DP with friends

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Modularization

- sudoku
- creator
- solver
- testing
- server-client

Algorithm Design

Create

- Starts with empty board and fills in entries randomly while adhering to sudoku rules

- Randomly plucks cells, we then solve the board and check if uniqueness still holds. Otherwise, we try to pluck another number.

Solve

- Given a valid sudoku board, will use a backtracking algorithm (or brute force) to attempt to fill in the cells.

- What this means is that our algorithm will continue to recursively fill in numbers until it comes across a cell with no valid entries. If we reach this point, then we backtrack to the last valid point.

Results Obtained

```
../sudoku/sudoku solve hard < ../tables/easyTable.txt
Original Board:
---------------------------------
| 3  0  4| 0  0  0| 2  6  9|
| 0  0  1| 0  6  0| 0  4  3|
| 0  6  9| 0  5  4| 0  0  1|
---------------------------------
| 5  0  0| 0  0  8| 6  0  0|
| 0  0  0| 6  9  0| 4  0  7|
| 9  0  0| 0  7  0| 0  0  0|
---------------------------------
| 0  0  0| 1  3  0| 0  2  6|
| 1  2  3| 0  0  0| 8  7  0|
| 0  9  5| 8  2  0| 0  1  0|
---------------------------------
Solved:
---------------------------------
| 3  5  4| 7  8  1| 2  6  9|
| 7  8  1| 2  6  9| 5  4  3|
| 2  6  9| 3  5  4| 7  8  1|
---------------------------------
| 5  3  7| 4  1  8| 6  9  2|
| 8  1  2| 6  9  3| 4  5  7|
| 9  4  6| 5  7  2| 1  3  8|
---------------------------------
| 4  7  8| 1  3  5| 9  2  6|
| 1  2  3| 9  4  6| 8  7  5|
| 6  9  5| 8  2  7| 3  1  4|
---------------------------------
```

Solving a 9x9 board on hard mode

Average Run Times:

Generate Easy: 0.009s

Generate Hard: 0.221s

Solve Easy: 0.002s

Solve Hard: 0.005s

Live Demo

Work Partition & Lessons Learned

How we worked as team

- Jeff: Algorithm design and code
- Ethan & Bansharee: Connecting the algorithms to the Sudoku interface
- Bansharee: Testing module
- Ethan: Server-Client module

Lessons Learned

1. Push to github frequently to save work
2. Modularize everything
3. Communicate within the team to avoid duplicate code/merge conflicts