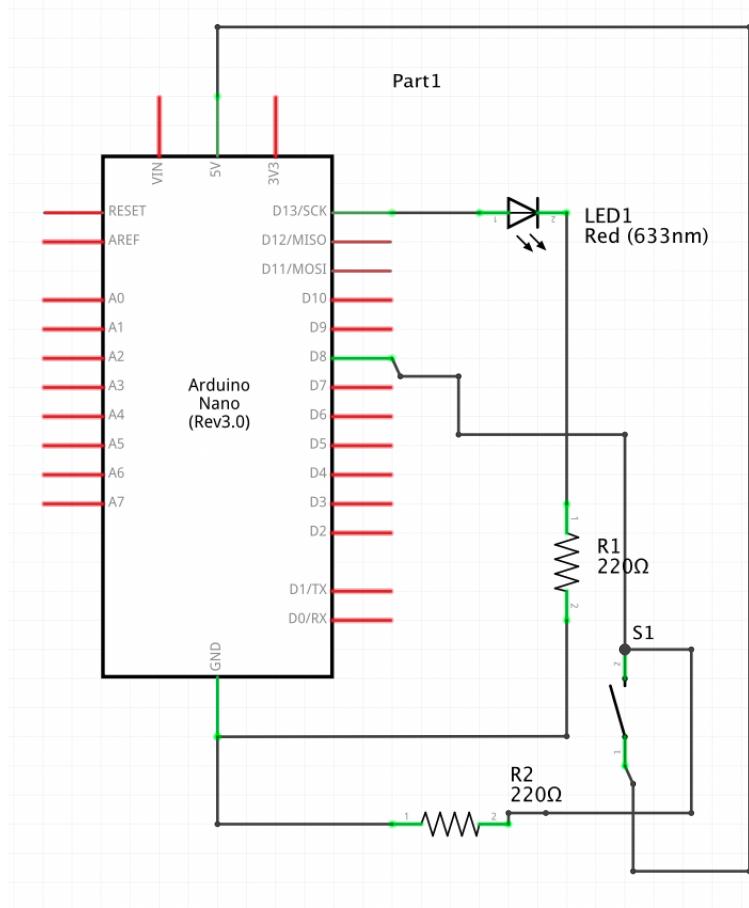
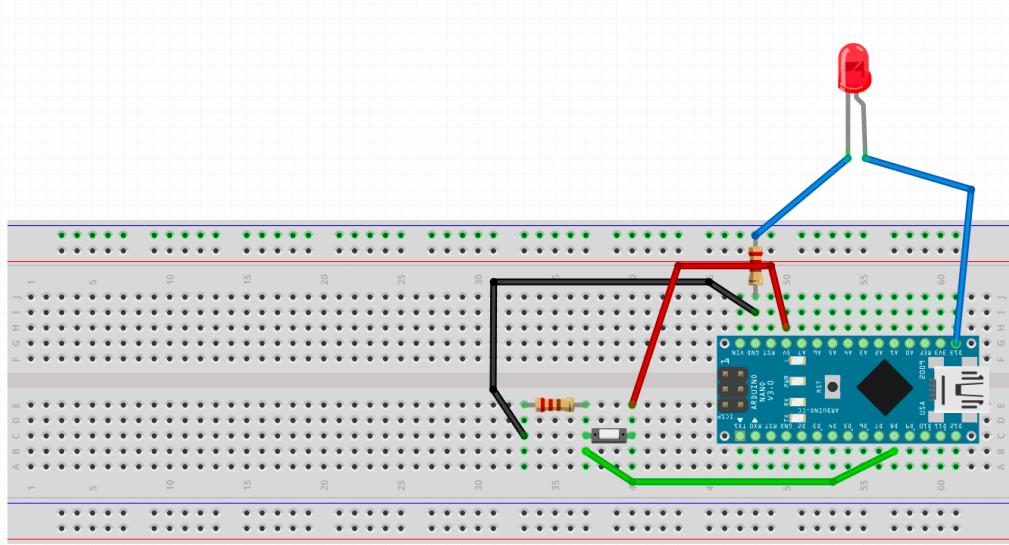
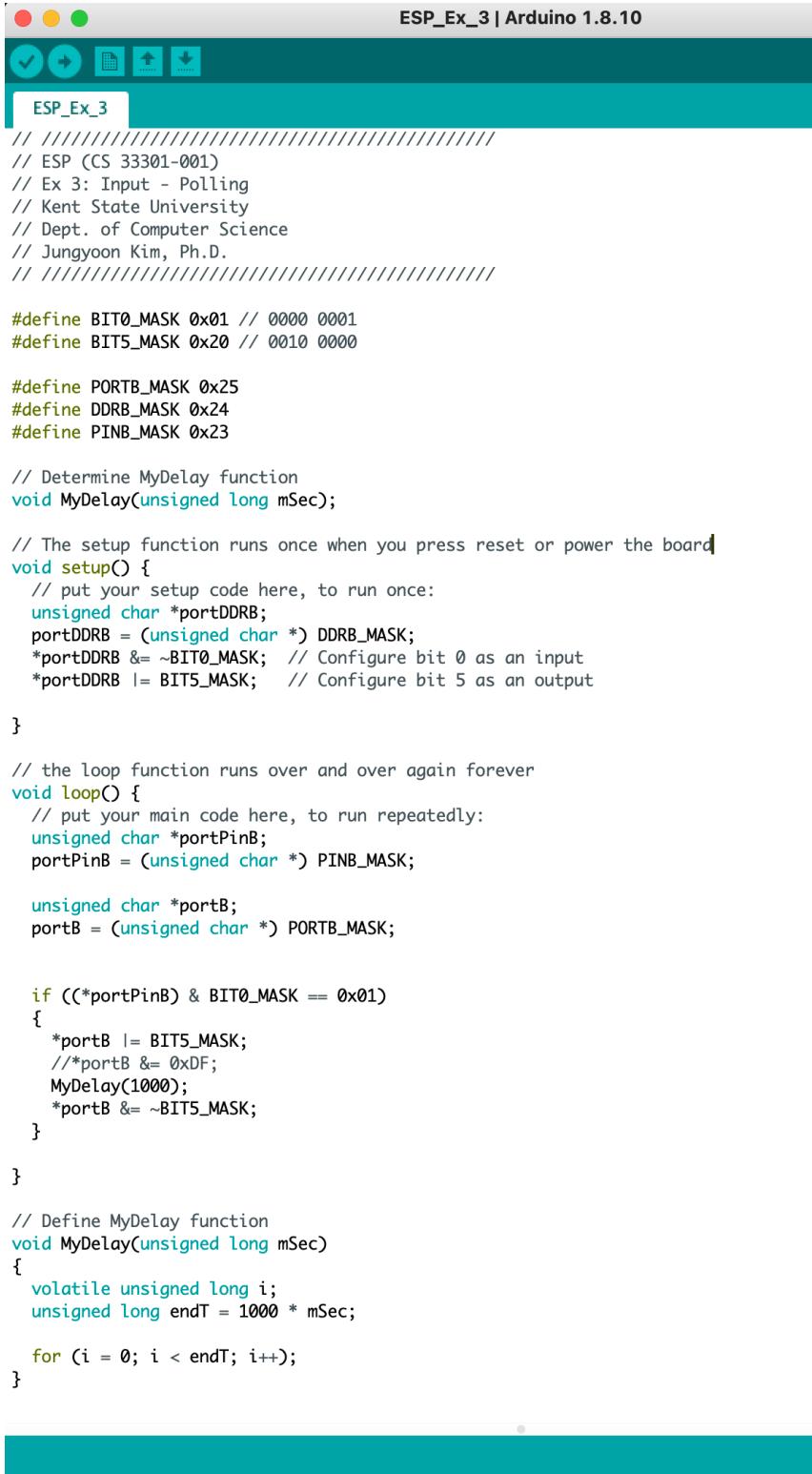


Project 1: Input (Polling) Instruction

One external LED with one resistor

One extern switch with pull-down resistor (resister value can be different)





The screenshot shows the Arduino IDE interface with the title bar "ESP_Ex_3 | Arduino 1.8.10". Below the title bar are standard toolbar icons for file operations like Open, Save, and Print. The main workspace contains the following C++ code:

```
// ///////////////////////////////////////////////////////////////////
// ESP (CS 33301-001)
// Ex 3: Input - Polling
// Kent State University
// Dept. of Computer Science
// Jungyo Kim, Ph.D.
// ///////////////////////////////////////////////////////////////////

#define BIT0_MASK 0x01 // 0000 0001
#define BIT5_MASK 0x20 // 0010 0000

#define PORTB_MASK 0x25
#define DDRB_MASK 0x24
#define PINB_MASK 0x23

// Determine MyDelay function
void MyDelay(unsigned long mSec);

// The setup function runs once when you press reset or power the board
void setup() {
    // put your setup code here, to run once:
    unsigned char *portDDRB;
    portDDRB = (unsigned char *) DDRB_MASK;
    *portDDRB &= ~BIT0_MASK; // Configure bit 0 as an input
    *portDDRB |= BIT5_MASK; // Configure bit 5 as an output
}

// the loop function runs over and over again forever
void loop() {
    // put your main code here, to run repeatedly:
    unsigned char *portPinB;
    portPinB = (unsigned char *) PINB_MASK;

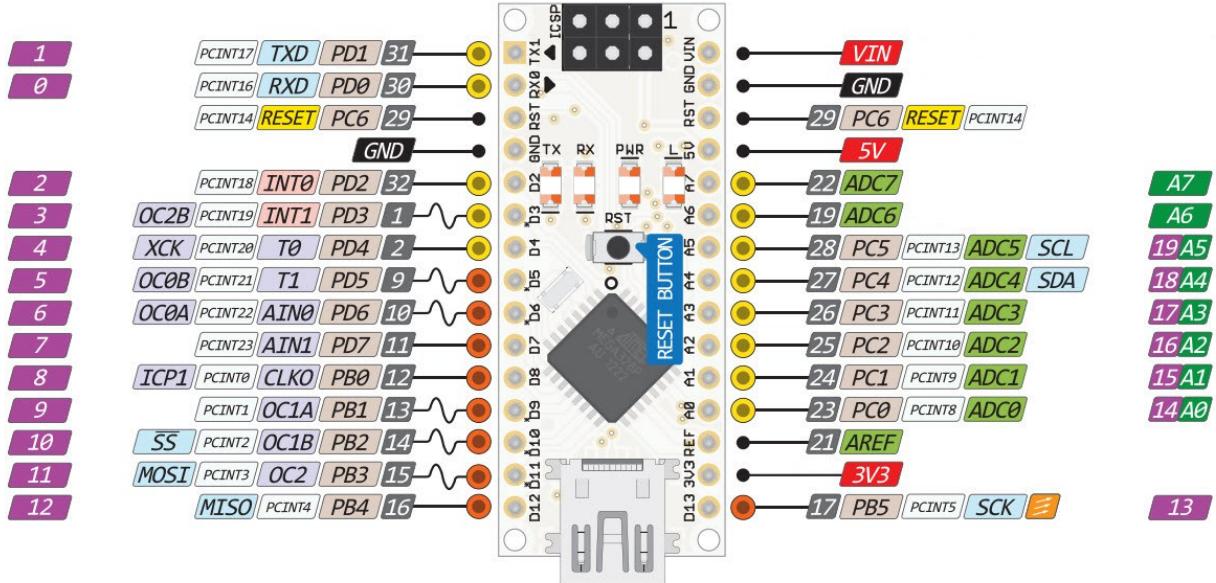
    unsigned char *portB;
    portB = (unsigned char *) PORTB_MASK;

    if ((*portPinB) & BIT0_MASK == 0x01)
    {
        *portB |= BIT5_MASK;
        /*portB &= 0xDF;
        MyDelay(1000);
        *portB &= ~BITS5_MASK;
    }
}

// Define MyDelay function
void MyDelay(unsigned long mSec)
{
    volatile unsigned long i;
    unsigned long endT = 1000 * mSec;

    for (i = 0; i < endT; i++);
}
```

Arduino Programming with GPIO registers.



6.4.1 PORTB - THE PORT B DATA REGISTER

Bit	7	6	5	4	3	2	1	0
0x25	PORTB7	PORTB6	PORTB5	PORTB4	PORTB3	PORTB2	PORTB1	PORTB0
Read/Write	R/W							
Default	0	0	0	0	0	0	0	0

- PORTB7-0: GPIO data value stored in bit n .

6.4.2 DDRB - THE PORT B DATA DIRECTION REGISTER

Bit	7	6	5	4	3	2	1	0
0x24	DDRB7	DDRB6	DDRB5	DDRB4	DDRB3	DDRB2	DDRB1	DDRB0
Read/Write	R/W							
Default	0	0	0	0	0	0	0	0

- DDRB7-0: selects the direction of pin n . If DDRB_n is written '1', then PORTB_n is configured as an output pin. If DDRB_n is written '0', then PORTB_n is configured as an input pin.

6.4.3 PINB - THE PORT B INPUT PINS ADDRESS

Bit	7	6	5	4	3	2	1	0
0x23	PINB7	PINB6	PINB5	PINB4	PINB3	PINB2	PINB1	PINB0
Read/Write	R	R	R	R	R	R	R	R
Default	-	-	-	-	-	-	-	-

- PINB7-0: logic value present on external pin n .

6.4.4 PORTC - THE PORT C DATA REGISTER

Bit	7	6	5	4	3	2	1	0
0x28	-	PORTC6	PORTC5	PORTC4	PORTC3	PORTC2	PORTC1	PORTCO
Read/Write	R	R/W						
Default	0	0	0	0	0	0	0	0

- PORTC6-0: GPIO data value stored in bit n .

6.4.5 DDRC - THE PORT C DATA DIRECTION REGISTER

Bit	7	6	5	4	3	2	1	0
0x27	-	DDRC6	DDRC5	DDRC4	DDRC3	DDRC2	DDRC1	DDRC0
Read/Write	R	R/W						
Default	0	0	0	0	0	0	0	0

6.4.6 PINC - THE PORT C INPUT PINS ADDRESS

Bit	7	6	5	4	3	2	1	0
0x26	-	PINC6	PINC5	PINC4	PINC3	PINC2	PINC1	PINCO
Read/Write	R	R	R	R	R	R	R	R
Default	0	-	-	-	-	-	-	-

- PINC6-0: logic value present on external pin n .

6.4.7 PORTD - THE PORT D DATA REGISTER

Bit	7	6	5	4	3	2	1	0
0x2B	PORTD7	PORTD6	PORTD5	PORTD4	PORTD3	PORTD2	PORTD1	PORTDO
Read/Write	R/W							
Default	0	0	0	0	0	0	0	0

- PORTD7-0: GPIO data value stored in bit n .

6.4.8 DDRD - THE PORT D DATA DIRECTION REGISTER

Bit	7	6	5	4	3	2	1	0
0x2A	DDRD7	DDRD6	DDRD5	DDRD4	DDRD3	DDRD2	DDRD1	DDRD0
Read/Write	R/W							
Default	0	0	0	0	0	0	0	0

- DDRD7-0: selects the direction of pin n . If DDRDn is written '1', then PORTDn is configured as an output pin. If DDRDn is written '0', then PORTDn is configured as an input pin.

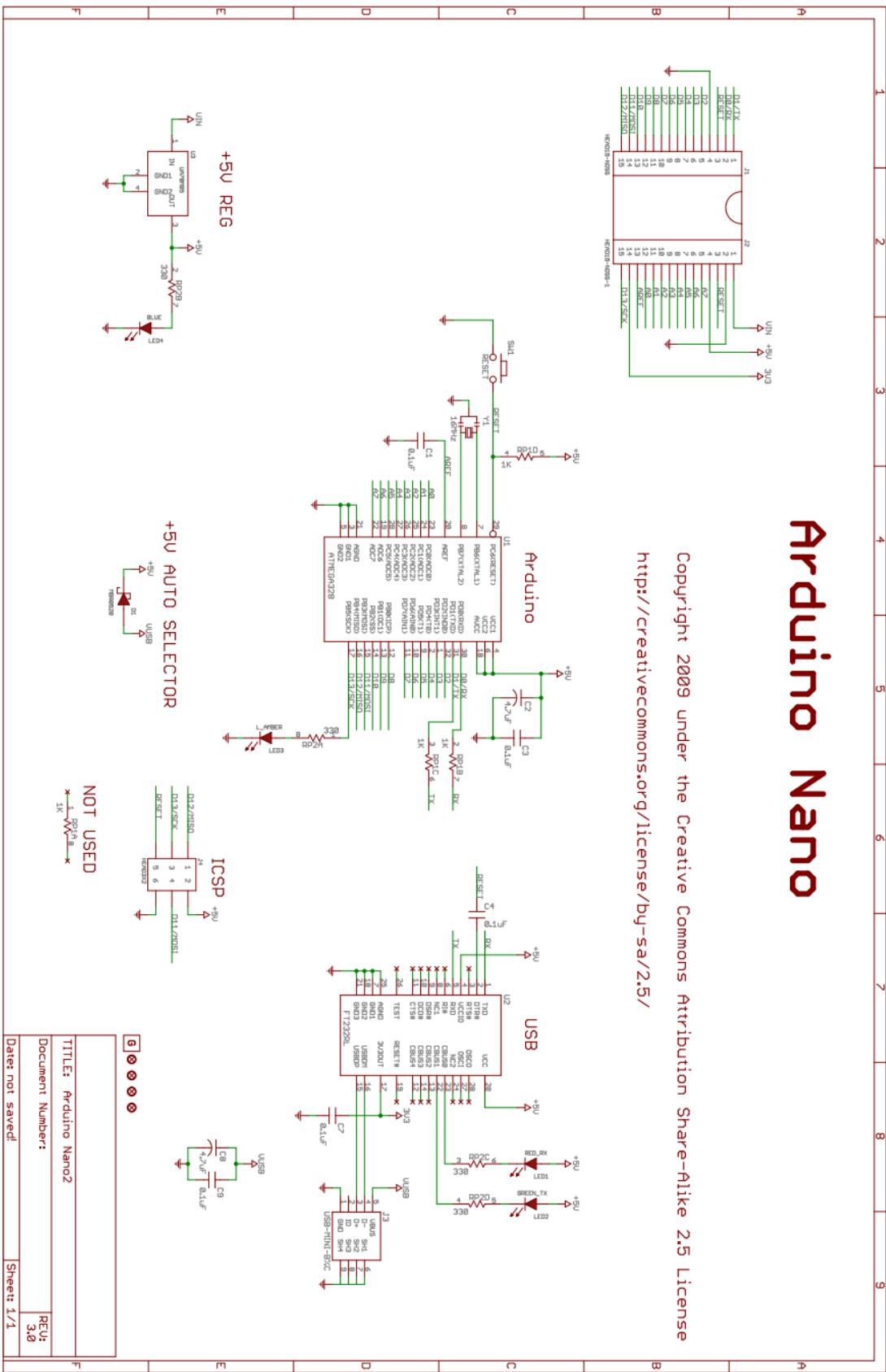
6.4.9 PIND - THE PORT D INPUT PINS ADDRESS

Bit	7	6	5	4	3	2	1	0
0x29	PIND7	PIND6	PIND5	PIND4	PIND3	PIND2	PIND1	PIND0
Read/Write	R	R	R	R	R	R	R	R
Default	-	-	-	-	-	-	-	-

- PIND7-0: logic value present on external pin n .

Arduino Nano

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Project 1. Write a program with Appropriate Comments

HW Connection: Using Port B bit 3 for input switch and Port D bit 5 for output LED

1. Initial state: LED ON

After 1 second - Push button → LED OFF

After 1 second - Push again → LED ON

After 1 second - Push again → LED OFF

...

2. initial state: internal LED ON and external LED OFF with optimal delayed value

After 1 second - Push again → External LED OFF and internal LED ON with optimal delayed value

After 1 second - Push again → External LED ON with optimal delayed value and internal LED OFF

After 1 second - Push again → External LED OFF and internal LED ON with optimal delayed value