

# Experiment 8: Random Number Generation

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Res. Asst. Tuğba Pamay Arslan

*pamay@itu.edu.tr*

## 1 Introduction

In this experiment, you will implement a random number generator with C language. Circuit designs of each part will be given in sections below.

- You are not allowed to use `delay()` function. Hint: You can use `millis()` function.
- You can not use block programming provided by Tinkercad.
- You must add comments for each line. Otherwise, you will get zero point.
- You can not use `digitalWrite()` and `pinMode()` functions.

## 2 Part 1

In this part, you will program the circuit whose design is presented in Figure 1 ([Design link](#)). This circuit will generate random numbers using *Additive Lagged Fibonacci Generator* (**ALFG**) approach. PIN#3 is used to interrupt the Arduino to generate a new random number between 0-16 and show it on the 7-segment display. In this experiment, `k` value is 2 for ALFG algorithm. That is, you will use two previous random numbers to generate the next one. Also, `void loop()` function must be empty.

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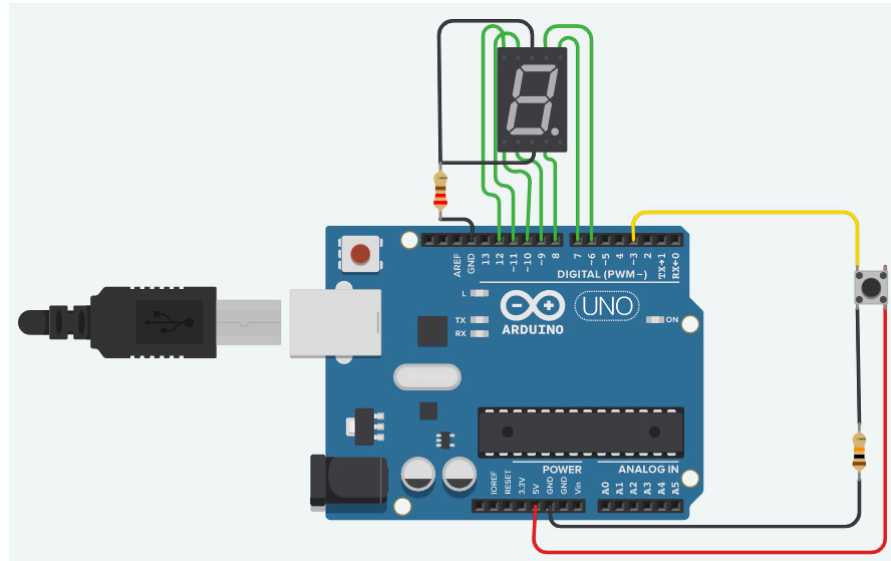


Figure 1: Part #1 diagram.

### 3 Part 2

In this part, you are going to use the Random Number Generator (RNG) in Part1. Use P#3 as button to interrupt the Arduino to generate  $m$  random number between 0-8(8 is not included) and write them into **dynamically** allocated memory locations (e.g. dynamically allocated array). This  $m$  value is taken from user over serial monitor. For this operation, user should be informed with a proper message, such as "Please enter a  $m$  value:" and program waits the input from user at this step. After input is read, Arduino will be interrupted and RNG starts running with the given  $m$  value. After generating all random numbers, check that how much the distribution of the random numbers generated from your random number generator close uniform. You can use counting to check the uniformity. At the end of the program, you must print how many times were produced from which number on the serial monitor. Show your work with different amount of random numbers and with different intervals of random numbers. For this experiment, you can use the same design in Part1, but now you do not need 7-segment display. Also, void loop() function must be empty.

### 4 Submission

- You should upload your experiment codes and report on Ninova, and please, do not send your experiment files via e-mail.
- You must upload each part's code separately to the ninova.

- Your reports must be written with Latex format. Latex report template is available on Ninova. You can use any Latex editor whichever you want. If you upload your report without Latex file, you directly get 0 as your report grade. You should upload both .pdf and .tex files of your report.
- Finally, please do not forget that late submissions are not accepted.