristic2

```
function B =convertToLogBoard(B)
B(isnan(B)) = 1;
```

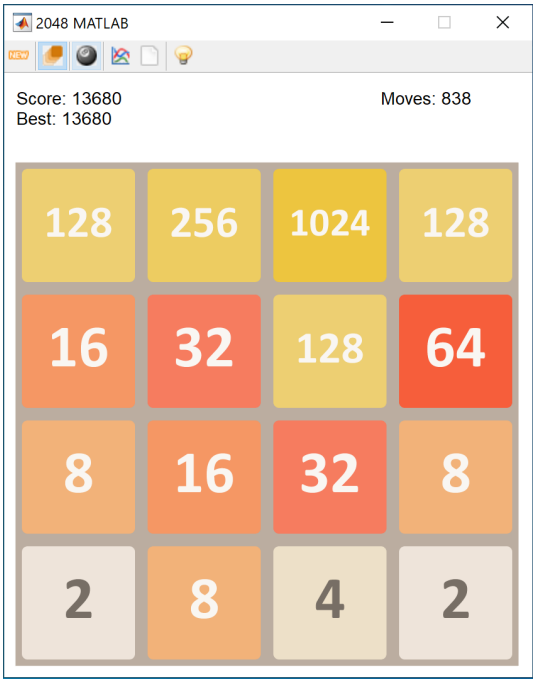
It checks nan and convert it to one

```
B = log2(B);
```

Compute the exponent using the log

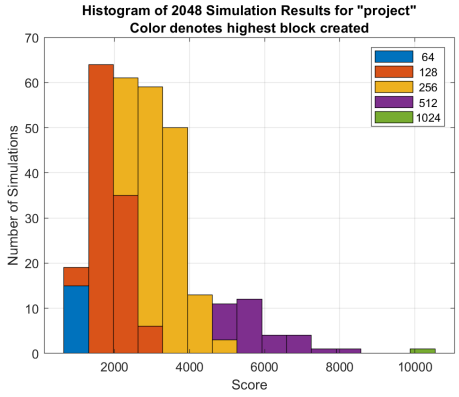
```
end
```

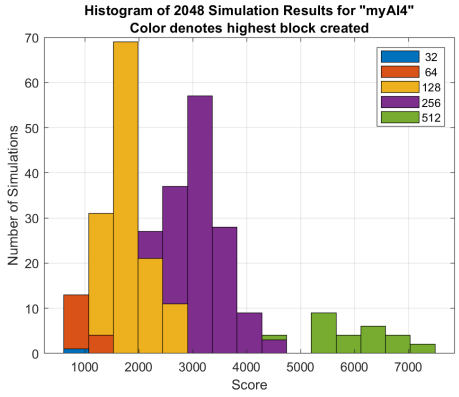
2.3 The board after running the game



2.4 Comparison between AI4 and my own AI

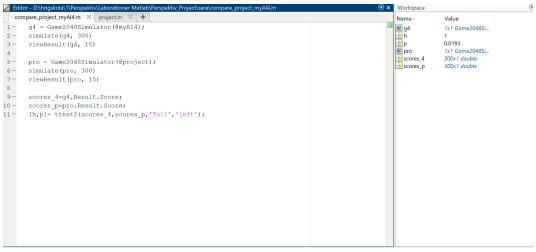
```
g4 = Game2048Simulator(@myAI4);
simulate(g4, 300)
viewResult(g4, 15)

pro = Game2048Simulator(@project);
simulate(pro, 300)
viewResult(pro, 15)

scores_4=g4.Result.Score;
scores_p=pro.Result.Score;
[h,p]= ttest2(scores_4,scores_p,'Tail','left');
```





2.5 Comparison results

The command window shows us the result which shown in the figure



2.6 Conclusion of Comparison results

P-value is the significance value of the test. which accept the one hypothesis and p value is bigger than 5%. using the tail left we got the result scores_p > scores_4 which mean that the combination of three heuristics is better than one heuristic