**CS21120 Assignment -**

**Sudoku solver**

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**Task 1**

Grid class was created to implement Grid for the sudoku, This class is used to store the grid for the sudoku using a 2 dimensional int array, No abstract data types declared in the class,

Implementation of the Grid class

**Instance Variables**

1. public static final int empty = 0;
2. private static final int Size = 9;
3. private int [][] grid;
4. private int x, y, num = 0;

**Constructor of the Grid class:**

No parameters required.

Initialises the sudoku grid to int 2 Dimensional array to an instance variable.

**Methods:**

**isValidNum(row, col) –** checks whether the number in the specified row and column is valid and returns the output as a Boolean value.

**isInRow(row, val) –** checks whether the given value repeats in the row and then returns the output as Boolean value if the given value has repeated more than once

**isInCol(col, val) -** checks whether the given value repeats in the coloumn and then returns the output as Boolean value if the given value has repeated more than once.

**isInGrid(row, col, val) -** checks whether the given value repeats in the grid and then returns the output as Boolean value if the given value has repeated more than once.

**isValid() -** checks whether the number in the whole sudoku grid is valid and returns the output as a Boolean value.

**isValidAt(row, col, val) –** checks whether the number in the specified row and column is valid and returns the output as a Boolean value.

**isEmpty(row, col) –** checks whether the value in the given row and column is empty and returns the output as a Boolean value .

**get(row, col) –** gets a value from the specified row and column of the grid and returns the value as primitive type int.

**set(row, col, val) –** sets the value to the specified place (row and column) in the grid, doesn’t return any value.

**Implementation of isValid Method –**

Text

Description automatically generated

Text

Description automatically generated

My is valid method just contains another method to check whether each value in the grid is valid, so it in turn calls a method to check if a given element of a grid is valid, satisfying the sudoku rules and neglects them if the grid contains zero, had to define three more methods to check whether the isValid methods follow our sudoku rules,

**Difficulties faced**

* initially had trouble due to the value as zero as I had declared zero as an valid number but due to the isValid method I had got zero as valid integer stored in the grid and got an logical error that it was being considered as an valid number stored as a value in the sudoku and didn’t allow zero in the code to repeat in each row, column and subgrid, so my testsEmptyValid test was getting failed.
* I tried to implement the current grid instance variable using enum but couldn’t as in a enum only option I had was to just store them fixed characters in (one, two,..etc) tried to implement the value of the grid as enum but it was getting complicated, it’s just easy this way, can’t imagine how difficult it would have been if I used enum instead, tackling the bugs would have been even difficult.
* Due to some logical error just 6 out of 12 tests were passing in my gridtests, so I had to spin my head around trying to debug the logical error.
* In my isValid method I had used isvalidat inside the isValid method
* As I had assigned the number as global variable as zero inside the isinRow, isInCol an isinGrid so I had created an bug unknowingly which counted the number of times digits reappeared even if it was valid and it didn’t allow the numbers to repeat in the whole grid even if It was valid, so in turn the problem was it didn’t allow the number to repeat in any row column or subgrids thus failing the tests even for grid with good digits in rows, columns and subgrids. So even this issue took me a while to get the problem
* in the if statement was true so due to the for loop it was just checking the first element in the grid and returning true if it was true and returned false it was false, so it didn’t check the whole grid, so had to invert it, and that is even logically right if just one of the digit in the grid isn’t valid then it would return false and return true just after no invalid digit is found.
* Another bug I had was when I included isEmpty method in the isvalidNum method using an and operator, it used to return false and true if I had used the or operator(passing the test) but logically I had to use the or operator. Then I figured out that the problem was it was considering zero as an element of the grid and didn’t ignore it’s repetations, so had to remove the equals operator from the greater than and equal to operator and changed it to greater than operator to fix the issue.

You can find the images of isValid method and it’s submethods that I have used to implement it above.