CS101

COURSE PROJECT

SLOT – 11

GROUP– 16

User Manual

PROJECT TOPIC

Sudoku: The Mind Game

PRE-REQUISITES

Solving a Sudoku puzzle does not require knowledge of mathematics. The person must have some logical and computative thinking.

OBJECTIVE

The objective of Sudoku is to enter a digit from 1 to 9 in each cell, in such a way that:

- Each horizontal row contains each digit exactly once.
- Each vertical column contains each digit exactly once.
- Each sub-grid or region contains each digit exactly once.

The puzzler's job is to fill the remainder of the grid with digits keeping in mind, the three constraints mentioned earlier.

WHAT THE USER HAS TO DO IN OUR PROGRAM

- When the user runs the program the following message will appear:
  "Press 1 to enter an unsolved Sudoku
    Press 2 to ask the Program to generate an incomplete Sudoku."
    The user may select any of the 2 choices
- If the user selects 1 the following message will appear:
  "Enter the desired Sudoku"
  Following which the user is expected to enter a 9x9 incomplete Sudoku by specifying the row and column in which the non zero entries of the incomplete Sudoku will appear. The blank spaces have 0 stored.
  Once the unsolved Sudoku is entered, then it will be verified and if it is incorrect a message saying "The Sudoku entered is incorrect" appears.
  If it is correct a 9x9 grid containing the unsolved Sudoku entered by the user appears on the screen, and the user may now start solving the Sudoku. The user will solve the Sudoku by specifying the row and the column number(position) and the value of his entry in the Sudoku.

- If the user has finished solving the Sudoku, his solution will be matched with the correct solution and if it is correct the following message will appear: "Congratulations!! You solution is correct." along with the Solved Sudoku.If it is incorrect the following message will appear "Sorry your Solution is incorrect. " along with the correct solution.
- At any stage if the user wants the correct solution he may enter 2, following which the correct solution will appear on the screen and the time taken by the user will also be displayed.

- If the user selects 2 the following message will appear:
  "Select your level of Difficulty:
  1. Easy
  2. Medium
  3. Hard"
  The user has to enter an alphabet from 1, 2or 3 in accordance to his chosen level of difficulty. Once the level of difficulty is chosen, an unsolved Sudoku will be generated for the user to solve. The user may now start solving the Sudoku.
  - At very stage the user is given to options:
    1. To make an entry into the unsolved Sudoku
    2. To get the solution of the Sudoku
  - If the user has finished solving the Sudoku, his solution will be matched with the correct solution and if it is correct the following message will appear: "Congratulations!! Your solution is correct." If it is incorrect the following message will appear "Sorry your Solution is incorrect."

POSSIBLE MISTAKES ONE MIGHT MAKE

If you make an incorrect allocation of a number in a Sudoku puzzle then the puzzle becomes unsolvable. At some later stage you will find an insurmountable contradiction, a number would have to be placed in two squares in the same row, column or region violating the Sudoku rule or else you will find a square that cannot take any of the numbers according to the rule. To correct the mistakes you need to backtrack through the allocations that you have made until you find the error. Often this is because you overlooked another possibility for a square which may have been a correct choice.

ALGORITHM TREE

```
                 START ◄─────────────────◄──────────┐
                   │                                 │
                   │                  ┌──────────────┴──┐
                   ▼               Y  │ Replenish this  │
            ┌──────────────┐─────────►│ squares         │
            │ Are we out of│          │ numbers and     │
            │ Numbers?     │          │ go back 1       │
            └──────────────┘          │ square          │
                   │ N                └─────────────────┘
                   ▼
        ┌────────────────────┐
        │ Get a number       │
        │ randomly from the  │
        │ available numbers  │
        └────────────────────┘
                   │
                   ▼                  ┌─────────────────┐
            ┌──────────────┐       Y  │ Remove from     │
            │ Does it      │─────────►│ available       │
            │ Conflict?    │          │ numbers for     │────►──┐
            └──────────────┘          │ this square     │       ▲
                   │ N                └─────────────────┘       │
                   ▼                                            │
            ┌──────────────┐                                    │
            │ Use it!      │                                    │
            └──────────────┘                                    │
                   │                                            │
                   ▼                                            │
        ┌────────────────────┐                                 │
        │ Go forward 1       │─────────────────────────────────┘
        │ square             │
        └────────────────────┘
```