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CS4244 SATSolver Draft 1

Our approach

Our team has decided to design different types of SATSolver to compare the efficiency of each solver and attempt to improve on it.

Current progress

- Iterative Davis–Putnam–Logemann–Loveland (DPLL)
  - Tested with benchmark sat & unsat CNF (Refer to `Appendix 1`)
- Recursive Davis–Putnam–Logemann–Loveland (RDPLL)
  - Tested with benchmark sat & unsat CNF (Refer to `Appendix 1`)
- CDCL (80%)
  - Our team is still resolving some bugs that occured during resolution.
  - Able to solve some cases in benchmark.

Results

Our team is still in the midst of running through all the benchmark test cases of our implementation. Currently, we have the following results :

- DPLL (Refer to `Appendix 2`)

Next stage

- Finish up CDCL
  - Resolve the bugs
  - Finish testing CDCL
- Attempt heuristic to improve efficiency of choose branching variables
  - Variable State Independent Decaying Sum
  - Exponential Recency Weighted Average
- Model SATSolver in Einstein puzzle

SETTING UP

1. Unzip the folder `CS4244-SATSolver.zip` by typing `unzip CS4244-SATSolver.zip`
2. Use the provided script `run.sh` to run the source code or running the source code manually

Using `run.sh` script

- To use the script, you may need to change the the execution rights of the script by typing `chmod 755 run.sh`
- There are two different types of command
    1. `./run.sh [CNF FOLDER PATH] [STRATEGY]`

        ```
        For example, to run test/50V_218C_sat/ with DPLL
        It should be ./run.sh test/50V_218C_sat/ DPLL
        ```

    2. `./run.sh` to run through all testcases with the default strategy, which is `DPLL`
- Available CNF Folder Path : (Refer to `Appendix 1`)
- Available Strategy :
    - `DPLL`
    - `RDPLL`
    - `CDCL` (Not working as expected)
- Result of the selected `CNF FOLDER PATH` will be in the `result` folder

Running source code manually

- After unzipping the folder, `javac SATSolver.java` to compile the whole project.
- To run the source code,
    1. `java SATSolver [CNF FOLDER PATH] [STRATEGY]` will run through the selected CNF folder with the selected strategy
    2. `java SATSolver` will run through all testcases in the benchmark and create the `.txt` files in the folder

Appendix

1. Benchmark testcases - Folder path : `test/`
    - `50V_218C_sat`
    - `50V_218C_unsat`
    - `75V_325C_sat`

- `75V_325C_unsat`
- `100V_430C_sat`
- `100V_430C_unsat`
- `125V_538C_sat`
- `125V_538C_unsat`
- `150V_645C_sat`
- `150V_645C_unsat`
- `175V_753C_sat`
- `175V_753C_unsat`
- `200V_860C_sat`
- `200V_860C_unsat`
- `225V_960C_sat`
- `225V_960C_unsat`
- `250V_1065C_sat`
- `250V_1065C_unsat`

```
Testcases folder format : 50V_218C_sat
50 Variables , 218 Clauses , Satisfiable
```

2. Result of DPLL - Folder path : `benchmark-result`

3. Source codes - Folder path : `src`