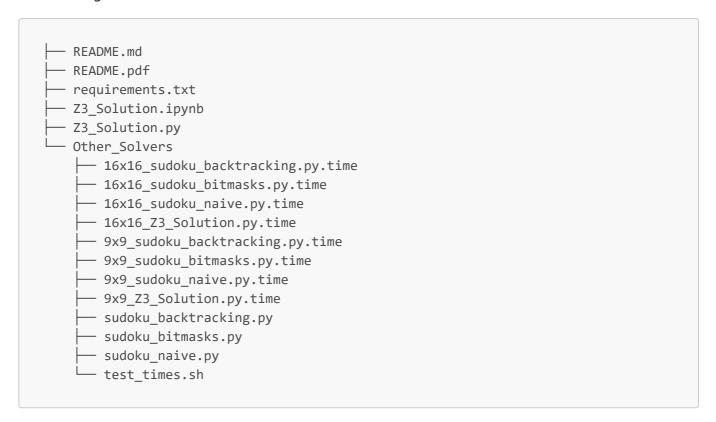
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CS-557 Network Verification & Synthesis, Spring 2023

Project: Z3-Sudoku

Files in archive

The following files are included in this archive:



File	Description
README.md	This README file as a Markdown file
README.pdf	This README file as a PDF file
requirements	Used by pip to install the Z3 solver and NumPy
Z3_Solution.ipynb	The Sudoku Z3 solution in a Jupyter Notebook
Z3_Solution.py	The Sudoku Z3 solution in a Python file
16x16_*.time	The execution time of all 4 Sudoku algorithms on a 16x16 puzzle, generated by test_times.sh
9x9_*.time	The execution time of all 4 Sudoku algorithms on a 9x9 puzzle, generated by test_times.sh
sudoku_backtracking.py	A Sudoku Back Tracking algorithm
sudoku_bitmasks.py	A Sudoku Back Tracking with Bit Masks algorithm
sudoku_naive.py	A Sudoku Naive algorithm

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File	Description
test_times.sh	Runs all the Python files (only the ones with extension .py) in batch and generate the execution time in milliseconds. Takes a required parameter, a string to prepend to each Python file and appends the string .time to each output file.

While a Jupyter Notebook file has been included (Z3_Solution.ipynb), it is not meant to be run. It includes additional markdown cells with stylized comments. The original source code in the Jupyter notebook can be found in the Z3_Solution.py file. This solution is meant to run only the Python scripts with extension .py.

Changing the Sudoku puzzle size

File	How to change the puzzle size
Z3_Solution.py	Set the variable puzzle to grid_9x9 for the 9x9 puzzle, or to grid_16x16 for the 16x16 puzzle.
<pre>sudoku_naive.py, sudoku_bitmasks.py, sudoku_backtracking.py</pre>	Set the variable grid to grid_9x9 for the 9x9 puzzle, or to grid_16x16 for the 16x16 puzzle.

Running the solution

The solution can be run using Virtual Environment (virtualenv) or using Anaconda.

Using virtualenv

Pre-requisites: virtualenv and Python (3.10.6 or higher)

- 1. Create a new virtual environment: virtualenv Z3_Sudoku (you can use any name)
- 2. Activate the new environment: source Z3_Sudoku/bin/activate (or use the name you selected in step 1, if different than the default name)
- 3. Install the required modules: pip install -r requirements.txt (you must be in the root directory of this extracted archive)
- 4. Run the solution: python3 Z3_Solution.py *

Using Anaconda

Pre-requisites: Anaconda (2023.3 or higher) and Python (3.10.6 or higher)

- 1. Create a new conda environment: conda create --name Z3_Sudoku (you can use any name)
- 2. Activate the new environment: conda activate Z3_Sudoku (or use the name you selected in step 1, if different than the default name)
- 3. Install the required modules: pip install -r requirements.txt (you must be in the root directory of this extracted archive)
- 4. Run the solution: python3 Z3_Solution.py *

^{*} If python3 does not work on your system, the executable might have been symlink to python instead of python3.