Sudoku

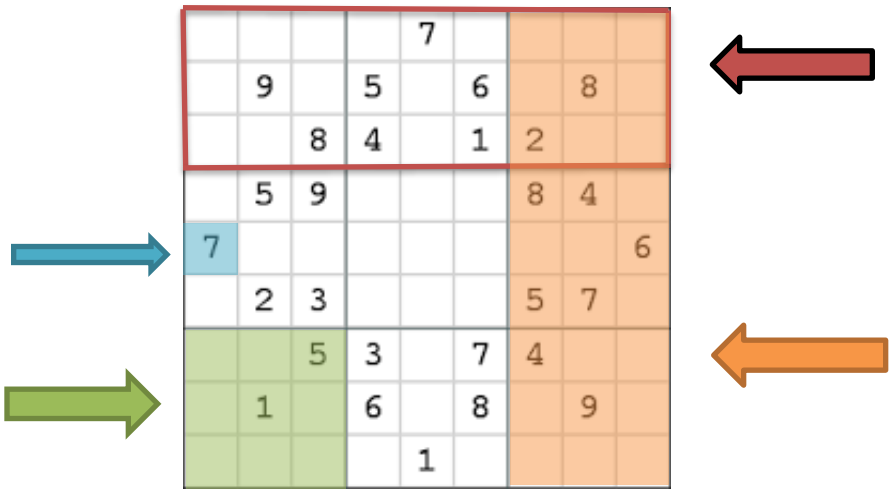
Sudoku originally called the number-placement puzzle is a **logic-based**, combinatorial number-placement puzzle. In classic Sudoku, the objective is to fill a 9 × 9 grid with digits so that each column, each row, and each of the nine 3 × 3 sub grids that compose the grid (also called "boxes", "blocks", or "regions") contain all of the digits from 1 to 9. The puzzle setter provides a partially completed grid, which for a well-posed puzzle has a single solution.

The 9 X 9 modern Sudoku game includes 3 elements:

1. **A Cell**: One square space found at the intersection of a row and a column. There are 81 cells in a 9 X 9 grid and every cell holds one number.
2. **A Block**: Its one area of the whole board made up of a 3 X 3 grid (9 cells). It can only hold numbers 1-9 without being repeated. There are 9 blocks in the standard Sudoku board.
3. **Ranks and stacks**: These are groupings of blocks (3 block in each stack). The horizontal groups are called ranks (Top, middle and bottom) and the vertical groups are called stacks (left, center and right).
4. **Rows and columns**: As the name indicates one column is a vertical element consisting of 9 cells and a row is a horizontal version of that. Each row and column contains of numbers 1-9 without being repeated.

Graphical Illustration

Red – Rank
Orange – Stack
Green – Block
Blue – Cell



How to Play

The rules for Sudoku are simple. **A 9×9 square must be filled in with numbers from 1-9 with no repeated numbers in each line, horizontally (columns) or vertically (rows)**. To challenge you more, there are 3×3 squares marked out in the grid (blocks), and each of these squares can't have any repeat numbers either.

When the puzzle starts a few of the cells will be already filled in. The easy puzzles will have more numbers filled in while the harder puzzles have less numbers filled in. The goal of the game is to fill in every cell in the grid by following the above rule of not repeating a number in a block, a row or a column. Whoever fills every cell in the grid without a mistake in the least amount of time wins the game.

OUR GUI

We used a graphical user interface called Qt.

Qt GUI refers to the graphical user interface framework provided by Qt, a popular cross-platform development toolkit. Qt GUI allows developers to create visually appealing and interactive applications with ease. It provides a comprehensive set of tools, widgets, and classes that enable the creation of modern, responsive, and platform-native user interfaces.

With Qt GUI, developers can design and customize user interfaces using Qt Designer, a powerful visual layout editor. The framework supports various UI elements, such as buttons, menus, dialogs, and forms, which can be easily integrated and styled to match the desired look and feel of the application.

Qt GUI is known for its flexibility and portability, as it enables developers to create applications that run seamlessly on different platforms, including Windows, macOS, Linux, and embedded systems. The framework abstracts the underlying platform-specific details, allowing developers to focus on designing intuitive interfaces and writing application logic.

Additionally, Qt GUI offers a wide range of features and capabilities, including event handling, signal and slot mechanism for inter-object communication, support for internationalization and accessibility, and extensive documentation. It also provides support for various input methods, touch and gesture handling, and multimedia integration, making it suitable for developing applications across different domains and industries.

Overall, Qt GUI empowers developers to build professional-looking, feature-rich, and cross-platform applications with efficiency and ease, making it a popular choice for desktop, mobile, and embedded software development.

To download, install and use Qt GUI use the first 10 minutes of the following video as a guide. (MinGW compiler needed)

You Tube: https://youtu.be/Wi9nQTDFF4U

After installing Qt follow the following steps:

1. Open the Qt project file.
2. Configure our code for your device.

The functions we used

1. The difficultySelected function is a slot that is triggered when a difficulty button (Easy, Medium, Hard) is clicked. It sets up the initial game grid based on the selected difficulty and displays it.

2. The showTime function is called by a timer and updates the game timer display.

3. The on_playButton_clicked function is triggered when the play button is clicked and switches to the difficulty selection screen.

4. The on_doneButton_clicked function is triggered when the done button is clicked. It checks if the current solution is valid and displays the appropriate message (win/lose). It also updates the high scores and saves them to a file.

5. The on_gameGrid_cellChanged function is triggered when a cell in the game grid is changed. It updates the corresponding value in the playInstance array.

6. The on_quitButton_clicked function is triggered when the quit button is clicked. It saves the current game progress to a file and asks for confirmation before quitting.

7. The on_continueButton_clicked function is triggered when the continue button is clicked. It loads the saved game progress from a file and resumes the game.

8. The on_completeHomeButton_clicked and on_completeStatsButton_clicked functions are triggered when the home and stats buttons are clicked, respectively. They switch to the home and stats screens.

9. The on_statsButton_clicked function is triggered when the stats button is clicked. It reads the high scores from a file and displays them on the stats screen.