TDT4136 - Assignment 5

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Assignment 5

Exercise 1

See attachment exercise5.zip

Exercise 2

Easy board

```
8 1 7 | 6 9 3 | 2 5 4

5 2 3 | 7 4 1 | 9 8 6

9 6 4 | 5 2 8 | 3 1 7

------+-------+------

6 7 1 | 8 5 9 | 4 2 3

3 4 8 | 2 6 7 | 1 9 5

2 9 5 | 1 3 4 | 7 6 8

------+-------+------

7 5 6 | 3 1 2 | 8 4 9

1 3 9 | 4 8 5 | 6 7 2

4 8 2 | 9 7 6 | 5 3 1

backtracked 1

failed backtracked 0

python assignment5.py boards/easy.txt  0.28s user 0.02s system 99% cpu 0.303 total
```

Backtracking

Backtracking is called only once because the program is able to solve the puzzle using the functions "inference" and "revise". This is possible because the program finds a candidate that is the solution on the first iteration.

Medium board

```
6 3 5 | 9 2 7 | 1 4 8
4 8 2 | 1 6 5 | 9 7 3
9 7 1 | 3 8 4 | 2 6 5
------+-------+------
5 2 9 | 7 1 6 | 3 8 4
8 4 6 | 2 9 3 | 5 1 7
7 1 3 | 5 4 8 | 6 9 2
------+-------+------
2 9 4 | 8 5 1 | 7 3 6
1 6 7 | 4 3 2 | 8 5 9
3 5 8 | 6 7 9 | 4 2 1
backtracked 1
failed backtracked 0
python assignment5.py boards/medium.txt  0.39s user 0.02s system 98% cpu 0.416 total
```

Backtracking

Backtracking is called only once because the program is able to solve the puzzle using the functions "inference" and "revise". This is possible because the program finds a candidate that is the solution on the first iteration.

Hard board

```
8 9 2 | 3 5 1 | 7 6 4
1 3 4 | 8 7 6 | 5 2 9
```

```
5 7 6 | 4 9 2 | 3 1 8
------+-------+------
7 1 5 | 6 2 9 | 4 8 3
4 6 3 | 5 1 8 | 2 9 7
2 8 9 | 7 4 3 | 6 5 1
------+-------+------
3 5 1 | 2 8 4 | 9 7 6
9 4 7 | 1 6 5 | 8 3 2
6 2 8 | 9 3 7 | 1 4 5
backtracked 16
failed backtracked 11
python assignment5.py boards/hard.txt  1.60s user 0.03s system 99% cpu 1.648 total
```

Backtracking

As the board is now more difficult to solve, the backtracking function is called several times. The failure rate is high, meaning that we backtracked a lot of partial solutions before finding one that is a valid solution.

Very hard board

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

```
backtracked 2
failed backtracked 0
python assignment5.py boards/veryhard.txt  0.55s user 0.02s system 97% cpu 0.581 total
```

Backtracking

Our program selects the next variable for evaluation randomly. This run is almost a best-case-scenario. On consecutive runs, the backtrack function was called several more times.