

CSE 537 Project 2 : Sudoku

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Question 4

Simple Backtrack

Implementation : We have used simple brute force search here. At each step, we check if a given value is possible, if yes then we expand next node. Otherwise we test another value at this node.

Results : We generated 10 puzzles with 30 existing numbers in the puzzle board and found the following results.

Number of Existing	Mean (μ)(secs)	Variance (σ^2)(secs)	No. of nodes Expanded (mean)
30	0.2229024	0.01138	3561

Question 5

(MRV) heuristic + forward checking + arc consistency propagation only when a variable with just one valid

Implementation : Arc consistency is being propagated only when the length of domain of a particular node becomes one. We've used AC3 algorithm for arc consistency. Other than that we've used basic mrv heuristic, forward checking.

We generated 10 puzzles with 30 existing numbers in the puzzle board and found the following results.

Number of Existing	Mean (μ)(secs)	Variance (σ^2)(secs)	No. of nodes Expanded (mean)
30	0.043553	7.945	78

Comparison between Simple Backtrack and MRV+Arc Consistency +Forward checking

Puzzle

_	_	_	_	9	_	_	2	_
_	_	_	_	_	_	_	5	9
_	2	9	_	6	5	_	_	4
6	1	_	2	_	3	7	_	_
2	9	7	_	_	_	3	_	_
5	3	_	_	_	_	_	6	2
_	_	_	4	_	_	_	_	1
7	_	1	_	2	_	_	_	_
9	_	_	_	8	_	_	4	_

Backtrack

Nodes expanded=2973

completed. time usage: 0.217661 secs.

MRV+Arc Consistency +Forward checking

Nodes expanded=53

completed. time usage: 0.024520 secs.

It is pretty obvious that MRV+Arc consistency+Forward checking is faster than brute force backtrack algorithm, along with number of nodes being expanded less than half as compared to the one's expanded in backtrack algorithm