Course Project Report

CS 101 Project

Sudoku Auto Solver

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Abstract

- This projects aims to design a C++ implementation of a Sudoku Auto-solver.
- Sudoku Auto-solver is a program that can solve a normal Sudoku of any degree of toughness as desired by the user.
- We have included certain other features like replacing the wrongly placed number by any other number .
- The program can also be used to check if a given Sudoku has a solution or not. If Solution does not exist it displays a message “No Solution”.

Introduction

Sudoku is a logic-based,combinatorial number-placement puzzle. 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 contains all of the digits from 1 to 9. The puzzle setter provides a partially completed grid, which for a well-posed puzzle has a unique solution.

History of Sudoku

In late nineteenth century number puzzles appeared in newspaper when French puzzle setters began experimenting with removing numbers from magic squares. Le Siècle, a Paris-based daily, published a partially completed 9×9 magic square with 3×3 sub-squares on November 19, 1892. It was not a Sudoku because it contained double-digit numbers and required arithmetic rather than logic to solve, but it shared key characteristics: each row, column and sub-square added up to the same number. On July 6, 1895, La France, refined the puzzle so that it was almost a modern Sudoku. It simplified the 9×9 magic square puzzle so that each row, column and broken diagonals contained only the numbers 1–9, but did not mark the sub-squares. Although they are unmarked, each 3×3 sub-square does indeed comprise the numbers 1–9 and the additional constraint on the broken diagonals leads to only one solution.

The puzzle was introduced in Japan by Nikoli in the paper Monthly Nikolist in April 1984 as Sūji wa dokushin ni kagiru , which also can be translated as "the digits must be single". At a later date, the name was abbreviated to Sudoku by Maki Kaji taking only the first characters of compound words to form a shorter version.Sudoku is a registered

trademark in Japan and the puzzle is generally referred to as Number Place.

General Description of Sudoku

Sudoku is a puzzle game which tests the logical capabilities of the solver. Sudoku is played over a 9x9 grid each element of which is called a tile, divided to 3x3 sub grids or boxes. The objective is to fill a grid with digits so that each column, each row, and each of the nine boxes that compose the grid contains all of the digits from 1 to 9 and each digit appears once.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

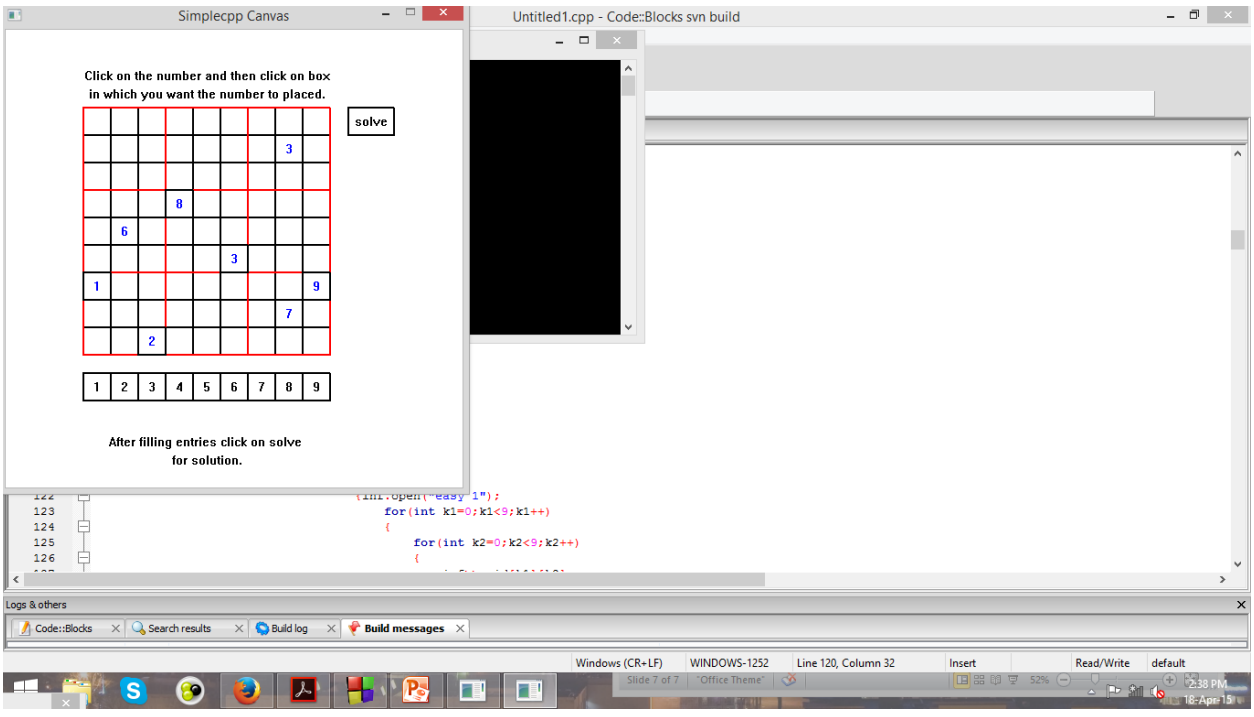
A sudoku puzzle...

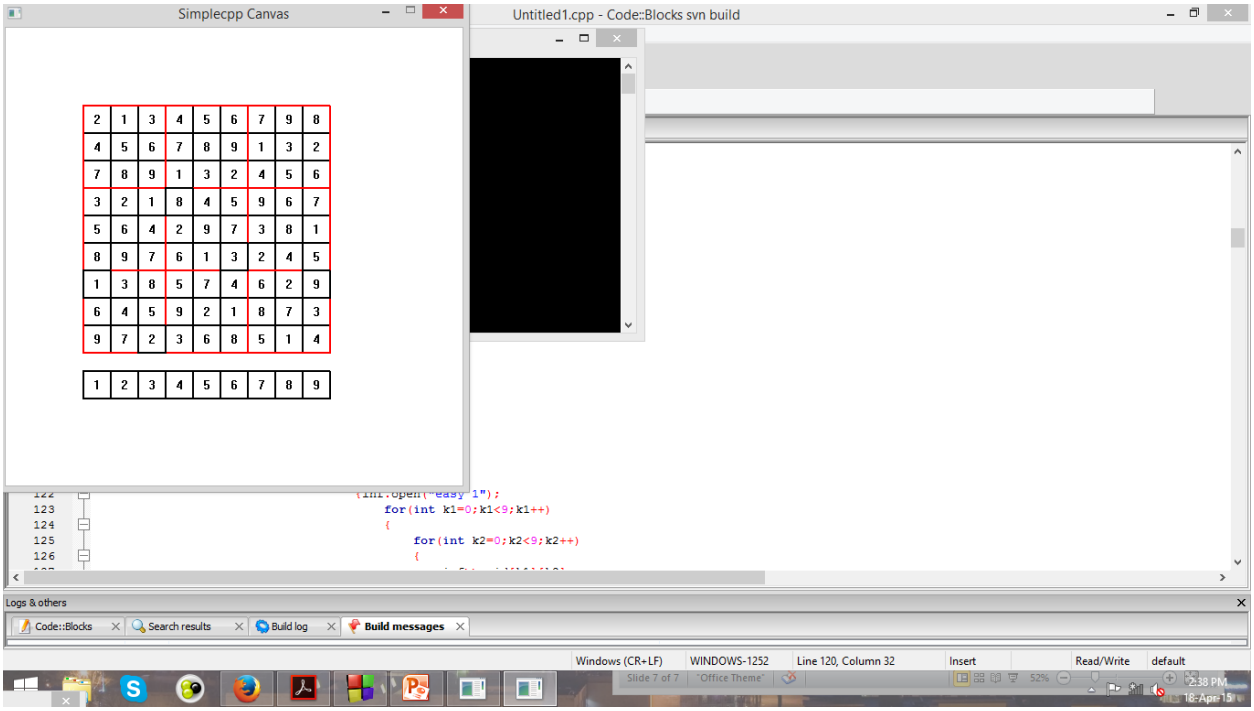
5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

...and its solution numbers marked in red

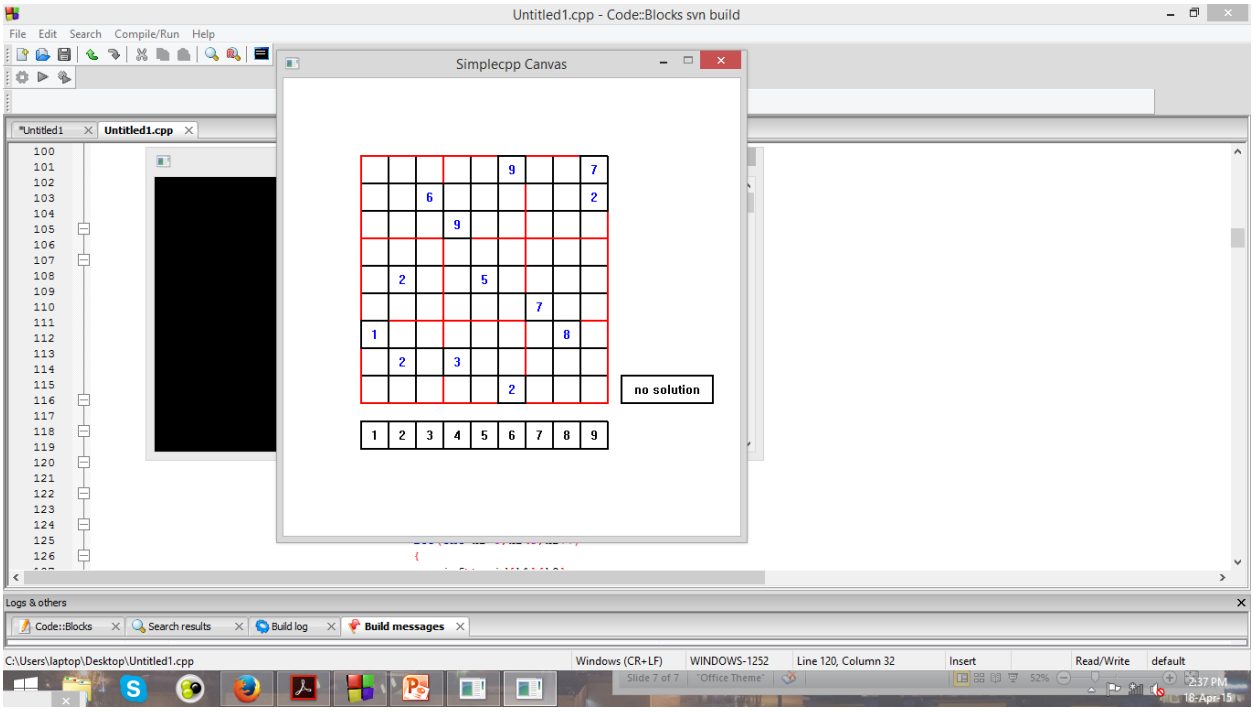
Testing Strategy and Data

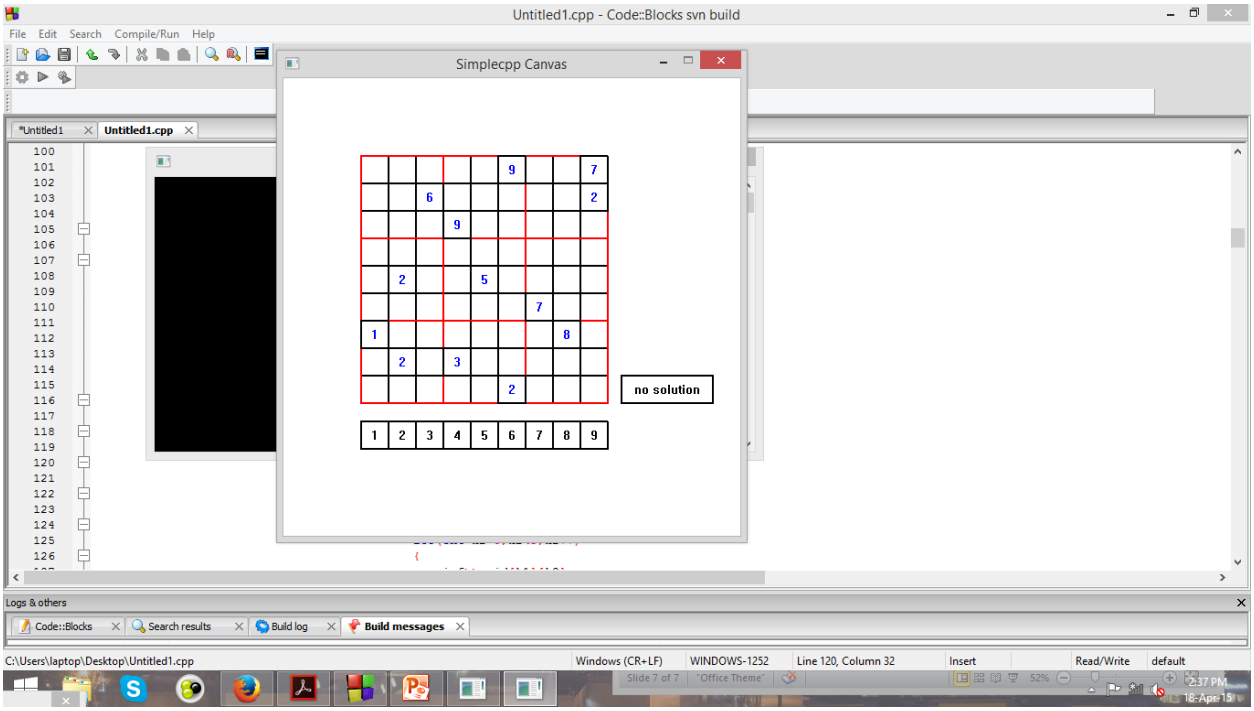
So far we have been able to code the normal sudoku solver and it is able to solve all
valid sudoku puzzles given to it. Note that valid here refers to puzzles having unique
solutions.
We feeded several easy puzzles and each of them was solved in less than 0.04
seconds.
The following is a puzzle and that our program solved.





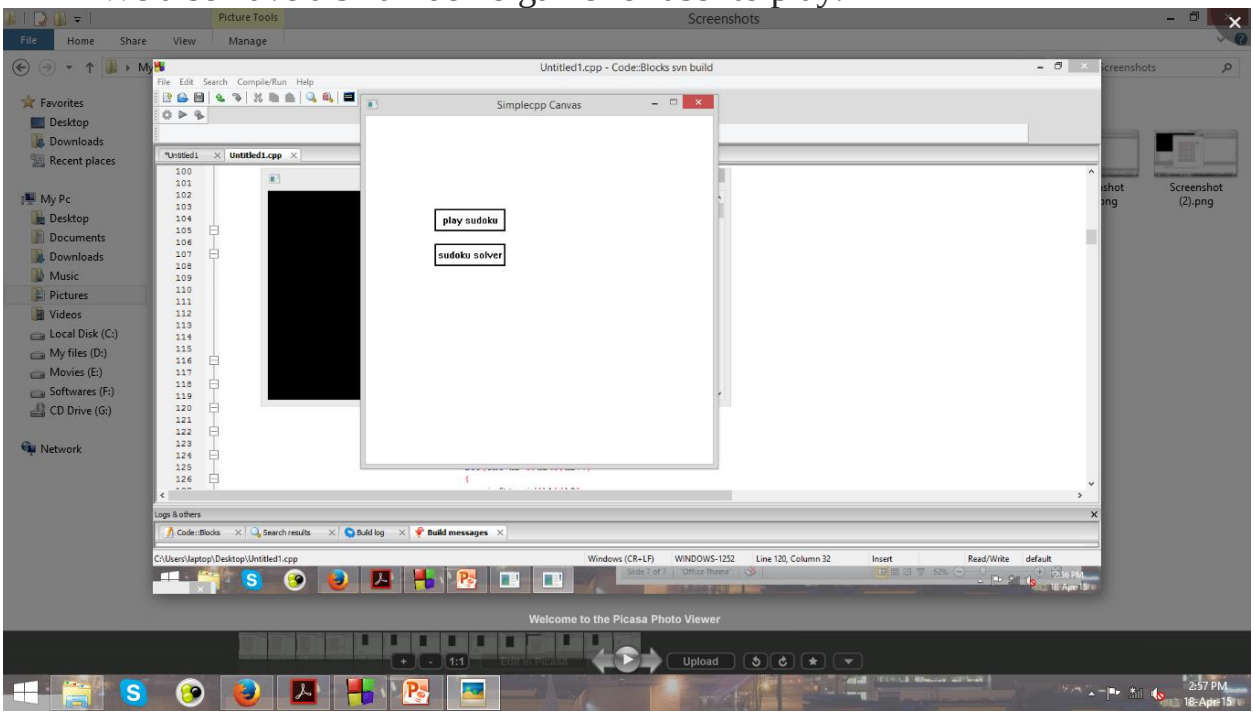
If There is no solution to the given puzzle it outputs a message box containing “No solution”.

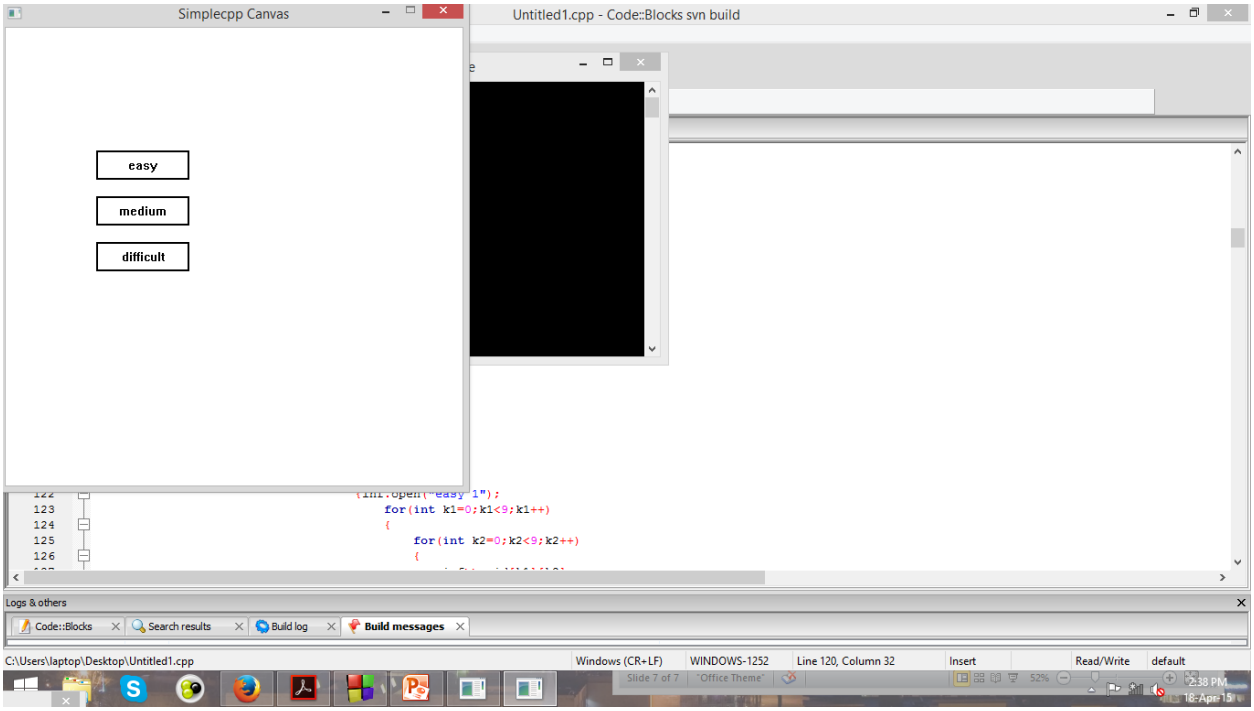


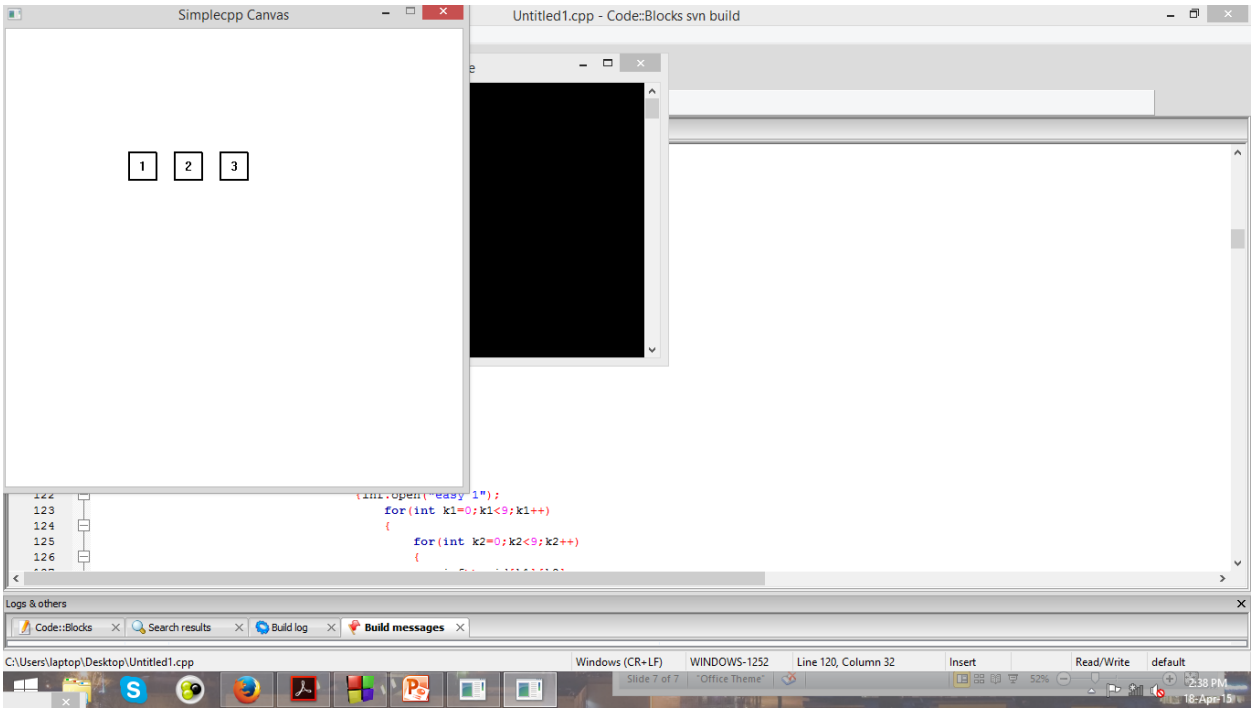


What we added extra other than auto solver?

We also have a small demo game for user to play.




Simplecpp Canvas
easy
medium
difficult
Untitled1.cpp - Code::Blocks svn build
for(int k1=0;k1<9;k1++)
for(int k2=0;k2<9;k2++)
Logs & others
Code::Blocks
Search results
Build log
Build messages
C:\Users\laptop\Desktop\Untitled1.cpp
Windows (CR+LF)
WINDOWS-1252
Line 120, Column 32
Insert
Read/Write
default


Simplecpp Canvas
1
2
3
Untitled1.cpp - Code::Blocks svn build
for(int k1=0;k1<9;k1++)
for(int k2=0;k2<9;k2++)
Logs & others
Code::Blocks
Search results
Build log
Build messages
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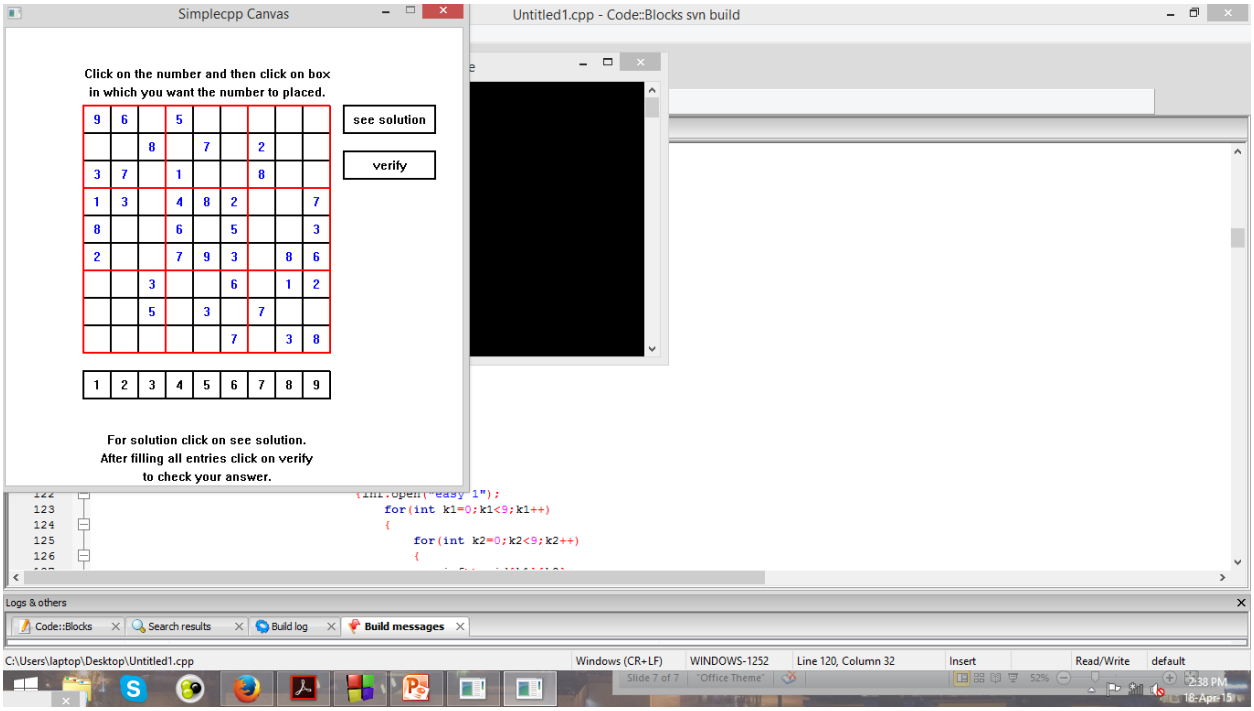
Simplecpp Canvas
Click on the number and then click on box
in which you want the number to placed.
see solution
verify
1 2 3 4 5 6 7 8 9
For solution click on see solution.
After filling all entries click on verify
to check your answer.
Untitled1.cpp - Code::Blocks svn build
for(int k1=0;k1<9;k1++)
for(int k2=0;k2<9;k2++)
Logs & others
Code::Blocks
Search results
Build log
Build messages
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WINDOWS-1252
Line 120, Column 32
Insert
Read/Write
default

Conclusions and Future Scope

- The project designed is capable of solving normal sudoku of any degree of toughness.
- This model can also be extended to solve larger grids and more complicated variants.
- We have incorporated a graphical user interface so that the program becomes more user-friendly.
- This can be extended to give multiple solutions of given Sudoku puzzle if it exists.

References

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  - Past year projects
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  - http://en.wikipedia.org/wiki/Sudoku
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