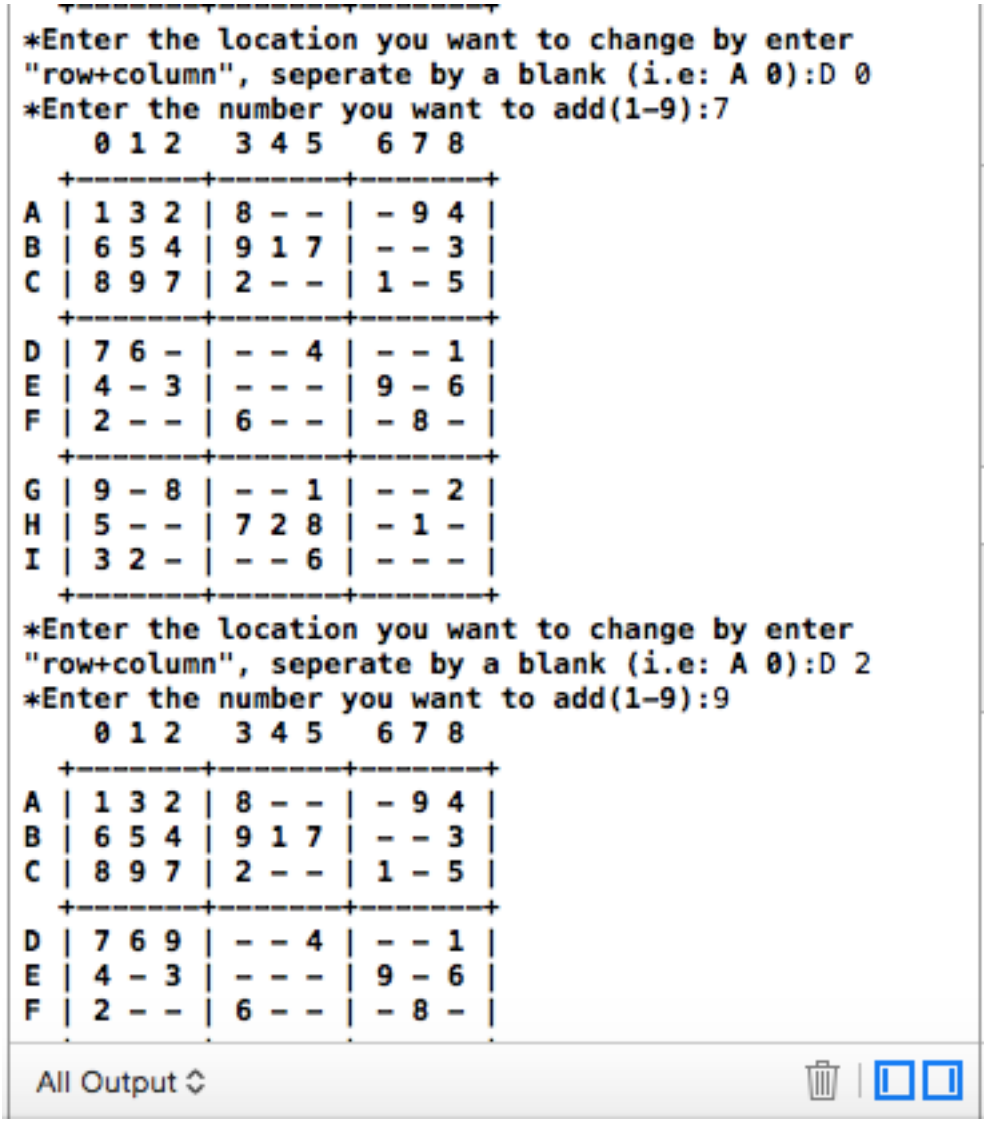
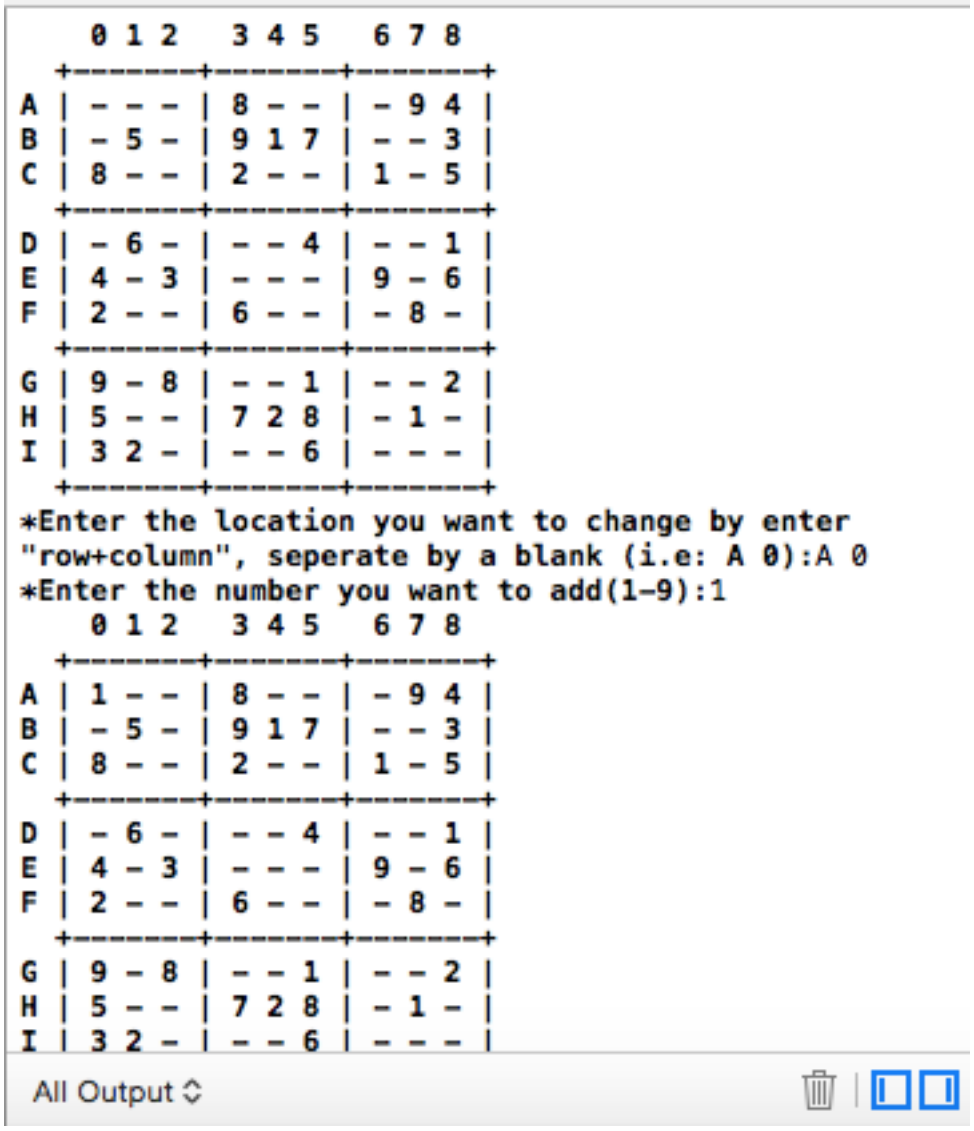
User Manual:
Program: testGrid.cpp
The program is a cpp file that create a Sudoku puzzle for you to play with. To run this program, double click on the file testGrid.cpp by a compiler and run. A console window will appear and start reading the initial puzzle. And the puzzle will show after the reading finished. To play with the puzzle game, you can enter the position and the number into the program. As the program's hint, you can enter the position by the combination of rows+columns, which means you can enter "A 0" to reach the left corner of the puzzle. If you enter the position wrong, invalid or there is a number already existed in that position, the error report will show on the screen and let you enter again. Once you enter the position, you can enter the number you want to that position. If there is a conflict between the numbers on current small grid, or current row, or current column, the error report will show and let you enter again. Once you finish the puzzle, the program will show "Finished!!!" and exit automatically, and you will find an output file called "Grid_output.txt" file in the folder. That is the game data of each steps.

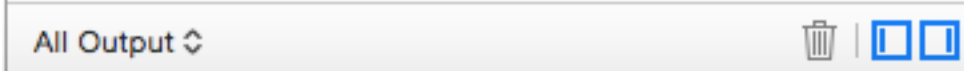
System manual:
Program: testGrid.cpp
This program include a class file and a implement file. The private data in the head file is a vector of vectors. There are two output method, one is the file output, another one is the display output. The output is combined with the display method. When the the program runs and show information in the console window, the file output will be created at the same time. There function start(Grid &g) is the most important function of the game, it do checks of the positions and value and report the conflicts and invalidation.

Sample runs:


*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):D 0
*Enter the number you want to add(1-9):7
0 1 2 3 4 5 6 7 8
A | 1 3 2 | 8 - - | - 9 4 |
B | 6 5 4 | 9 1 7 | - - 3 |
C | 8 9 7 | 2 - - | 1 - 5 |
D | 7 6 - | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
G | 9 - 8 | - - 1 | - - 2 |
H | 5 - - | 7 2 8 | - 1 - |
I | 3 2 - | - - 6 | - - - |
*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):D 2
*Enter the number you want to add(1-9):9
0 1 2 3 4 5 6 7 8
A | 1 3 2 | 8 - - | - 9 4 |
B | 6 5 4 | 9 1 7 | - - 3 |
C | 8 9 7 | 2 - - | 1 - 5 |
D | 7 6 9 | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
All Output


0 1 2 3 4 5 6 7 8
A | - - - | 8 - - | - 9 4 |
B | - 5 - | 9 1 7 | - - 3 |
C | 8 - - | 2 - - | 1 - 5 |
D | - 6 - | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
G | 9 - 8 | - - 1 | - - 2 |
H | 5 - - | 7 2 8 | - 1 - |
I | 3 2 - | - - 6 | - - - |
*Enter the location you want to change by enter "row+column", seperate by a blank (i.e: A 0):A 0
*Enter the number you want to add(1-9):1
0 1 2 3 4 5 6 7 8
A | 1 - - | 8 - - | - 9 4 |
B | - 5 - | 9 1 7 | - - 3 |
C | 8 - - | 2 - - | 1 - 5 |
D | - 6 - | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
G | 9 - 8 | - - 1 | - - 2 |
H | 5 - - | 7 2 8 | - 1 - |
I | 3 2 - | - - 6 | - - - |
All Output

```
  +-------+-------+-------+
D | 7 6 9 | 5 8 4 | 2 3 1 |
E | 4 8 3 | 1 7 2 | 9 5 6 |
F | 2 1 5 | 6 3 9 | 4 8 7 |
  +-------+-------+-------+
G | 9 7 8 | 3 5 1 | 6 4 2 |
H | 5 4 6 | 7 2 8 | 3 1 9 |
I | 3 2 1 | 4 9 6 | 5 - - |
  +-------+-------+-------+
*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):I 7
*Enter the number you want to add(1-9):7
    0 1 2   3 4 5   6 7 8
  +-------+-------+-------+
A | 1 3 2 | 8 6 5 | 7 9 4 |
B | 6 5 4 | 9 1 7 | 8 2 3 |
C | 8 9 7 | 2 4 3 | 1 6 5 |
  +-------+-------+-------+
D | 7 6 9 | 5 8 4 | 2 3 1 |
E | 4 8 3 | 1 7 2 | 9 5 6 |
F | 2 1 5 | 6 3 9 | 4 8 7 |
  +-------+-------+-------+
G | 9 7 8 | 3 5 1 | 6 4 2 |
H | 5 4 6 | 7 2 8 | 3 1 9 |
I | 3 2 1 | 4 9 6 | 5 7 - |
  +-------+-------+-------+
*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):I 8
*Enter the number you want to add(1-9):8
Finished!!!
```



```
    0 1 2   3 4 5   6 7 8
  +-------+-------+-------+
A | - - - | 8 - - | - 9 4 |
B | - 5 - | 9 1 7 | - - 3 |
C | 8 - - | 2 - - | 1 - 5 |
  +-------+-------+-------+
D | - 6 - | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
  +-------+-------+-------+
G | 9 - 8 | - - 1 | - - 2 |
H | 5 - - | 7 2 8 | - 1 - |
I | 3 2 - | - - 6 | - - - |
  +-------+-------+-------+
*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):a 0
*Invaild position, Please enter again:B 1
*The position already exist a number, Please choose a
different position:A 2
*Enter the number you want to add(1-9):8
Your number has conflict with current row, Please
enter another number:
```

```
    0 1 2   3 4 5   6 7 8
  +-------+-------+-------+
A | - - - | 8 - - | - 9 4 |
B | - 5 - | 9 1 7 | - - 3 |
C | 8 - - | 2 - - | 1 - 5 |
  +-------+-------+-------+
D | - 6 - | - - 4 | - - 1 |
E | 4 - 3 | - - - | 9 - 6 |
F | 2 - - | 6 - - | - 8 - |
  +-------+-------+-------+
G | 9 - 8 | - - 1 | - - 2 |
H | 5 - - | 7 2 8 | - 1 - |
I | 3 2 - | - - 6 | - - - |
  +-------+-------+-------+
*Enter the location you want to change by enter
"row+column", seperate by a blank (i.e: A 0):D 2
*Enter the number you want to add(1-9):2
Your number has conflict with current 3x3 grid,
Please enter another number:
```