



Department of Electrical & Computer Engineering
ENCS4380 - INTERFACING TECHNIQUES

Homework 2

Arduino UNO inputs/outputs basic operations

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Section 1

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Idea behind the design:

First, we built the BCD Decoder circuit using Tinkercad in order to simulate and test before implementing it using hardware components. We developed a code that receives three inputs through push buttons, these inputs represent the 3-bit binary number decoded by our circuit. Since it is a 3-bit input, the output will be produced through 8 (2^3) pins as signals that lighten up 8 LEDs. The circuit acts like an active high decoder, with active low enable signal.

In Tinkercad the following components were used:

1. 8 LEDs
2. 4 push buttons
3. 12 $1k\Omega$ resistors
4. Arduino UNO
5. Breadboard
6. Some wires

After that, the code was developed using C++, and simulated on the virtual circuit to make sure it is logically correct. The final circuit was as shown in the following figure:

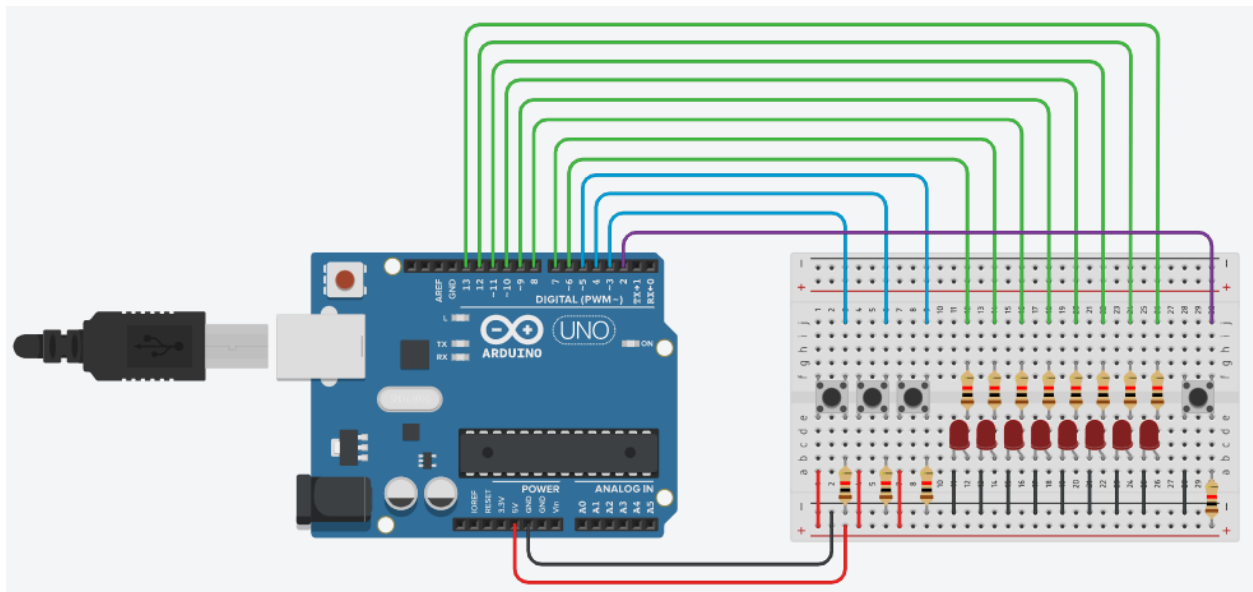


Figure 1: Tinkercad Circuit

The code is attached in [Appendix A](#).

Then, we started to connect the hardware circuit as designed virtually using the same mentioned components, expect that the resistors used were 220Ω instead of $1k\Omega$, because there were no $1k\Omega$ ones in the lab. The code was downloaded on the Arduino chip using Arduino IDE.

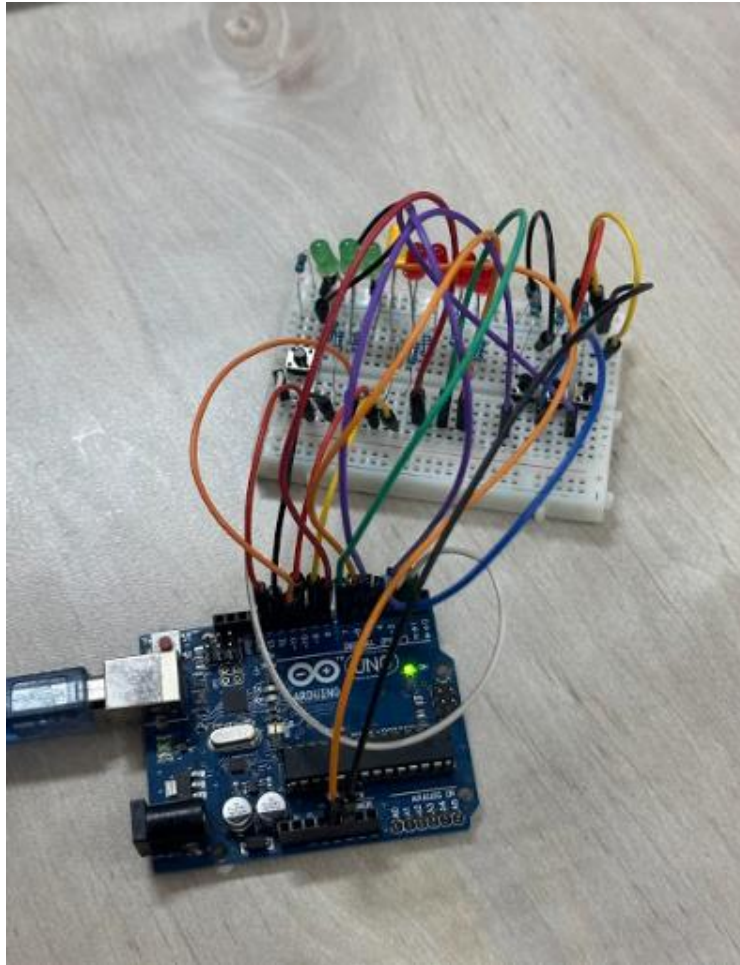


Figure 2: Connected 3-8 BCD decoder in hardware

Problems faced:

During the hardware part, we suffered from unexpected outputs, due to some problems in the hardware components. The first problem was caused by having a defected pin in the Arduino we used. The second was caused by having a damaged LED and wire that we needed to change to get a correct output for the BCD decoder.

Also, while we were connecting the circuit, we have noticed the floating pins problem, which happened when the pull-down circuit for some buttons was disconnected.

Links:

The following link shows a drive that contains videos and photos of our circuit:

<https://drive.google.com/drive/folders/1T6s32LDOR2-pcMmciR9KrU4B-TzRTzcU?fbclid=IwAR3RUe5sbJccyd58aGAJpVBknHQI75PsGRZdz-WEFHX3l5YTTiURaJnEiog>

And the following link shows the simulated circuit using Tinkercad

<https://www.tinkercad.com/things/aAnAImqAW7b?sharecode=-e-eC6zyPdmDCimWQWHi5YKwlSiMIQg5ntsnVdydmzo>

Appendices:

Appendix A:

```
#define b0 5
#define b1 4
#define b2 3
int en=1;
int dec;
void setup(){
    for(int i = 6; i <= 13; i++){
        pinMode(i, OUTPUT);
    }
    for(int i=3; i<=5; i++){
        pinMode(i, INPUT);
    }
    attachInterrupt(0,enable,CHANGE);
}
void enable(){
    en = digitalRead(2);
}
void loop(){
    if(!en){
        int prevDec = dec;
        dec = digitalRead(b2) << 2;
        dec += digitalRead(b1) << 1;
        dec += digitalRead(b0);
        digitalWrite(prevDec + 6, LOW);
        digitalWrite(dec + 6, HIGH);
    }
    delay(500); // Wait for 500 millisecond(s)
}
```