

EE351 Module-01: Game of numbers

Goal of the module: The goal of this module is to learn the use of Arduino UNO pins as digital output and input pins. In order to do so we need to use the function `pinMode()`.

Pre-lab work:

1. Read about the syntax `pinMode()` from [1].
2. Read about the syntax `tone()` to be used for the piezo buzzer (see [2]).
3. Read about seven segment displays (common anode/cathode) and BCD to 7-segment decoder.
4. Simulate a simple LED blinking program in TinkerCAD (Link in [3])) first to get used to writing codes in Arduino. This program needs to be demonstrated in the lab before starting the actual module.

TinkerCad supports Arduino simulation. To start make a students account in TinkerCad.

Steps: Login — Circuits — Create in circuit — Assemble using the components.

5. Simulate the entire system to be designed for Module-01 in TinkerCad. (No demonstration required)

Module-01 Objectives: Demonstrate the LED blinking program (part of Pre-Lab) in the lab to the TAs. You can proceed to implementing the actual module only after you have demonstrated this pre-lab assignment to the TAs.

- A. Design a 10 second timer using pins of Arduino UNO as output. While designing autonomous systems, it is important to use the pins of the processor wisely and economically. Hence, use a BCD to 7-segment decoder. We will use this timer in the next objective. Try to write an efficient code using loops, if required.
- B. Implement a 2-player game in Arduino (with one of the players being the Arduino). The rules of the game are
 - (a) The game is between the Arduino board (say Player A) and you (say Player B).

- (b) At first Player A will display a random number in the seven segment display (0-9). Say the number displayed is x . This will be displayed in the 7-segment display for 2 seconds. After 2 seconds the timer designed in Objective A starts. Player B will have to input the number one's complement of $x \bmod 3$ with the help of switches connected to the Arduino board within the 10 seconds being displayed in the timer.
- (c) To signal if the answer by Player B is correct or wrong, a buzzer would be used. If Player B is correct, then the buzzer would beep once. Else the buzzer would give beep thrice to indicate that the answer is wrong. *The three beeps for wrong answer should sound different.*
- (d) Player B needs to input his/her answer within 10 seconds. The timer designed in Objective A will be used to display the time.
- The timer should count from 0 - 9 and stop at the tenth second. This means that the timer should display 0 at the end of the count.

Report Guidelines: The report to be submitted must have the following:

1. Objectives of the module.
2. Circuit diagram with proper labelling.
3. Block diagram of the system designed (for Objective 1B).
4. Flowchart of the algorithm.
5. Observations, if any.
6. Answers to the questions below.

Answer the following:

1. How did you achieve a delay of 1 sec for the timer? Explain in details the working principle.
2. What is the input supplied to the piezo-buzzer? Explain the working principle of the piezo-buzzer based on the input you provided.
3. Is the system developed in Objective B a control system? Justify.

References

- [1] <https://www.arduino.cc/reference/en/language/functions/digital-io/pinmode/>
- [2] <https://www.arduino.cc/reference/en/language/functions/advanced-io/tone/>
- [3] <https://www.tinkercad.com/>