Umetna intelegenca
Seminarska naloga 2

Januar, 2021

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1. Introduction

The goal of this seminar was to use multiple graph path finding algorithms and see how they preform. The states are represented using an array of stacks that represent the boxes. One state is a node of the graph. The connections between the nodes are movements of one box from one to another place(in the form of an array with length two [from, to]).

2. Heuristics

The heuristic used for the informed algorithms checks each child state and defines a score for it based on the *heuristic algorithm*. The highest score is considered as the best heuristic.

```
private int heuristicAlgorithm(State compareState, State endState){
    int score = 0;
    int height;

    for(int i=0;i<endState.getPositions().getPositions().length;i++){
        height = whoIsSmaller(compareState,endState,i);
        for(int j=1;j<height;j++){
            if(compareState.getItem(i,j-1).equals(endState.getItem(i,j-1))){
                //if previous item was correct
                if(compareState.getItem(i,j).equals(endState.getItem(i,j))){
                    //if this item is correct
                    score += 1;
                }
                else{
                    //if only previous is correct
                    score += 0;
                }
            }
            else{
                //if previous is wrong
                score -= 1;
            }
        }
    }

    return score;
}
```

The algorithm works iteratively on a level to level basis, starting from the bottom of the stack to the top of it. The starting heuristic score for each state is 0.

For each position on a level it checks first if the item below it is in the correct position, if it is wrong the state receives a -1 reduction from it's heuristic score.
With this we discouraging placing boxes on top of wrongly positioned boxes, as that leads to having to pass through more states to find the correct one.

If the item below is correct, the heuristic score increments by 1 or zero depending on whether the top item is correct.

This is repeated until we reach the top of the stack and with that we obtain our heuristic score for that particular state.

3. Results

From the results it is clearly visible that informed algorithms preformed better than uninformed (fewer iterations, fewer developed nodes etc...).

Algorithm	Iterations	Developed nodes	Max. nodes in memory	Max. reached depth
A*	42	283	243	33
DFS	51418	201717	150304	23443
ID	205286	853012	165	25
BFS	21826	179299	25850	8