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CSE-408: Artificial Intelligence

Topic - Production system for solving 15 puzzle problem

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ABSTRACT

In this project a solution for classical 15 puzzle problem has been proposed by using Breadth First search(BFS) algorithm. In this problem initial stage is present of numbers till 1-15 in random manner and we need to arrange it in final stage using set of rules in ordered way by using one blank space.

INTRODUCTION

15 Puzzle problem is sliding puzzle problem available in different other category such as 8 puzzle. If the table is present in the size 3x3 then its 8 puzzle but if it is present in 4x4 then its 15 puzzle problem but stem of solving it remain same. Other common name of this problem are boss puzzle, gem puzzle, game of fifteen, mystic square etc.

LITERATURE REVIEW

Artificial intelligence- Artificial intelligence is field of computer science which is responsible for creating machine like having intelligence like human beings. Some of these are such as speech recognition, learning, planning etc. in AI we make an agent which act rationally and involve various search algorithm

A search space includes of -:

- STATE SPACE -: State space is set of all the possible nodes which can be originated from initial stage can be visited
- INITIAL STAGE -: Initial stage is position from where the search begin as given in question
- FINAL STAGE-: Final state also known as goal state. It consists of value which user is searching for

There are various search algorithms used in AI some of the common algorithms used are Breadth first search , Depth first search etc.

Production System - production system consists of set of production rule which are required to move towards the next stage .

It consists of set of production rule these consists of certain rules and regulation for solving a problem and these rules are also termed as productions.

It consist of two part IF and THEN

Eg-: $X \rightarrow Y$

This means IF x THEN y

PROPOSED METHODOLOGY

In 15 puzzle problem in initial stage number till 1-15 are placed randomly as shown in fig 1.

And the final stage is shown in fig 2.

6	1	10	2
7	11	4	14
5		9	15
8	12	13	3

Fig-1

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

Fig-2

Not all the problem in 15 puzzle are solvable. So, firstly before solving the problem we need to know whether the problem is solvable or not. For eg non solvable condition is shown in fig-3.

1	2	3	4
5	6	7	8
9	10	11	12
13	15	14	

After getting to know if the problem is solvable then we use BFS algorithm for searching from the tree of all the possible condition .

BFS(Breadth First Search) Algorithm

BFS algorithm is an example of uninformed search in which a program goes through all the possible state spaces to find the goal stage . All though if any goal is not present than this approach can cause problem.

So this condition need to be handled carefully

RESULT AND DISCUSSION

The 15 puzzle problem as Production System

Initial stage

6	1	10	2
7	11	4	14
5		9	15
8	12	13	3

Final stage

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

Production rule

- 1) GOAL STATE IN WORKING MEMORY-> STOP
- 2) BLANK IS NOT ON LEFT EDGE-> MOVE THE BLANK LEFT
- 3) BLANK IS NOT ON RIGHT EDGE-> MOVE THE BLANK RIGHT
- 4) BLANK IS NOT ON TOP EDGE-> MOVE THE BLANK UP
- 5) BLANK IS NOT ON BOTTOM EDGE-> MOVE THE BLANK DOWN

CONTROLLING CONDITION

- 1) FOLLOW EACH RULES IN ORDERED WAY
- 2) DON'T FORM ANY LOOPS
- 3) STOP WHEN GOAL STATE IS ACHIEVED

BFS(Breadth first search) Algorithm for Suitable path searching

We will perform it with BFS Algorithm

Firstly we check all the possible moves from the initial stage i.e Left, right, up and down.

Then after every movement we will compare puzzle with the goal state . If it get matched with goal state then it will print –

1)Goal state found successfully

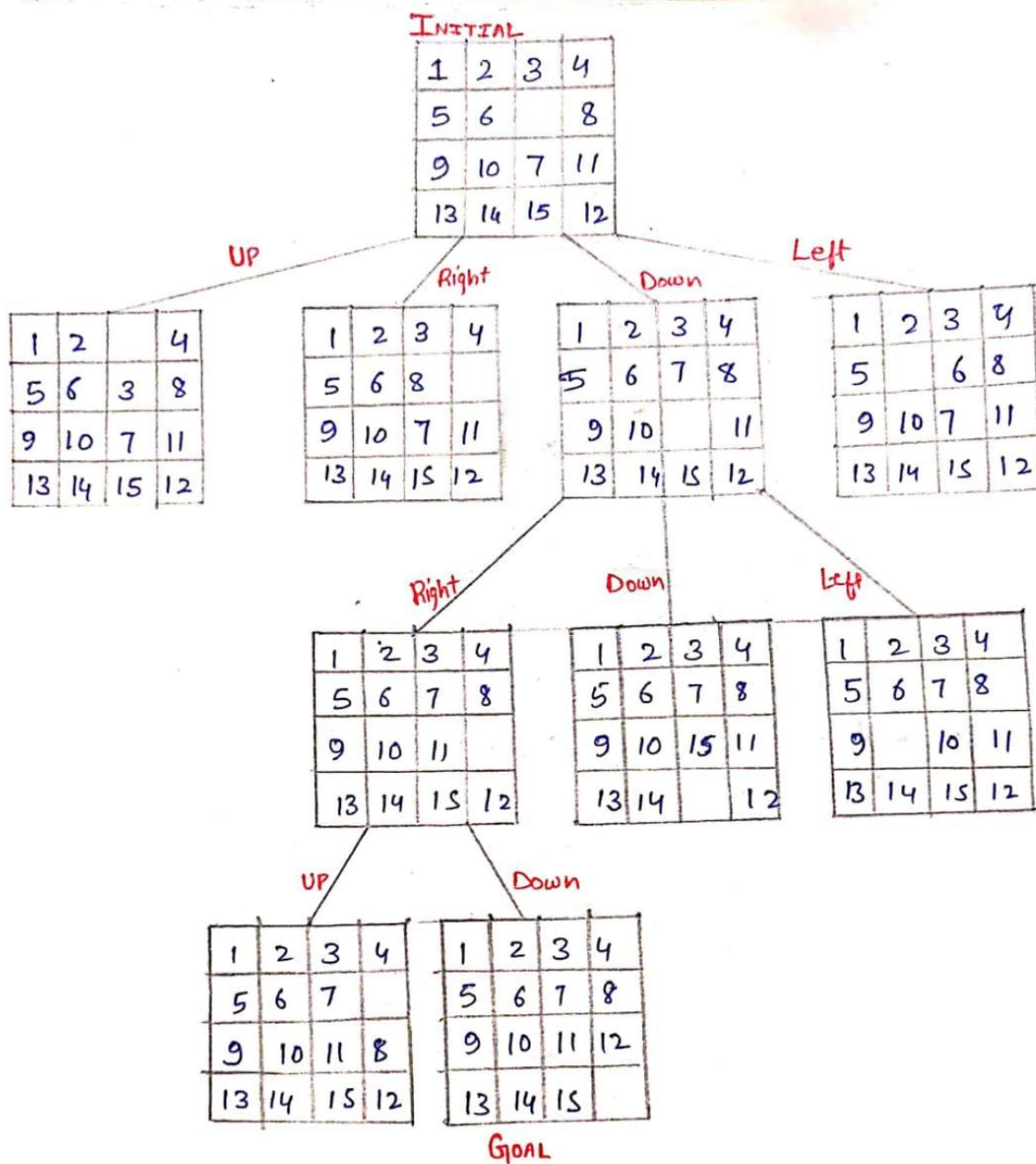
2)No of nodes expanded

3)Time taken

For unsolvable condition if searching time exceeds greater than 30 seconds then it will stop the search and print –

Goal State not found

CONCLUSION



REFERENCES

- www.geekforgeeks.com
- www.wikipedia.com/15puzzleproblem
- www.github.com

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CONTENTS 1) Abstract 2) Introduction 3) Literature review 4) Proposed methodologies 5)Result and Discussion 6) Conclusion 7) References 8) Plagiarism 9) Work done by individual ABSTRACT In this project a solution for classical 15 puzzle problem has been proposed by using Breadth First search(BFS) algorithm. In this problem initial stage is present of numbers till 1-15 in random manner and we need to arrange it in final stage using set of rules in ordered way by using one blank space.
INTRODUCTION 15 Puzzle problem is sliding puzzle problem available in different other category such as 8 puzzle. If the table is present in the size 3x3 then its 8 puzzle but if it is present in 4x4 then its 15 puzzle problem but stem of solving it remain same. Other common name of this problem are boss puzzle, gem puzzle, game of fifteen, mystic square etc. LITERATURE REVIEW Artificial intelligence- Artificial intelligence is field of computer science which is responsible for creating machine like having intelligence like human beings. Some of these are such as speech recognition, learning, planning etc. In AI we make an agent which act rationally and involve various search algorithm A search space includes of :- • STATE SPACE :- State space is set of all the possible nodes which can be originated from initial stage can be visited • INITIAL STAGE :- Initial stage is position from where the search begin as given in question • FINAL STAGE:- Final state also known as goal state. It consists of value which user is searching for There are various search algorithms used in AI some of the common algorithms used are Breadth first search , Depth first search etc. PROPOSED METHODOLOGY In 15 puzzle problem in initial stage number till 1-15 are placed randomly as shown in fig 1. And the final stage is shown in fig 2. 6 1 10 2 7 11 4 14 5 9 15 8 12 13 3 Fig-1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Fig-2 Not all the problem in 15 puzzle are solvable. So, firstly before solving the problem we need to know whether the problem is solvable or not. For eg non solvable condition is shown in fig-3. 1 2 3 4 5 6 7 8 9 10 11 12 13 15 14 After getting to know if the problem is solvable then we use BFS algorithm for searching from the tree of all the possible condition . BFS(Breadth First Search) Algorithm BFS algorithm is an example of uninformed search in which a program goes through all the possible state spaces to find the goal stage . All though if any goal is not present than this approach can cause problem. So this condition need to be handled carefully RESULT AND DISCUSSION BFS(Breadth first search) Algorithm for Suitable path searching We will perform it with BFS Algorithm Firstly we check all the possible moves from the initial stage i.e Left, right, up and down. Then after every movement we will compare puzzle with the goal state . If it get matched with goal state then it will print - 1)Goal state found successfully 2)No of nodes expanded 3)Time taken For unsolvable condition if searching time exceeds greater than 30 seconds then it will stop the search and print - Goal State not found CONCLUSION From the above example we can conclude that ADFJ is most suitable to reach goal stage REFERENCES • www.geekforgeeks.com • www.wikipedia.com/15puzzleproblem • www.github.com Group wise work distribution Name Roll no Work distribution Hariom Yadav 57 - Rohit rai 58 - Abhayanker 59 Ideation,Report,code(100%) Karunamaye Nayak 60 -

Sources

Similarity

Group wise work distribution

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