Write a program to implement an 8-tile puzzle Using BFS in JAVA

Lab Assignment-10

CSE3002 : Artificial Intelligence

Submitted by:

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SCOPE

VIT-AP

Task:

Write a program to implement an 8-tile puzzle using BFS (Breadth-first search) in Java

Solution:

I have used Heap data structure to implement BFS and A* algorithm to solve this puzzle using Java

Below is the source code of the same.

```
import java.util.*;
class lab10{
    public static void main(String [] args){
        int [][] board= {{1,2,3},{0,4,6},{7,5,8}};
        System.out.println("Below is the Path to Goal State : \n");
        slidepuzzle(board,1,0);
    }
    static int [] rdir={-1,0,1,0};
    static int [] cdir={0,1,0,-1};
    static int[][] goal={{1,2,3},{4,5,6},{7,8,0}};

    public static void addval(int [] [] cb,int [][]rb){
        for(int i=0;i<cb.length;i++){
            for(int j=0;j<cb[0].length;j++){
                cb[i][j]=rb[i][j];
            }
        }
    }
    public static void display(int [][] board){
        for(int i=0;i<board.length;i++){
            for(int j=0;j<board[0].length;j++){
                System.out.print(board[i][j]+" ");
            }
            System.out.println();
        }
        System.out.println("--------------------\n");
    }
    public static int gethuristic(int [][] board){
        int h=0;
```

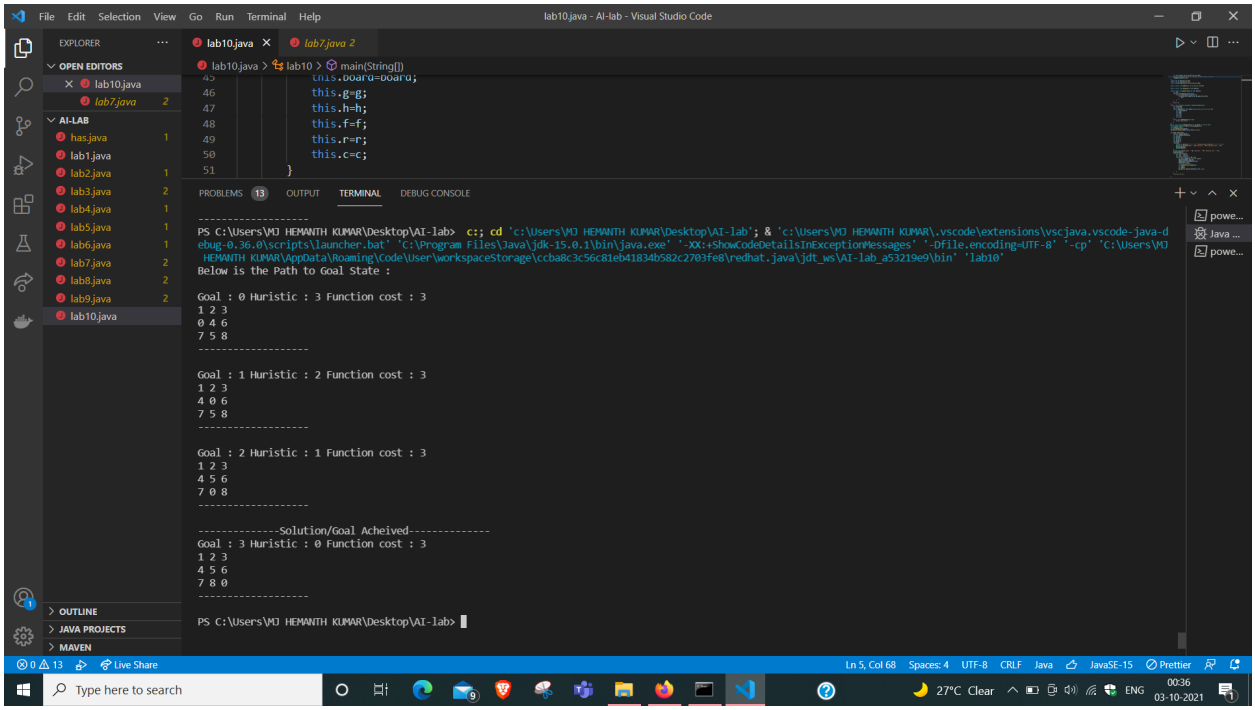
```
        for(int i=0;i<board.length;i++){
            for(int j=0;j<board.length;j++){
                if(board[i][j]!=goal[i][j] && goal[i][j]!=0){
                    h++;
                }
            }
        }
        return h;
    }
    static class Spuzzle implements Comparable<Spuzzle>{
        int [][]board;
        int r,c,h,f,g;
        public Spuzzle(int [][] board,int g,int h,int f,int r,int c){
            this.board=board;
            this.g=g;
            this.h=h;
            this.f=f;
            this.r=r;
            this.c=c;
        }
        public int compareTo(Spuzzle o){
            return this.f-o.f;
        }
    }
   public static void slidepuzzle(int [] [] board,int cr,int cc){
    PriorityQueue<Spuzzle> pq=new PriorityQueue<>();
    int n=board.length;
    int hur=gethuristic(board);
    pq.add(new Spuzzle(board,0,hur,0+hur,cr,cc));

    while(pq.size()<16){
        Spuzzle rem=pq.remove();
        int [][] pboard=rem.board;
        int er=rem.r;
        int ec=rem.c;
        int h=rem.h;
        int g=rem.g;
        int f=rem.f;
        if(h==0){
```

```
            System.out.println("--------------Solution/Goal
Acheived--------------");
            System.out.println("Goal : "+g+" Huristic : "+h+" Function
cost : "+f);
            display(pboard);
            System.exit(0);
        }
        System.out.println("Goal : "+g+" Huristic : "+h+" Function cost :
"+f);
        display(pboard);
        for(int i=0;i<4;i++){
            int r=er + rdir[i];
            int c=ec + cdir[i];
            if(r>=0 && c>=0 && r<n && c<n){
                int [][] newboard = new int [n][n];
                addval(newboard,pboard);
                newboard[er][ec]=pboard[r][c];
                newboard[r][c]=0;
                int H=gethuristic(newboard);
                int G=g+1;
                int F=H+G;
                pq.add(new Spuzzle(newboard,G,H,F,r,c));

            }
        }
    }
    }
}
```

Output below :


File Edit Selection View Go Run Terminal Help
lab10.java - AI-lab - Visual Studio Code
EXPLORER
OPEN EDITORS
lab10.java
lab7.java 2
AI-LAB
has.java 1
lab1.java
lab2.java 1
lab3.java 2
lab4.java 1
lab5.java 1
lab6.java 1
lab7.java 2
lab8.java 2
lab9.java 2
lab10.java
OUTLINE
JAVA PROJECTS
MAVEN
lab10.java
lab7.java 2
lab10.java > lab10 > main(String[])
this.g=g;
this.h=h;
this.f=f;
this.r=r;
this.c=c;
}
PROBLEMS 13
OUTPUT
TERMINAL
DEBUG CONSOLE
PS C:\Users\MJ HEMANTH KUMAR\Desktop\AI-lab> c:; cd 'c:\Users\MJ HEMANTH KUMAR\Desktop\AI-lab'; & 'c:\Users\MJ HEMANTH KUMAR\.vscode\extensions\vscjava.vscode-java-debug-0.36.0\scripts\launcher.bat' 'C:\Program Files\Java\jdk-15.0.1\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-Dfile.encoding=UTF-8' '-cp' 'C:\Users\MJ HEMANTH KUMAR\AppData\Roaming\Code\User\workspaceStorage\ccba8c3c56c81eb41834b582c2703fe8\redhat.java\jdt_ws\AI-lab_a53219e9\bin' 'lab10'
Below is the Path to Goal State :
Goal : 0 Huristic : 3 Function cost : 3
1 2 3
0 4 6
7 5 8
Goal : 1 Huristic : 2 Function cost : 3
1 2 3
4 0 6
7 5 8
Goal : 2 Huristic : 1 Function cost : 3
1 2 3
4 5 6
7 0 8
--------------Solution/Goal Acheived--------------
Goal : 3 Huristic : 0 Function cost : 3
1 2 3
4 5 6
7 8 0
PS C:\Users\MJ HEMANTH KUMAR\Desktop\AI-lab>
Live Share
Ln 5, Col 68 Spaces: 4 UTF-8 CRLF Java JavaSE-15 Prettier
Type here to search
27°C Clear
ENG
00:36
03-10-2021