PROJECT REPORT

Structured programming

6 DE AGOSTO DE 2019

UNIT 4

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Materials

To perform this project were used the next materials

- 1 Arduino 1 R3
- 1 Switch 3 pins
- 1 Buzzer
- 1 10k ohm potentiometer
- 1 RGB LED
- 3 330-ohm resistors
- 1 Breadboard
- 1 Matrix keyboard 4x4
- Dupont cables
- 1 Power supply

Objective

The objective of this project was use all the knowledge acquired during the Structured Programming course, making work a device with the next characteristics:

Design a circuit/device and program it under the next conditions

- With an 4X4 Matrix keyboard, introduce the rgb code needed to represent a color in the rgb led, the program needs to process the information and apply the color to the led. After each series of 3 numbers, press ‘A’ to introduce the number.
- Control the fade out/fade in time of the led by the use of a potentiometer
- After each number introduced, make sound the buzzer. After each press ‘A’ to save the number, make a different sound with the buzzer as confirmation.
- Use a switch to turn on/of the device/circuit

Procedure

First, it was needed to make a research about how to operate a 4x4 matrix keyboard, how to get the data and how to convert the data which is saved as char into an int data.

After that, continued with the assembly on the breadboard, mounting the 4x4 matrix keyboard into the digital ports, the RGB into the digital pwm ports, the potentiometer into the analog port, the buzzer into a digital port and the switch to a digital port. Also, the power supply to the breadboard was provided by the 5v and GND ports of the Arduino.

Continuing, the variables and the ports was started at the code, before the Void setup() function. Also, there was declared the matrix keyboard

Into the void setup() function were declared the ports as digital or analog ports

The section of void(loop) was built in two divided parts. The first part makes get the numbers from the matrix keyboard, save into a variable, convert it from char to int, and make sound the buzzer. All that under a Switch(count) where count was a counter for each one of the situations.

On the second part of the code was declared the part of how much intensity each color will have and the velocity of the effect. The intensity worked under a for function, working under the quantity of intensity given on the previous part. One for each led to turn it on, and one to turn off each one. The effect was controlled by a variable taken by the potentiometer, using it into a delay.

Results

The result was not exactly as the expected but similar.

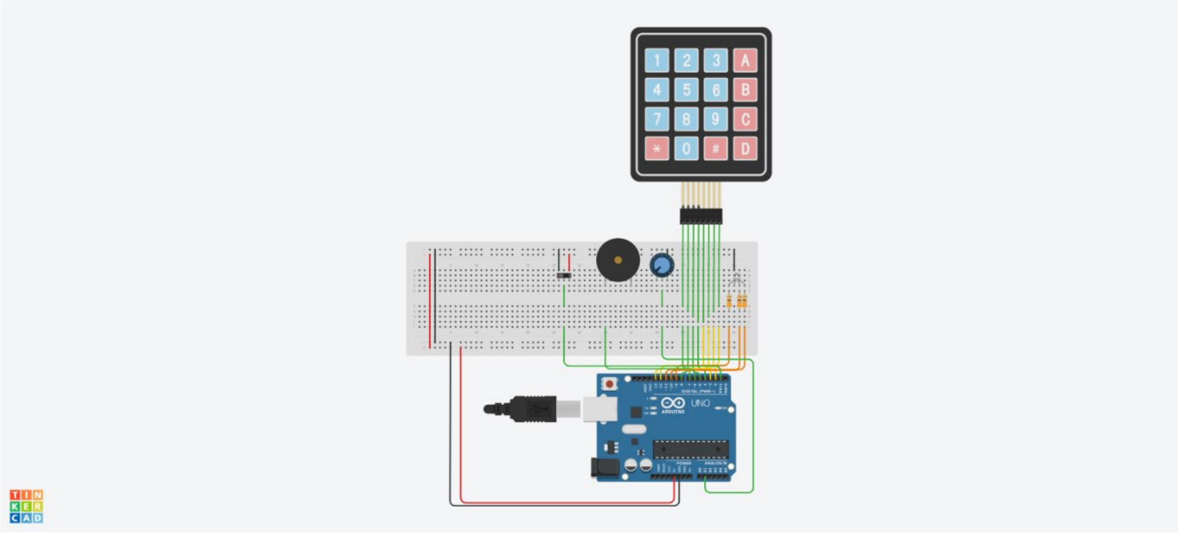
The matrix keyboard was able to introduce and save the numbers, but with a unknow delay produced by the potentiometer

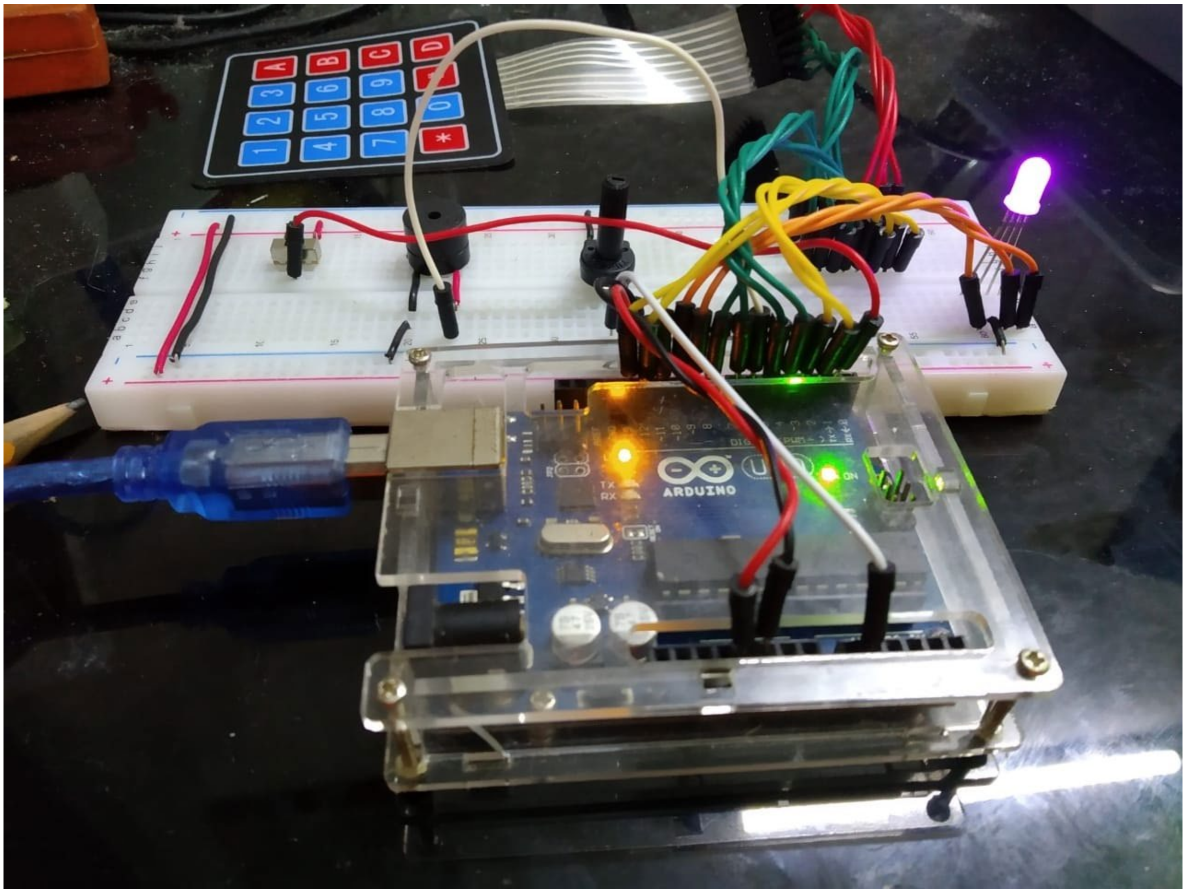
The switch worked as expected, turned off the system

The delay worked, the time was taken by the potentiometer but by an error in the code, the LEDs made a blink effect.

The LEDs displayed the required colors

The buzzer produced the stablished sound when a key was pressed or when a variable was saved.





Analysis and questions

a) Which components are digital inputs?

The 8 pins of the matrix keyboard, and the switch

b) Which components are digital outputs?

The buzzer and the RGB led (3 pins)

c) Which components are analog inputs?

The potentiometer

d) Which components are analog outputs?

There were not analog outputs

e) Explain why you connect each component in the ports you used.

For the keyboard matrix there were not specifications about what digital port use, just using a digital port because there were going to be analyzed a condition of HIGH or LOW

For the potentiometer were use a analog port, because analog information were going to be sent, and Arduino only analyze that kind of information in the analog ports.

For the switch were used a digital port because there were going to be analyzed a condition of HIGH or LOW

For the RGB there were needed to use digital pwm ports, because the intensity of each color was needed to be set into a specific number. Pwm uses a 0-255 magnitude, which is the same used as rgb colors.

The buzzer was connected to a digital output because we just needed to send HIGH and LOW pulses with a certain duration.

f) Explain the differences, if any, between the simulation and the real circuit

It worked as the same because it was used the same library Keypad.h, the only thing is that the simulation had a delay as showed on the simulation hour, maybe this happens by the capacity of cloud processing given by the page.

Code

```
#include <Keypad.h>

  const byte ROWS = 4;
  const byte COLS = 4;
  char keys[ROWS][COLS] ={
    {'1','2','3','A'},
    {'4','5','6','B'},
    {'7','8','9','C'},
    {'*','0','#','D'}
  };

  byte rowPins[ROWS] = {7,8,5,4};
  byte colPins[COLS] = {3,2,13,12};
  Keypad keypad = Keypad(makeKeymap(keys), rowPins, colPins, ROWS,
COLS);

  #define power 1
  #define rled 9
  #define gled 10
  #define bled 11
  #define pot A1
  #define buzz 6

  int valpot;
  char key;
  int nkey;
  int ctrl=48;
  int count=0;
  int crled;
  int nleda;
  int nledb;
  int nledc;
  int nledd;
  int nlede;
  int nledf;
  int nledg;
  int nledh;
  int nledi;
  int temp;
  int tempa;
  int tempb;
  int ia;
  int ib;
  int ic;
  int id;
  int ie;
  int ig;
void setup() {
  // put your setup code here, to run once:

  pinMode (power, INPUT);

  pinMode (rled, OUTPUT);
  pinMode (gled, OUTPUT);
  pinMode (bled, OUTPUT);

  pinMode (pot, INPUT);

  pinMode (buzz, OUTPUT);

  Serial.begin(9600);
}
```

```
void loop() {
if (digitalRead(power)==HIGH){
  key=keypad.getKey();
 if(key != NO_KEY){
 switch(count){

  case 0:
    //key=keypad.getKey();
    nleda= key - '0';
    Serial.println(nleda);
    digitalWrite(buzz,HIGH);
      delay(200);
      digitalWrite(buzz,LOW);
    count = count + 1;
    break;

   case 1:
    //key=keypad.getKey();
    nledb= key - '0';
    digitalWrite(buzz,HIGH);
      delay(200);
      digitalWrite(buzz,LOW);
    count = count + 1;
    Serial.println(nledb);
    break;

   case 2:
    //key=keypad.getKey();
    nledc= key - '0';
    digitalWrite(buzz,HIGH);
      delay(200);
      digitalWrite(buzz,LOW);
    count = count + 1;
    Serial.println(nledc);
    break;

    case 3:
    if(key =='A'){
      temp=0*10+nleda;
      temp=temp*10+nledb;
      temp=temp*10+nledc;
      digitalWrite(buzz,HIGH);
      delay(1000);
      digitalWrite(buzz,LOW);
      count=count+1;
      Serial.println(temp);
      break;
  }

  case 4:
    //key=keypad.getKey();
    nledd= key - '0';
    Serial.println(nledd);
    digitalWrite(buzz,HIGH);
      delay(200);
      digitalWrite(buzz,LOW);
    count = count + 1;
    break;

   case 5:
    //key=keypad.getKey();
    nlede= key - '0';
    digitalWrite(buzz,HIGH);
```

```
    delay(200);
    digitalWrite(buzz,LOW);
  count = count + 1;
  Serial.println(nlede);
  break;

 case 6:
  //key=keypad.getKey();
  nledf= key - '0';
  digitalWrite(buzz,HIGH);
    delay(200);
    digitalWrite(buzz,LOW);
  count = count + 1;
  Serial.println(nledf);
  break;

  case 7:
  if(key =='A'){
    tempa=0*10+nledd;
    tempa=tempa*10+nlede;
    tempa=tempa*10+nledf;
    digitalWrite(buzz,HIGH);
    delay(1000);
    digitalWrite(buzz,LOW);
    count=count+1;
    Serial.println(tempa);
    break;
}


  case 8:
  //key=keypad.getKey();
 nledg= key - '0';
 Serial.println(nledg);
 digitalWrite(buzz,HIGH);
   delay(200);
   digitalWrite(buzz,LOW);
 count = count + 1;
 break;

case 9:
 //key=keypad.getKey();
 nledh= key - '0';
 digitalWrite(buzz,HIGH);
   delay(200);
   digitalWrite(buzz,LOW);
 count = count + 1;
 Serial.println(nledh);
 break;

case 10:
 //key=keypad.getKey();
 nledi= key - '0';
 digitalWrite(buzz,HIGH);
   delay(200);
   digitalWrite(buzz,LOW);
 count = count + 1;
 Serial.println(nledi);
 break;

 case 11:
 if(key =='A'){
   tempb=0*10+nleda;
   tempb=tempb*10+nledb;
```

```
     tempb=tempb*10+nledc;
     digitalWrite(buzz,HIGH);
     delay(1000);
     digitalWrite(buzz,LOW);
     count=count+1;
     Serial.println(tempb);
     break;

   //  case 12:
     //if(key== 'D'){
       //temp=0;
       //tempa=0;
       //tempb=0;
       //count=0;
     //digitalWrite(buzz,HIGH);
     //delay(500);
     //digitalWrite(buzz,LOW);
     //delay(200);
     //digitalWrite(buzz, HIGH);
     //delay(500);
     //digitalWrite(buzz, LOW);
       }
 }
}

   valpot=(analogRead(pot)*(0.4));

   for(ia=1; ia<temp; ia++){
   analogWrite(rled, ia);
   }
 for(ib=1; ib<tempa; ib++){
   analogWrite(gled, ib);
```

```
    }
    for(ic=1; ic<tempb; ic++){
    analogWrite(bled, ic);
    }
   delay(valpot);
    for(id=temp; id>0; id--){
    valpot=pot*3;
    analogWrite(rled, id);
    }
    for(ie=tempa; ie>0; ie--){
    analogWrite(gled, ie);
    }
    for(ig=tempb; ig>0; ig--){
    analogWrite(bled, ig);
    }
    delay(valpot);

}else {
  digitalWrite(rled, LOW);
  digitalWrite(gled, LOW);
  digitalWrite(bled, LOW);
  count=0;
  }
 }
```