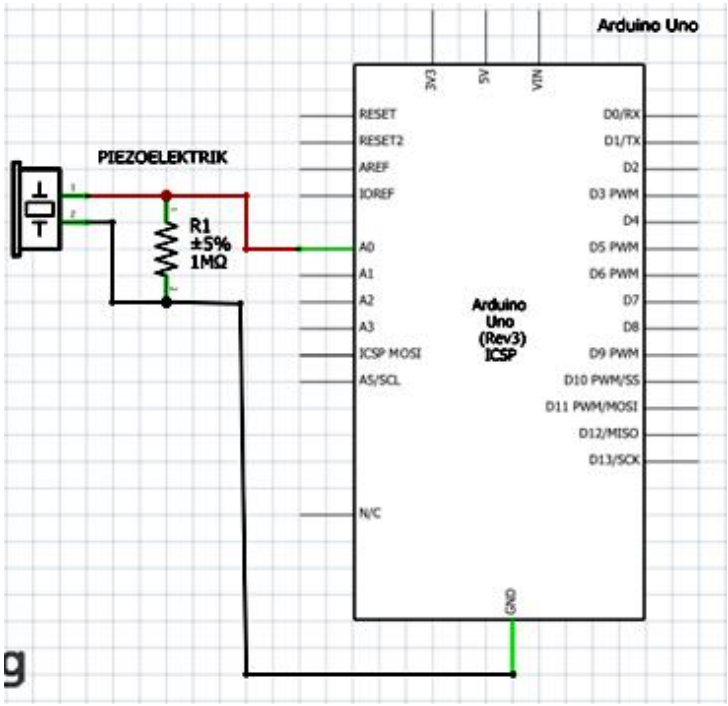
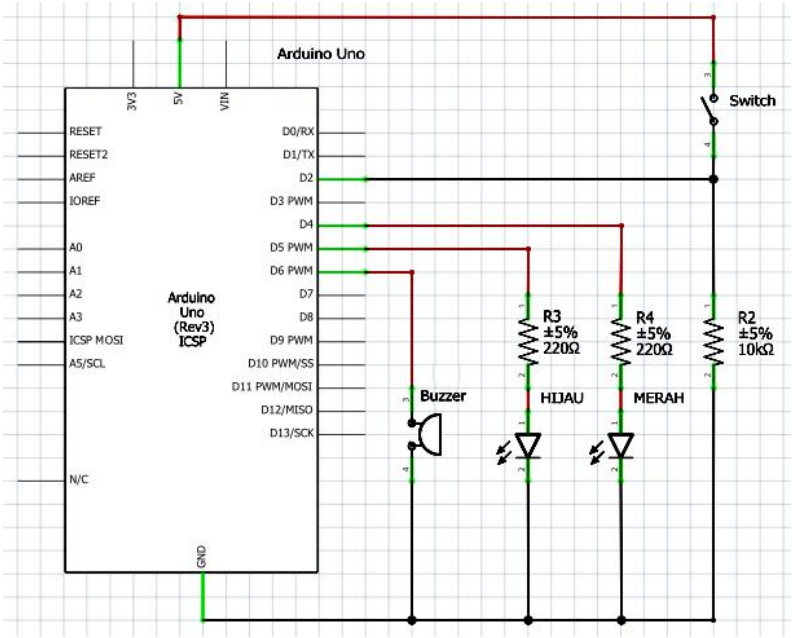
LAMPIRAN 1

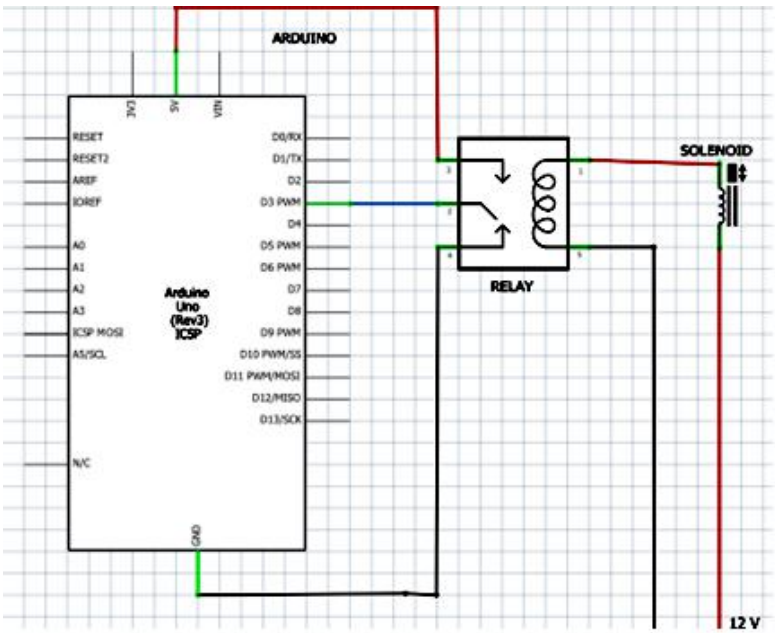
1. Skema Rangkaian *Arduino* dengan *Piezoelektrik*



2. Rangkaian Skema *Arduino* dengan *Tombol Rekam*



3. Rangkaian Skema Arduino dengan *Solenoid DC*



LAMPIRAN 2

Cooding Pintu Otomatis Menggunakan Pola Ketukan

```
  Analog Pin 0: Piezo speaker
  Digital Pin 2: Digunakan untuk memprogram ketukan
  Digital Pin 3: Relay
  Digital Pin 4: Red LED.
  Digital Pin 5: Green LED.
  Digital Pin 6: Buzzer
 */
#define RELAY_ON 0
#define RELAY_OFF 1
#define RELAY_1  3   // pin yang digunakan yaitu pin 3

// Pin yang digunakan
const int knockSensor = 0;        // Piezo sensor di pin 0.
const int programSwitch = 2;      // digunakan untuk memprogram ketukan baru
const int redLED = 4;             // Status LED
const int greenLED = 5;           // Status LED
const int buzzer = 6;

const int threshold = 3;          // Minimum signal from the piezo to register as a
knock
const int rejectValue = 25;       // If an individual knock is off by this percentage of a
knock we don't unlock..
const int averageRejectValue = 15; // If the average timing of the knocks is off by
this percent we don't unlock.
```

```
const int knockFadeTime = 150;     // milliseconds we allow a knock to fade before
we listen for another one. (Debounce timer.)

const int lockTurnTime = 650;      // milliseconds that we run the motor to get it to
go a half turn.

const int maximumKnocks = 20;       // Maximum number of knocks to listen for.

const int knockComplete = 1200;     // Longest time to wait for a knock before we
assume that it's finished.


// Variables.

int secretCode[maximumKnocks] = {50, 25, 25, 50, 100, 50, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0}; 

int knockReadings[maximumKnocks];

int knockSensorValue = 0;

int programButtonPressed = false;


void setup() {

  pinMode(RELAY_1, OUTPUT);

  digitalWrite(RELAY_1, RELAY_OFF);

  pinMode(redLED, OUTPUT);

  pinMode(greenLED, OUTPUT);

  pinMode(buzzer, OUTPUT);

  pinMode(programSwitch, INPUT);


  Serial.begin(9600);

  Serial.println("Program start.");

  digitalWrite(greenLED, HIGH);

}
```

```
void loop() {
  // Listen for any knock at all.
  knockSensorValue = analogRead(knockSensor);

  if (digitalRead(programSwitch)==HIGH){  // is the program button pressed?
    programButtonPressed = true;          // Yes, so lets save that state
    digitalWrite(redLED, HIGH);           // and turn on the red light too so we know
we're programming.
  } else {
    programButtonPressed = false;
    digitalWrite(redLED, LOW);
  }

  if (knockSensorValue >=threshold){
    listenToSecretKnock();
  }
}

// Records the timing of knocks.
void listenToSecretKnock(){
  Serial.println("knock starting");
  int i = 0;
  // First lets reset the listening array.
  for (i=0;i<maximumKnocks;i++){
    knockReadings[i]=0;
  }
```

```
  int currentKnockNumber=0;                    // Incrementer for the array.

  int startTime=millis();                      // Reference for when this knock
started.

  int now=millis();

  digitalWrite(greenLED, LOW);                 // we blink the LED for a bit as a
visual indicator of the knock.

  if (programButtonPressed==true){

    digitalWrite(redLED, LOW);                // and the red one too if we're
programming a new knock.

  }

  delay(knockFadeTime);                       // wait for this peak to fade before we
listen to the next one.

  digitalWrite(greenLED, HIGH);

  if (programButtonPressed==true){

    digitalWrite(redLED, HIGH);

  }

  do {

   //listen for the next knock or wait for it to timeout.

   knockSensorValue = analogRead(knockSensor);

   if (knockSensorValue >=threshold){

     //record the delay time.

     Serial.println("knock.");

     now=millis();

     knockReadings[currentKnockNumber] = now-startTime;

     currentKnockNumber ++;

     startTime=now;

     // and reset our timer for the next knock
```

```
    digitalWrite(greenLED, LOW);
    if (programButtonPressed==true){
      digitalWrite(redLED, LOW);                    // and the red one too if we're
programming a new knock.
    }
    delay(knockFadeTime);                           // again, a little delay to let the knock
decay.
    digitalWrite(greenLED, HIGH);
    if (programButtonPressed==true){
      digitalWrite(redLED, HIGH);
    }
  }

  now=millis();

  //did we timeout or run out of knocks?
 } while ((now-startTime < knockComplete) && (currentKnockNumber <
maximumKnocks));

 //we've got our knock recorded, lets see if it's valid
 if (programButtonPressed==false){            // only if we're not in progrmaing mode.
  if (validateKnock() == true){
    triggerDoorUnlock();
  } else {
    Serial.println("Secret knock failed.");
    digitalWrite(greenLED, LOW);                    // We didn't unlock, so blink the red
LED as visual feedback.
```

```
    for (i=0;i<4;i++){
      digitalWrite(redLED, HIGH);
      digitalWrite(buzzer, HIGH);
      delay(1000);
      digitalWrite(redLED, LOW);
      digitalWrite(buzzer, LOW);
      delay(100);
    }
    digitalWrite(greenLED, HIGH);
  }
} else { // if we're in programming mode we still validate the lock, we just don't do
anything with the lock
  validateKnock();
  // and we blink the green and red alternately to show that program is complete.
  Serial.println("New lock stored.");
  digitalWrite(redLED, LOW);
  digitalWrite(greenLED, HIGH);
  for (i=0;i<3;i++){
    delay(100);
    digitalWrite(redLED, HIGH);
    digitalWrite(greenLED, LOW);
    delay(100);
    digitalWrite(redLED, LOW);
    digitalWrite(greenLED, HIGH);
  }
}
```

```
}
// Runs the motor (or whatever) to unlock the door.
void triggerDoorUnlock(){
  Serial.println("Door unlocked!");
  int i=0;

  digitalWrite(RELAY_1, RELAY_ON); //lampu menyala 2 detik
  digitalWrite(greenLED, HIGH);           // And the green LED too.
  delay (10000);                  // Wait a bit.
  digitalWrite(RELAY_1, RELAY_OFF);

  // Blink the green LED a few times for more visual feedback.
  for (i=0; i < 5; i++){
     digitalWrite(greenLED, LOW);
     delay(100);
     digitalWrite(greenLED, HIGH);
     delay(100);
  }
}
// Sees if our knock matches the secret.
// returns true if it's a good knock, false if it's not.
// todo: break it into smaller functions for readability.
boolean validateKnock(){
  int i=0;

  // simplest check first: Did we get the right number of knocks?
```

```
int currentKnockCount = 0;
int secretKnockCount = 0;
int maxKnockInterval = 0;                    // We use this later to normalize the times.

for (i=0;i<maximumKnocks;i++){
  if (knockReadings[i] > 0){
    currentKnockCount++;
  }
  if (secretCode[i] > 0){                    //todo: precalculate this.
    secretKnockCount++;
  }

  if (knockReadings[i] > maxKnockInterval){    // collect normalization data while
we're looping.
    maxKnockInterval = knockReadings[i];
  }
}

// If we're recording a new knock, save the info and get out of here.
if (programButtonPressed==true){
    for (i=0;i<maximumKnocks;i++){ // normalize the times
      secretCode[i]= map(knockReadings[i],0, maxKnockInterval, 0, 100);
    }
    // And flash the lights in the recorded pattern to let us know it's been
programmed.
    digitalWrite(greenLED, LOW);
```

```
    digitalWrite(redLED, LOW);
    delay(1000);
    digitalWrite(greenLED, HIGH);
    digitalWrite(redLED, HIGH);
    delay(50);
    for (i = 0; i < maximumKnocks ; i++){
      digitalWrite(greenLED, LOW);
      digitalWrite(redLED, LOW);
      // only turn it on if there's a delay
      if (secretCode[i] > 0){
        delay( map(secretCode[i],0, 100, 0, maxKnockInterval)); // Expand the time
back out to what it was.  Roughly.
        digitalWrite(greenLED, HIGH);
        digitalWrite(redLED, HIGH);
      }
      delay(50);
    }
            return false;     // We don't unlock the door when we are recording a new
knock.
  }


  if (currentKnockCount != secretKnockCount){
    return false;
  }
  /*  untuk membandingkan interval relatif mengetuk pada sensor
 */
```

```
  int totaltimeDifferences=0;
  int timeDiff=0;
  for (i=0;i<maximumKnocks;i++){
    knockReadings[i]= map(knockReadings[i],0, maxKnockInterval, 0, 100);
    timeDiff = abs(knockReadings[i]-secretCode[i]);
    if (timeDiff > rejectValue){
      return false;
    }
    totaltimeDifferences += timeDiff;
  }
  if (totaltimeDifferences/secretKnockCount>averageRejectValue){
    return false;
  }
  return true;
}
```