# Project-4 Mathematics Project (Interactive Game)

**Haiyan Cheng**
Department of Computer Science
Willamette University
Salem, OR 97301
hcheng@willamette.edu

**CS-435 Computational Science and Applications**

*Fall 2016*

*If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is.*

— John Louis von Neumann

## 1 Introduction

In this project you will learn how to do the following things using MATLAB:

1. Learn how to use `while` loop
2. Practice using `if...else....end` statement to make logical decisions.
3. Learn how to use relational and logic operators to construct conditions for if statement.
4. Practice more about random number generator.

## 2 In-Class Project

### 2.1 Develop an Interactive Number Guessing Game

In this project, we will develop an interactive number guessing game. The user needs to guess an integer (the target number) between a given range and type the guessed number in the console, the program will provide hints to help the user guess the number until the user guess the right number. In the meantime, the number of guesses the user made will be recorded and displayed. We will implement the following with MATLAB:

1. Display a message for user to choose a difficulty level of the game: 1-easy, 2-medium, 3-hard.
2. Depending on the user input to design the game according to the following:
    - 1-Easy: target number is between 1 and 10
    - 2-Medium: target number is between 1 and 100
    - 3-Hard: target number is between 1 and 1000

3. Generate a uniformly distributed random number $X$ between the appropriate range as the guessing target.
4. Prompt the user to input an integer $A$ according to the difficulty level he/she chose.
5. Compare the user guessed number $A$ with the target $X$.
6. If user did not guess the right number, display corresponding message to let the user know if the number he/she guessed is too big or too small, then prompt the user for input again.
7. If user guessed the right number, display a message to congratulate the user and display the number of guesses the user has made.
8. Also display the average guess number.

## 3 Lab Projects

In this lab project, you will extend the in-class project to build a "Treasure Hunting" game. You will generate a 2-dimensional coordinate system as your field (the field size depends on the user selected difficulty level), the treasure is located within the field. Write a MATLAB program to accomplish the following tasks.

1. Your program should allow the user to choose a difficult level: 1-easy, 2-medium, 3-hard. For easy one, your coordinate system has size 10-by-10. For medium one, your coordinate system has size 50-by-50, for hard one, your coordinate system has size 100-by-100.
2. Based on user's selection, the program should display informative message to allow user guess the x, y coordinates of the treasure location (positive integers within the range corresponding to the difficulty level) . You need to check the user input, if user input an invalid number, you program should display a message and allow user to input again.
3. Based on user's guess, the program should provide instruction to guide user for the next move. For example, if the treasure location is $(12, 34)$, and user guessed $(9, 48)$, the program should display information such as "Move to the right and down", and allow user to input the next guess.
4. After the user guess correct, the program should display how many times user has guessed, and generate a plot to display: user's first guess (red dot), all user guessed location connected with a blue line, and the treasure location (green dot). In order to do that, you will have to create a variable to record all user guesses.

Before start coding, make sure you understand the problem statement and the implementation plan. Please test your program to make sure everything works and document the program properly. The program will be graded based on coding style, logic, syntax and correct output.

The following is one example of the test run result and the corresponding plot:

```
Please enter a difficulty level (1-easy, 2-medium, 3-hard): 2
Location x [0, 10]: 5
Location y [0, 10]: 6
Sorry, try again!
```

```
Move left and down.
Please input the location x: 2
Please input the location y: 3
Sorry, try again!
Move right and up.
Please input the location x: 4
Please input the location y: 4
Sorry, try again!
Move left and up.
Please input the location x: 3
Please input the location y: 5
You got it after 4 guesses.
```

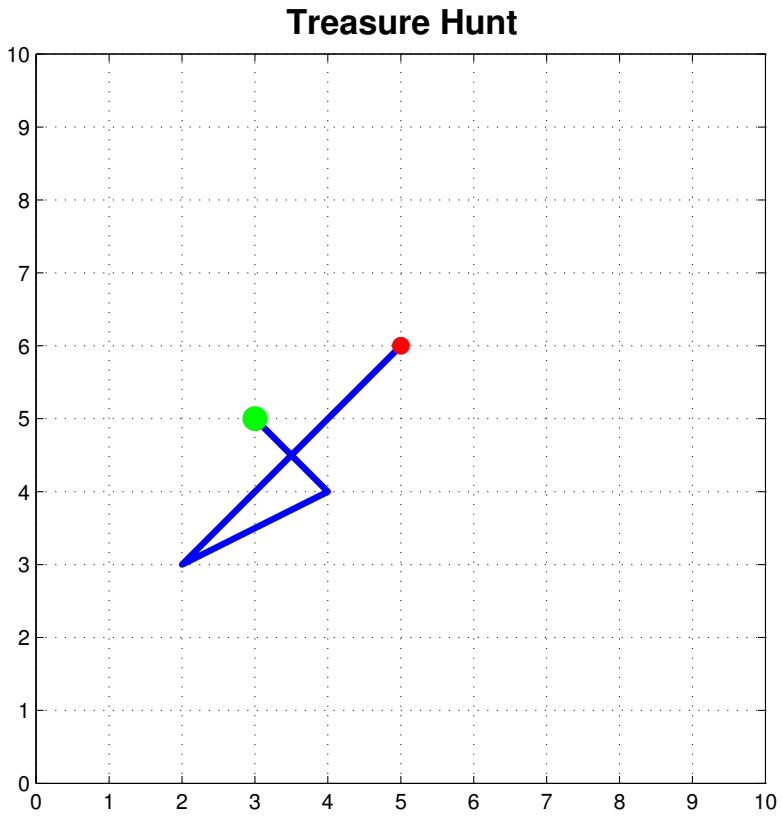


**Figure 1.** Treasure Hunt.

### 3.1 Lab Project Submission and Demonstration

Please create folders for each problem. If there are source data required to run your program, you need to put the data under the same folder, so that as soon as I unzip your code, I can test your code. Please zip all the folders that contain programs you want to submit and name it `YourFirstname_P4.zip`, submit the zipped file to the WISE dropbox before 11:59PM on Nov 1. You need to demonstrate your program and answer questions in order to get credits.