Experiment 4: Using Analog Inputs & Outputs

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1 Introduction

In this experiment, you will generate various resistance values by helping of potentiometer, read these values from analog inputs and observe the related outputs on RGB LED and 7-segment display as required. Circuit designs of each part will be given in sections below.

- **You can not use any loop statement and recursive functions except main LOOP label.**
- **You are 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.**

2 Part 1

In this part, you will program the circuit whose design is presented in Figure 1 (Design link). You will use `analogRead()` and `analogWrite()` functions provided by Ardunio in this part. Also, you can use `pinMode()` function to adjust ports as I/O. Basically, resistance values are read from analog input pins. Each leg of RGB LED is connected to one of the PVM output pins. According to values read from potentiometer, RGB lights will turn on with different brightness. Resistances are 150 Ω.
HINT: Be careful about the range of analog values of analog read and write functions. That is, you should make a pre-processing on analog input before writing it to PVM output.

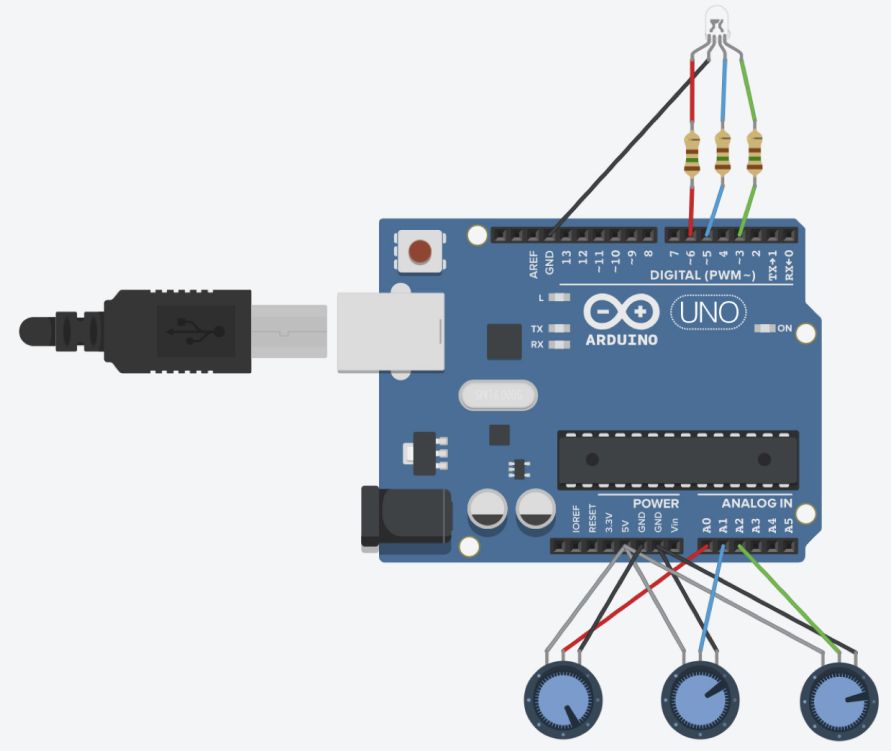

Figure 1: Part #1 diagram.

3 Part 2

In this part, you will observe the last digit of analog input value on a 7-Segment Display and the related design is given in Figure 2 (Design link). Therefore, you need to parse the analog input's last digit firstly, then observe the digit on display. Similar to Part1, analog input value is obtained by potentiometer. 7-Segment Display has common anode so that you should be careful about what bytes are assigned to 7-Segment Display ports (A,B,...,G) to observe the correct digit. The important thing is that these related port values (bytes) must be read from memory. That is, these values are stored in memory (e.g. array), and read from there.

In this design, a PNP Transistor (BJT) is also used to make active the display whenever it is needed and transistor is connected to bottom common pin of display. You can read potentiometer value by `analogRead()` function. Output values are written to ports with assignment operation, so you cannot use any write function in this step. Resistance values of display are 100 Ω and the other is and 4 $k\Omega$.

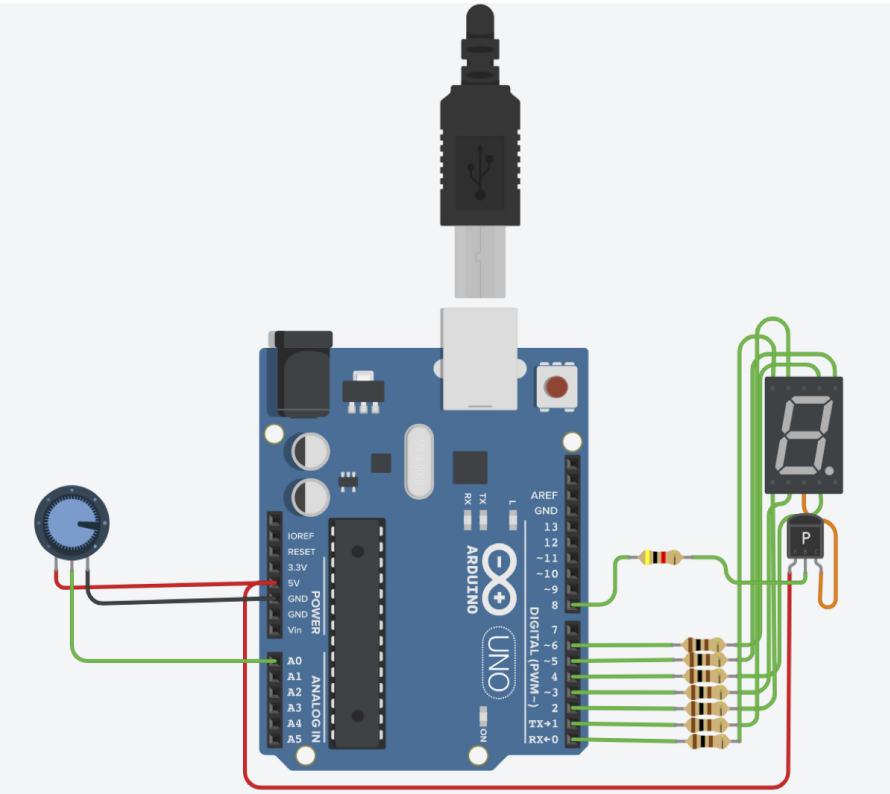

Figure 2: Part #2 diagram.

4 Part 3

In this experiment, you will implement the 4-digit version of the Part #2 and the design is given in Figure 3 (Design link). The working mechanism is very similar with the Part #2. For this time, you will observe the analog input value on displays, not only its last digit. Resistance values, constraints are the same with the previous part. You can read potentiometer value by `analogRead()` function. Output values are written to ports with assignment operation, so you cannot use any write function in this step.

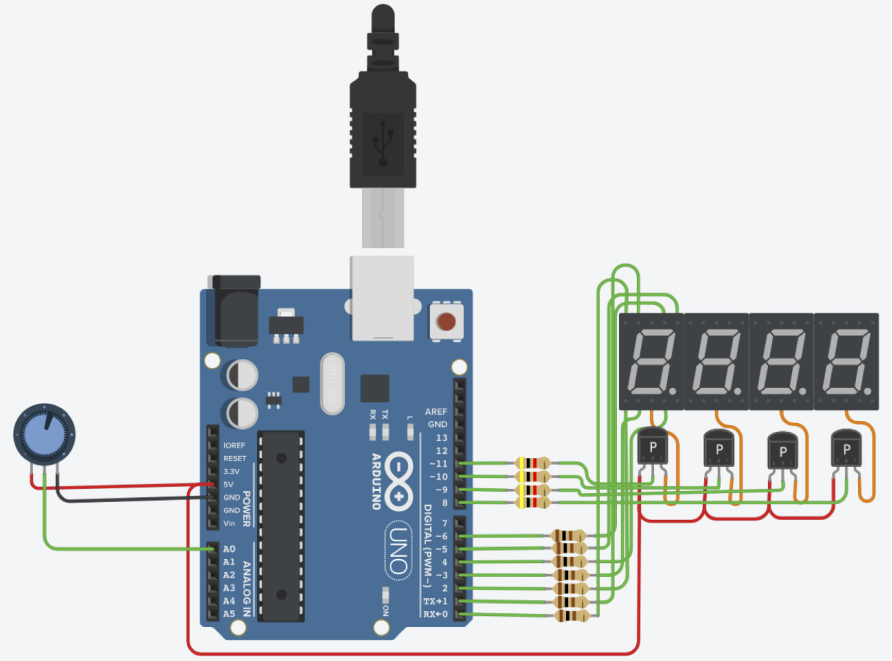

Figure 3: Part #3 diagram.

5 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 seperately 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.