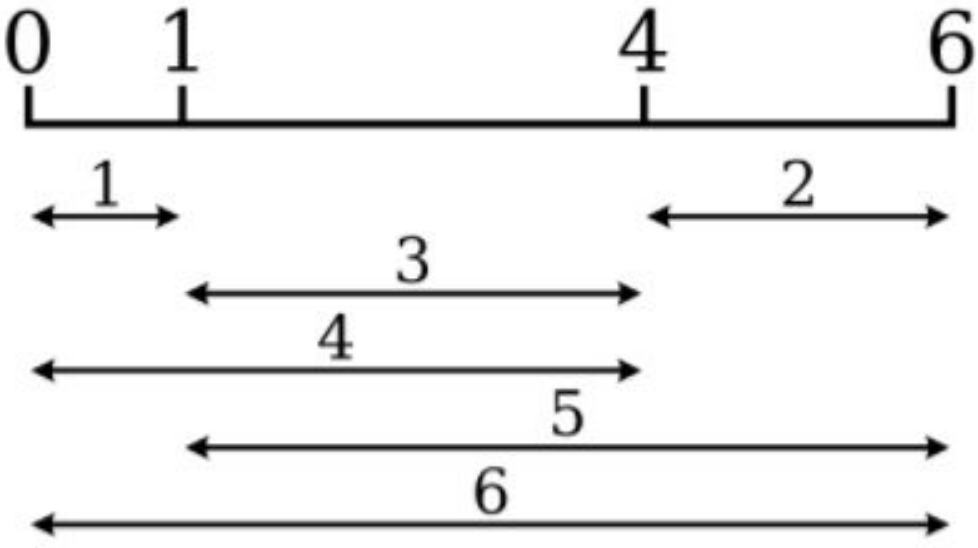
Assignment - 3

CSE 537 Artificial Intelligence



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PROBLEM STATEMENT

In this project, we have to design a CSP solution to verify whether or not a Golomb ruler of a fixed length L for M marks exists.

If a solution exists for length L find an optimal length ruler, that is one for which no shorter length ruler exists for M marks.

The question and detailed explanation of the problem statement can be found at: http://www3.cs.stonybrook.edu/~cse537/project03.html

IMPLEMENTATIONS

submit.py

This file has the skeleton for implementing different strategies - Plain Backtracking,Backtracking with Forward checking

Question 1 - Implementing Plain Backtracking:The **backtracking search** involves depth-first traversal that chooses values for one variable at a time and backtracks when a variable has no legal values left to assign.It uses one at a time incremental method of successor generation where it extends the assignment to generate the successors.It is a type of uniformed search strategy which makes is ineffective for larger problems.

Length of ruler(L)	Order of Ruler (M)	Marks	Nodes expanded
6	4	0 1 4 6	22
11	5	0 1 4 9 11	114
17	6	0 1 4 10 12 17	788
25	7	0 1 4 10 18 23 25	6848
34	8	0 1 4 9 15 22 32 34	51610

Question 2 - Implementing Backtracking with Forward Checking: The plain backtracking can be improved by making use of constraints by a method called forward checking.It extends the current partial solution on arrival of a new assignment of a consider variable and checks for every other variable that is unassigned if there is a consistent solution exists for given partial solution.

Length of ruler(L)	Order of Ruler (M)	Marks	Nodes Expanded
6	4	0 1 4 6	15
11	5	0 1 4 9 11	71
34	8	0 1 4 9 15 22 32 34	32427

CONCLUSION

The backtracking algorithm expands all the nodes from the domains which makes very slow for large domain values.The Forward checking algorithms prunes the domain values and expands less nodes and runs faster.

REFERENCES

1. Peter Norvig's "Introduction to Ai"
2. https://en.wikipedia.org/wiki/Golomb_ruler