POLITECHNIKA ŚWIĘTOKRZYSKA

LABORATORIUM TECHNOLOGIE IOT

Numer ćwiczenia:	**Temat ćwiczenia:**	Damian Zdyb
4	Temat nr 4	
Data wykonania:	**Data oddania do sprawdzenia:**	**Ocena:**
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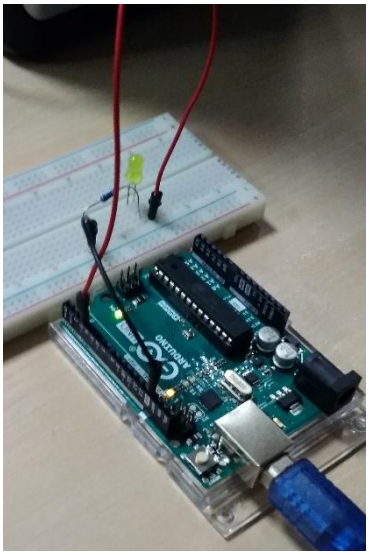
Cel:

1. Praktyczne zbudowanie i zaprogramowanie prostego układu Arduino wyposażonego w 3 diody

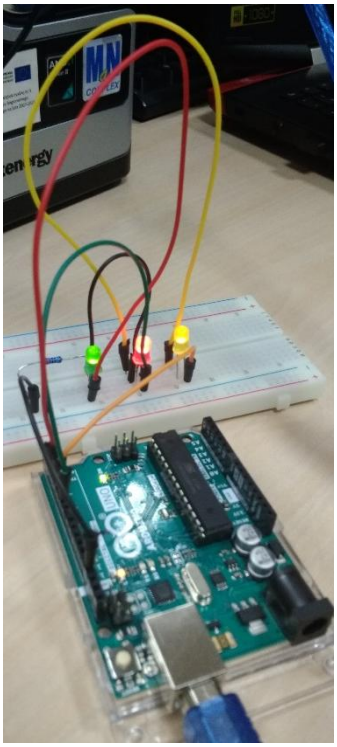
2. Praktyczne zbudowanie i zaprogramowanie prostego układu Arduino wyposażonego w buzzer i grającego zadaną melodie

Wykonanie:

Wykonanie prostego układu świecącego 3ema diodami
Najpierw wykonaliśmy prosty układ zapalający i gaszący 1 diodę (zdjęcie 1)



Zdjęcie 1 Układ z 1 diodą



Zdjęcie 2 Układ z trzema diodami

Następnie zmodyfikowaliśmy ten układ o dwie dodatkowe diody oraz program sterujący pozwalający na naprzemienne świecenie diody (zdjęcie 2). Program realizujący sterowanie tymi diodami zawarty jest w poniżej (kod 1)

kod programu:

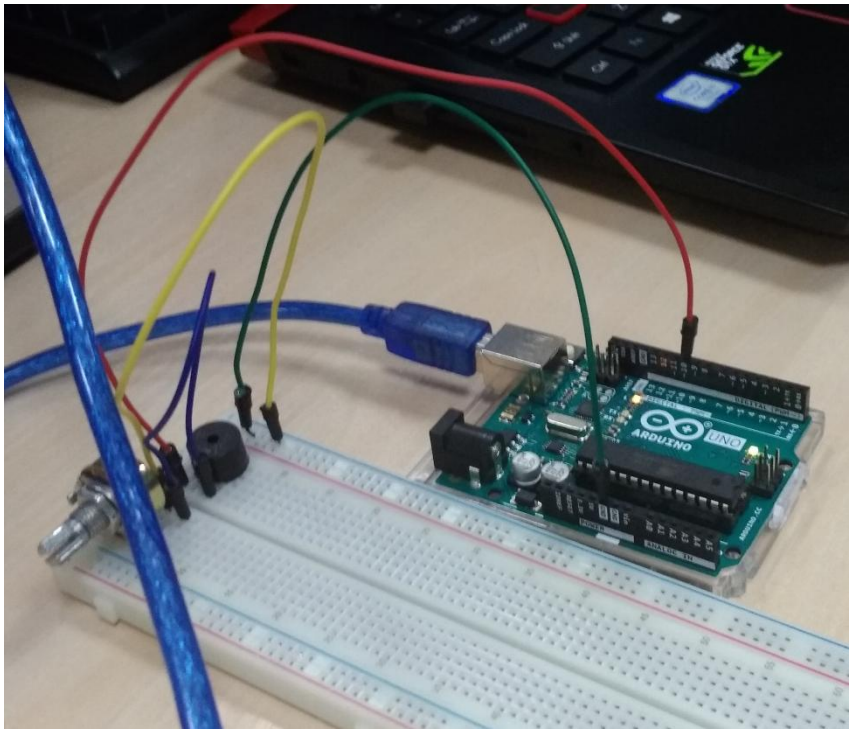
```ino
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(3, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(3, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(6, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(5, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(3, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
  digitalWrite(6, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
  digitalWrite(5, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

Kod 1 Naprzemienne miganie 3ech diod

W drugiej część laboratorium naszym zadaniem było zmodyfikować układ w następujący sposób. Usunąć z układu wszystkie diody LED i umieść buzzer który to miał odegrać melodie happy birthday.

Podłączenie układu reprezentuje zdjęcie 2 , a kod który zaimplementowaliśmy z pomocą Dipto Pratyaksa (który napisał znaczną cześć kodu) znajduje się poniżej. Ponieważ domyślnie nie posiadaliśmy wymaganego kodu wzorcowego, przeszukaliśmy Internet i znaleźliśmy kod na piosenki z gry mario. Po analizie kodu i dostosowaniu go do naszego urządzenia (zmodyfikowaliśmy przede wszystkim porty wyjściowe oraz niektóre stałe), załadowaliśmy na urządzenie ,które to zagrało wesołą melodię.



Zdjęcie 3 Układ z buzzerem

```
/************************************************

 * Public Constants

 ************************************************/

#define NOTE_B0  31
#define NOTE_C1  33
#define NOTE_CS1 35
#define NOTE_D1  37
#define NOTE_DS1 39
#define NOTE_E1  41
#define NOTE_F1  44
#define NOTE_FS1 46
#define NOTE_G1  49
#define NOTE_GS1 52
#define NOTE_A1  55
#define NOTE_AS1 58
#define NOTE_B1  62
#define NOTE_C2  65
#define NOTE_CS2 69
#define NOTE_D2  73
#define NOTE_DS2 78
#define NOTE_E2  82
#define NOTE_F2  87
#define NOTE_FS2 93
#define NOTE_G2  98
#define NOTE_GS2 104
#define NOTE_A2  110
#define NOTE_AS2 117
#define NOTE_B2  123
#define NOTE_C3  131
#define NOTE_CS3 139
#define NOTE_D3  147
#define NOTE_DS3 156
#define NOTE_E3  165
#define NOTE_F3  175
#define NOTE_FS3 185
#define NOTE_G3  196
#define NOTE_GS3 208
#define NOTE_A3  220
#define NOTE_AS3 233
#define NOTE_B3  247
#define NOTE_C4  262
#define NOTE_CS4 277
#define NOTE_D4  294
#define NOTE_DS4 311
#define NOTE_E4  330
#define NOTE_F4  349
#define NOTE_FS4 370
#define NOTE_G4  392
#define NOTE_GS4 415
#define NOTE_A4  440
#define NOTE_AS4 466
#define NOTE_B4  494
#define NOTE_C5  523
#define NOTE_CS5 554
#define NOTE_D5  587
#define NOTE_DS5 622
#define NOTE_E5  659
#define NOTE_F5  698
#define NOTE_FS5 740
#define NOTE_G5  784
#define NOTE_GS5 831
#define NOTE_A5  880
#define NOTE_AS5 932
#define NOTE_B5  988
```

```
#define NOTE_C6  1047
#define NOTE_CS6 1109
#define NOTE_D6  1175
#define NOTE_DS6 1245
#define NOTE_E6  1319
#define NOTE_F6  1397
#define NOTE_FS6 1480
#define NOTE_G6  1568
#define NOTE_GS6 1661
#define NOTE_A6  1760
#define NOTE_AS6 1865
#define NOTE_B6  1976
#define NOTE_C7  2093
#define NOTE_CS7 2217
#define NOTE_D7  2349
#define NOTE_DS7 2489
#define NOTE_E7  2637
#define NOTE_F7  2794
#define NOTE_FS7 2960
#define NOTE_G7  3136
#define NOTE_GS7 3322
#define NOTE_A7  3520
#define NOTE_AS7 3729
#define NOTE_B7  3951
#define NOTE_C8  4186
#define NOTE_CS8 4435
#define NOTE_D8  4699
#define NOTE_DS8 4978
#define melodyPin 10



//Mario main theme melody

int melody[] = {

  NOTE_E7, NOTE_E7, 0, NOTE_E7,

  0, NOTE_C7, NOTE_E7, 0,

  NOTE_G7, 0, 0,  0,

  NOTE_G6, 0, 0, 0,



  NOTE_C7, 0, 0, NOTE_G6,

  0, 0, NOTE_E6, 0,

  0, NOTE_A6, 0, NOTE_B6,

  0, NOTE_AS6, NOTE_A6, 0,



  NOTE_G6, NOTE_E7, NOTE_G7,

  NOTE_A7, 0, NOTE_F7, NOTE_G7,

  0, NOTE_E7, 0, NOTE_C7,

  NOTE_D7, NOTE_B6, 0, 0,



  NOTE_C7, 0, 0, NOTE_G6,
```

```
  0, 0, NOTE_E6, 0,
  0, NOTE_A6, 0, NOTE_B6,
  0, NOTE_AS6, NOTE_A6, 0,

  NOTE_G6, NOTE_E7, NOTE_G7,
  NOTE_A7, 0, NOTE_F7, NOTE_G7,
  0, NOTE_E7, 0, NOTE_C7,
  NOTE_D7, NOTE_B6, 0, 0
};
//Mario main them tempo
int tempo[] = {
  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,

  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,

  9, 9, 9,
  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,

  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,
  12, 12, 12, 12,

  9, 9, 9,
  12, 12, 12, 12,
  12, 12, 12, 12,
```

```
  12, 12, 12, 12,
};
//Underworld melody
int underworld_melody[] = {
  NOTE_C4, NOTE_C5, NOTE_A3, NOTE_A4,
  NOTE_AS3, NOTE_AS4, 0,
  0,
  NOTE_C4, NOTE_C5, NOTE_A3, NOTE_A4,
  NOTE_AS3, NOTE_AS4, 0,
  0,
  NOTE_F3, NOTE_F4, NOTE_D3, NOTE_D4,
  NOTE_DS3, NOTE_DS4, 0,
  0,
  NOTE_F3, NOTE_F4, NOTE_D3, NOTE_D4,
  NOTE_DS3, NOTE_DS4, 0,
  0, NOTE_DS4, NOTE_CS4, NOTE_D4,
  NOTE_CS4, NOTE_DS4,
  NOTE_DS4, NOTE_GS3,
  NOTE_G3, NOTE_CS4,
  NOTE_C4, NOTE_FS4, NOTE_F4, NOTE_E3, NOTE_AS4, NOTE_A4,
  NOTE_GS4, NOTE_DS4, NOTE_B3,
  NOTE_AS3, NOTE_A3, NOTE_GS3,
  0, 0, 0
};
//Underwolrd tempo
int underworld_tempo[] = {
  12, 12, 12, 12,
  12, 12, 6,
  3,
  12, 12, 12, 12,
  12, 12, 6,
  3,
  12, 12, 12, 12,
  12, 12, 6,
```

```
  3,
  12, 12, 12, 12,
  12, 12, 6,
  6, 18, 18, 18,
  6, 6,
  6, 6,
  6, 6,
  18, 18, 18, 18, 18, 18,
  10, 10, 10,
  10, 10, 10,
  3, 3, 3
};


void setup(void)
{
  pinMode(10, OUTPUT);//buzzer
  pinMode(13, OUTPUT);//led indicator when singing a note


}
void loop()
{
  //sing the tunes
  sing(1);
  sing(1);
  sing(2);
}
int song = 0;


void sing(int s) {
  // iterate over the notes of the melody:
  song = s;
  if (song == 2) {
    Serial.println(" 'Underworld Theme'");
    int size = sizeof(underworld_melody) / sizeof(int);
```

```
    for (int thisNote = 0; thisNote < size; thisNote++) {

      // to calculate the note duration, take one second
      // divided by the note type.
      //e.g. quarter note = 1000 / 4, eighth note = 1000/8, etc.
      int noteDuration = 1000 / underworld_tempo[thisNote];

      buzz(melodyPin, underworld_melody[thisNote], noteDuration);

      // to distinguish the notes, set a minimum time between them.
      // the note's duration + 30% seems to work well:
      int pauseBetweenNotes = noteDuration * 1.30;
      delay(pauseBetweenNotes);

      // stop the tone playing:
      buzz(melodyPin, 0, noteDuration);

    }

  } else {

    Serial.println(" 'Mario Theme'");
    int size = sizeof(melody) / sizeof(int);
    for (int thisNote = 0; thisNote < size; thisNote++) {

      // to calculate the note duration, take one second
      // divided by the note type.
      //e.g. quarter note = 1000 / 4, eighth note = 1000/8, etc.
      int noteDuration = 1000 / tempo[thisNote];

      buzz(melodyPin, melody[thisNote], noteDuration);

      // to distinguish the notes, set a minimum time between them.
      // the note's duration + 30% seems to work well:
```

```
      int pauseBetweenNotes = noteDuration * 1.30;
      delay(pauseBetweenNotes);


      // stop the tone playing:
      buzz(melodyPin, 0, noteDuration);


    }
  }
}


void buzz(int targetPin, long frequency, long length) {
  digitalWrite(13, HIGH);
  long delayValue = 1000000 / frequency / 2; // calculate the delay value between transitions
  //// 1 second's worth of microseconds, divided by the frequency, then split in half since
  //// there are two phases to each cycle
  long numCycles = frequency * length / 1000; // calculate the number of cycles for proper
timing
  //// multiply frequency, which is really cycles per second, by the number of seconds to
  //// get the total number of cycles to produce
  for (long i = 0; i < numCycles; i++) { // for the calculated length of time...
    digitalWrite(targetPin, HIGH); // write the buzzer pin high to push out the diaphram
    delayMicroseconds(delayValue); // wait for the calculated delay value
    digitalWrite(targetPin, LOW); // write the buzzer pin low to pull back the diaphram
    delayMicroseconds(delayValue); // wait again or the calculated delay value
  }
  digitalWrite(13, LOW);


}
```

Wnioski:

Laboratorium zostało wykonane poprawnie oraz dzięki kodu z Internetu udało nam się zauważyć kilka niedoskonałość kodu bazowego (np. brak obsługi funkcji reset, oraz ciekawa deklaracja nut).