

I have also included `x_sudoku.lhs` which is part of my extension.

Commands: `getDiagonal xs` – Gets the diagonal of list of lists. `sudoku x` – shows the X-Sudoku puzzle that is saved. `solve (sudoku x)` – solves the X-Sudoku puzzle that is saved.

This report is about creating a program that solves X-Sudoku.

Firstly, X-Sudoku is a variant of Sudoku with additional rule where the main diagonals should have a unique number that is from 1 to 9. Hence, it is called X-Sudoku since when but diagonals intersect it will look like letter X.

The concept of this program is pretty simple. I have written a function called `getDiagonal`, where it take `[[a]]` and returns `[a]` which is a list that contains the diagonal elements of `[[a]]`. Therefore, I was able to write function that defines the diagonals, which are very similar to `rows`, `cols`, and `boxs` functions. The first diagonal called `diagonalrown` (right + down) gets the diagonal of the rows, whereas the second diagonal called `diagonalrown` (left + down) get the diagonal of reverse of the rows.

Now that both diagonals are defined, the only thing left is to check their validity, where in valid function I have included 2 extra line of codes, which are:

```
&& all (unique . filter lone) (diagonalrown puzzle)
&& all (unique . filter lone) (diagonalrown puzzle)
```

To test this to work I have included a puzzle I have found on <http://www.sudoku-space.com/x-sudoku/> . To print out the actual puzzle use command “`sudoku x`”, and to solve it use command “`solve (sudoku x)`”. On my computer, which has Sandybridge-E i7 processor it took about 2 minutes to solve it. I believe is due the fact we are using lists instead of matrix, also using `getDiagonal` function might be the cause as well.

During making this program, I have thought of an idea of creating X⁹-Sudoku, where is the diagonals of each box has to be unique. I could have implemented a solver easily. However, what’s the point of creating a program that solves a problem that doesn’t exist?. Perhaps, I need learn to make a Sudoku puzzle generator, in order to make X⁹-Sudoku puzzle, which it can be used in the solver.