

TDT4136 Introduction to artificial intelligence - Assignment 3

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October 16, 2020

1 Overview

In this assignment the objective is to implement a general solver for Constraint Satisfaction Problems, specifically using backtracking search and the arc-consistency algorithm AC-3. I will then use this program to solve Sudoku boards of varying difficulty.

2 How to run the code

Simply run the provided code **Assignment.py**

3 Outputs

The AC-3 algorithm can manage quite easily to solve a wide range of Suduko boards, and in the case for the easy board, the algorithm managed to find a solution within the first iteration. As the boards gets harder with less clue integers, the algorithm run into dead ends, thus the number of backtracks and failed backtracks increases.

easy

Number of backtracks: 1
Number of failed backtracks: 0

7	8	4		9	3	2		1	5	6
6	1	9		4	8	5		3	2	7
2	3	5		1	7	6		4	8	9
-----+-----+-----										
5	7	8		2	6	1		9	3	4
3	4	1		8	9	7		5	6	2
9	2	6		5	4	3		8	7	1
-----+-----+-----										
4	5	3		7	2	9		6	1	8
8	6	2		3	1	4		7	9	5
1	9	7		6	5	8		2	4	3

Figure 1: Terminal output easy board

medium

Number of backtracks: 3
Number of failed backtracks: 0

8	7	5		9	3	6		1	4	2
1	6	9		7	2	4		3	8	5
2	4	3		8	5	1		6	7	9
-----+-----+-----										
4	5	2		6	9	7		8	3	1
9	8	6		4	1	3		2	5	7
7	3	1		5	8	2		9	6	4
-----+-----+-----										
5	1	7		3	6	9		4	2	8
6	2	8		1	4	5		7	9	3
3	9	4		2	7	8		5	1	6

Figure 2: Terminal output medium board

hard

Number of backtracks: 12
Number of failed backtracks: 4

1	5	2		3	4	6		8	9	7
4	3	7		1	8	9		6	5	2
6	8	9		5	7	2		3	1	4
-----			+	-----			+	-----		
8	2	1		6	3	7		9	4	5
5	4	3		8	9	1		7	2	6
9	7	6		4	2	5		1	8	3
-----			+	-----			+	-----		
7	9	8		2	5	3		4	6	1
3	6	5		9	1	4		2	7	8
2	1	4		7	6	8		5	3	9

Figure 3: Terminal output hard board

Number of backtracks: 68
Number of failed backtracks: 57

4	3	1		8	6	7		9	2	5
6	5	2		4	9	1		3	8	7
8	9	7		5	3	2		1	6	4
-----			+	-----			+	-----		
3	8	4		9	7	6		5	1	2
5	1	9		2	8	4		7	3	6
2	7	6		3	1	5		8	4	9
-----			+	-----			+	-----		
9	4	3		7	2	8		6	5	1
7	6	5		1	4	3		2	9	8
1	2	8		6	5	9		4	7	3

Figure 4: Terminal output very hard board