(a) Pot Luck

Design and implement a GUI application that presents a game based on a 4 by 4 matrix of buttons. One of the buttons (selected at random) "hides" the prize, while two of the buttons (selected at random, should be different than each other and prize button) hide bombs. A status bar at the top of the window shows the number of guesses. When the prize button is pressed, the status bar shows "You got it in *x* attempts!". When one of the bomb buttons is pressed, the status bar shows "Sorry! You are blown up at attempt *x*!".

(b) The SOS Game

Details of the SOS game --which some of you wrote as an exercise in CS101 last semester-- can be found in this Wikipedia article. This time we will give you the completed SOS Java class and ask you to create a simple GUI for it. The completed game will look something like Figure 1.

As always, begin by creating a new project in your favourite IDE. The first thing is to make sure you can instantiate and use the SOS class. Download the SOS.class file and save it somewhere on your IDE's classpath. In a main method, create a new instance of the SOS class and make sure your program compiles and runs properly. Refer to the UML diagram in Figure 2. for details of the SOS class constructors and methods.

Building the game:

Constructing GUIs is usually done in two stages: (1) creating the UI, and (2) add the interactions so that everything works.

(1) Creating the UI...

Create a new Java class called SOSCanvas, that extends JPanel. This class will simply display the SOS game as a grid. While you could use a collection of JButtons in a GridLayout --as you did in part a-- this time we want you to draw the grid yourself. To do this you will need to override the paintComponent method. You will also need a reference to the SOS game, so have the constructor take a reference to an instance of the SOS class and save it into a suitably named property. Test the class by having your main method create an instance of your SOSCanvas class (passing it an instance of the SOS class), and add it to a JFrame. Note: you should be able to call the SOS play method a few times before making the frame visible, so you can see the letters are correctly positioned in the grid.

Next, create a class called SOSGUIPanel, that again extends JPanel. This class will include an instance of the SOSCanvas class, as well as the other UI components necessary to show the player names and scores, and a combo box for selecting the letter to play. You should pass an

instance of the SOS class and two Strings containing the players names, to its constructor. Test this class by adding an instance of it to the JFrame in your main method. Once you have the GUI looking like that of Figure 1, it's time to wire everything up so it actually works!

(2) Adding the interactions...

Having got the basic UI done, you can start "wiring it up" using Java's event handling mechanism.

Actually, you only need to be able to detect mouse events on the SOSCanvas. When the user clicks the mouse on a particular cell on the grid, you have to determine its row and column number, then, using this information and the current state of the combo box (that say which letter the user wants to play), call the SOS play method and update the (grid and the score) displays accordingly --changing the colour of the player name labels so as to indicate whose turn it is. When the game is over, (use a JOptionPane to) pop-up a message saying who won. *Hint:* there are a lot of ways to code this, but the simplest solution is probably to write the mouse listener as an inner class of the SOSGUIPanel class and add an instance of it as a listener to the SOSCanvas instance in the SOSGUIPanel constructor.

Congratulations

You should now have a completely functional SOS game. Ok, it may not be very pretty, but it does work and, more importantly, you should have learnt a bit about creating such programs. If you have time you might try making it even better. For example: try changing the text size and font used to display the letters in each cell as well as the player names and scores; add borders to the panels; allow players to enter their names and to choose the grid size they will use (there are a lot of UI options for achieving this --menus, dialogs, panels, with textfields, choiceboxes, lists, etc.-- the more of them you try the more you will learn). You might also try extending the game itself, perhaps by adding a time limit for players to move or by placing a few letters on the grid at random before play begins. Players should be able to start a new game or close the program whenever they wish, but it might be nice to remind them that the current game will be lost (assuming it hasn't yet finished). Alternatively, you could automatically save the game state and reload it next time the program is opened. Even more sophisticated, draw coloured lines showing the places where each player scored points. *Note:* some of these may require "modifying" the SOS class!

Use your imagination and show us what you can do!

Figure 1. An example of SOS game and two example "Game Over" messages.

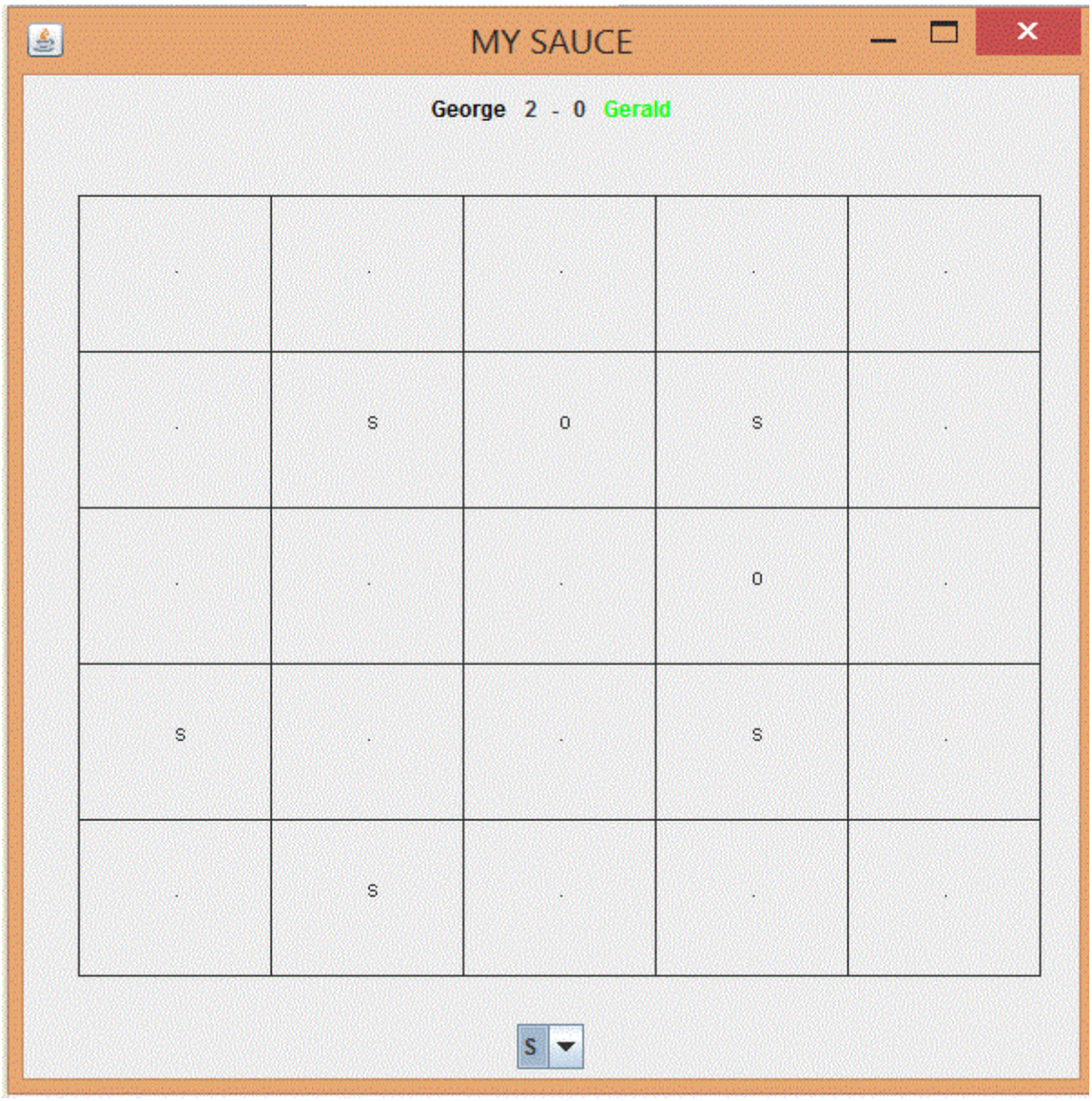
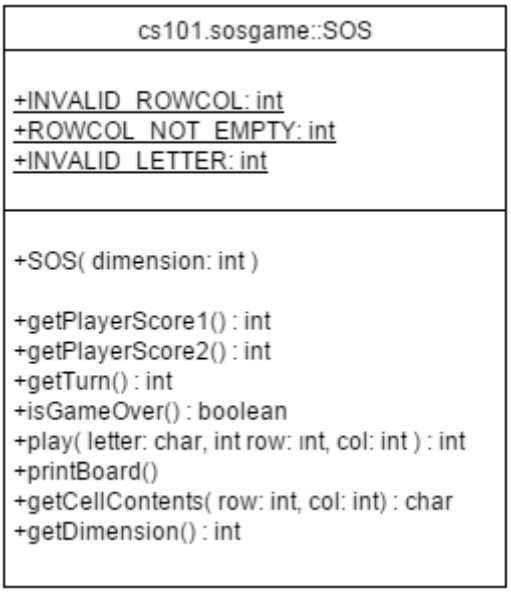


Figure 2. UML diagram for SOS class.



The SOS game class:

In package: cs101.sosgame

getTurn() : int ~ returns player number, either 1 or 2

getDimension() : int ~ returns grid size

printBoard() ~ shows current board state on Java console

play(letter, row, col) : int ~ attempts to place the given letter at row, col on the grid

- returns: points [0..8] if successful,
  else negative value indicating error [INVALID_ROWCOL, ROWCOL_NOT_EMPTY, INVALID_LETTER]