Project
Stopwatch Untuk Pertadingan Olah Raga

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Apakah yang diperlukan?

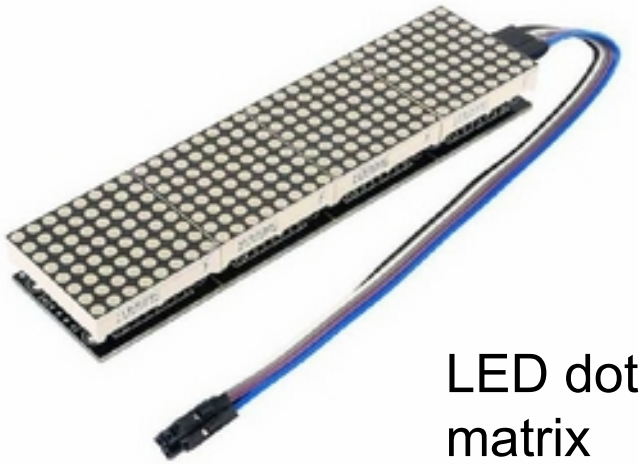
- Perlu tiga Buah library :

1)TM1637Display.h

2)Timer.h

3)LedControl.h

Penanda bunyi (buzzer)



LED dot matrix MAX7219

Library Timer.h

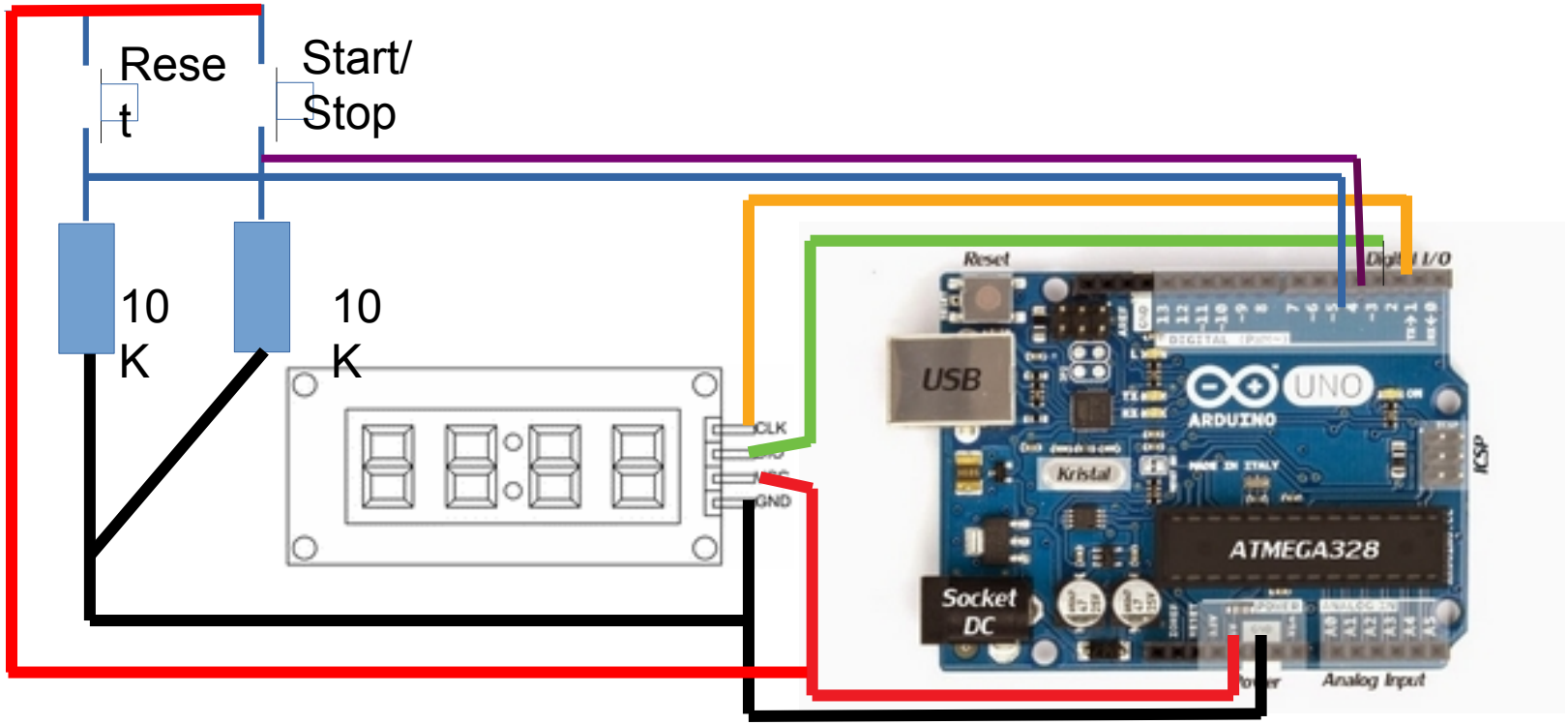
- https://github.com/JChristensen/Timer/blob/master/Timer.h
- Atau
- https://github.com/JChristensen/Timer/

Apakah Gunanya Timer.h

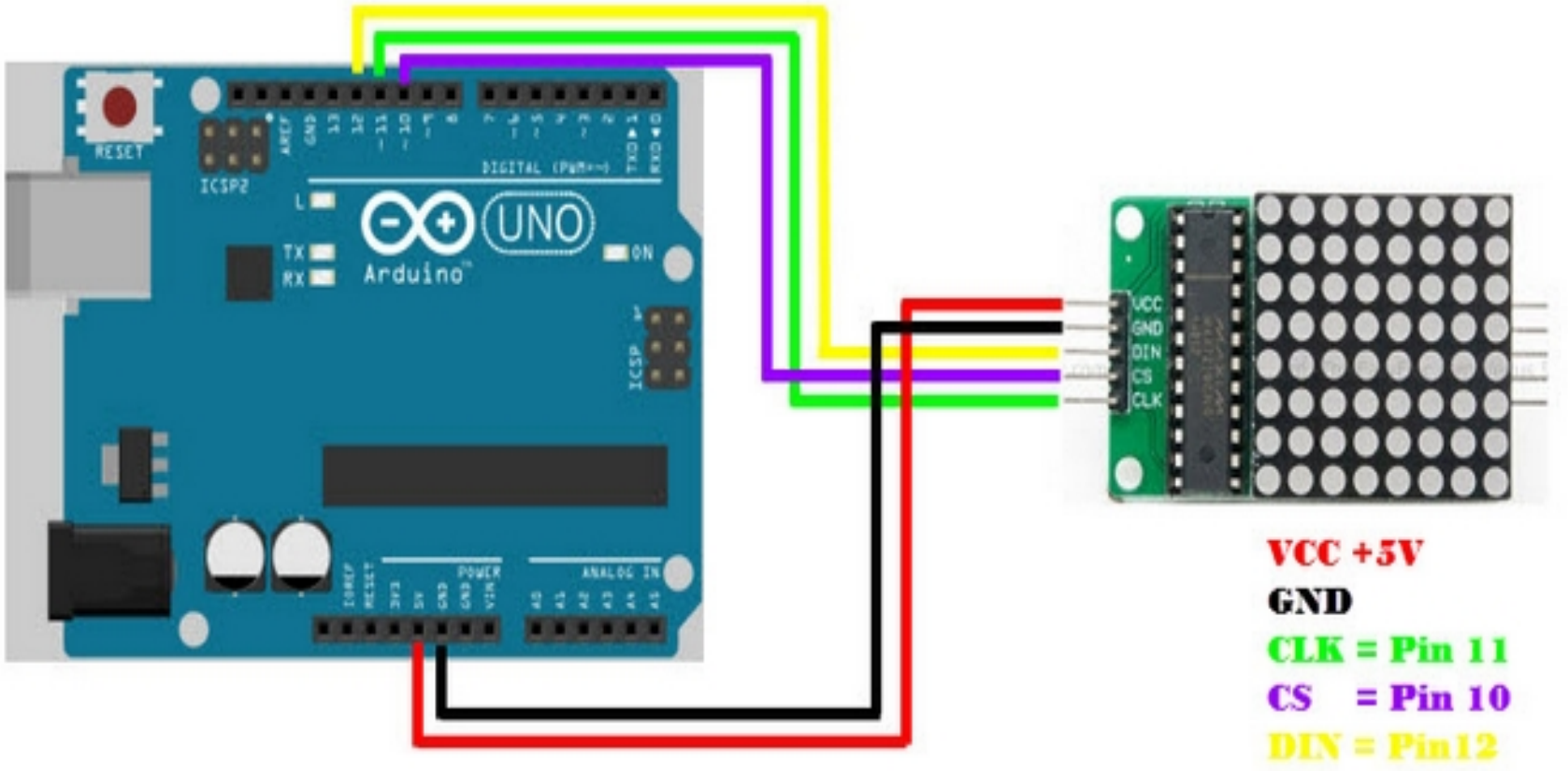
- Arduino timer library.
- Baik untuk menggantikan fungsi delay(), dan akan membuat sebuah task asynchronous task secara mudah.
- mendukung dalam fungsi callbacks, jadi kita bisa gunakan dalam class program kita.

Rangkaian StopWatch

- Perhatikan pin CLK terhubung dengan pin 2 Arduino dan pin DIO terhubung dengan pin 3 Arduino UNO. Switch Start ke pin 4 dan Switch Reset ke pin 5.



Rangkaian Tambahan



Code Program-nya

```
#include <TM1637Display.h>
#include <Timer.h>
#include "LedControl.h"
// Cascade LED dot matrix
LedControl lc=LedControl(12,11,10,4);  // Pins: DIN,CLK,CS, # of Display
connected

#define CLK 2
#define DIO 3
#define START 4
#define RESET 5
#define BUZZ 6
int devices;
//counter variabel akan bertambah satu tiap detik
int minX0,min0X,secX0,sec0X=0;
int jam=0,menit=0,detik=0;
int angka;
int start=0;

TM1637Display display(CLK, DIO);
Timer t;
```

4 LED dot matrix
pin 12 data (DIN
Pin 11 clock (CLK)
Pin 10 Chip Select(CS)

Tombol Start di pin 4
Tombol Reset di pin 5

Tanda bunyi pin 6

Code Program (Lanjutan)

```
// bitmap huruf
byte hurufA[] = {0x3C,0x24,0x24,0x7E,0x62,0x62,0x62,0x00};
byte hurufB[] = {0x7C,0x24,0x24,0x3E,0x32,0x32,0x7E,0x00};
byte hurufC[] =
{
  B00111110,  // First frame of invader #1
  B00100010,
  B00100000,
  B01100000,
  B01100000,
  B01100010,
  B01111110,
  B00000000
};
byte hurufD[] = {0x7E,0x22,0x22,0x32,0x32,0x32,0x7E,0x00};
byte hurufR[] = {0x3E,0x22,0x22,0x7E,0x68,0x68,0x66,0x00};
byte hurufU[] = {0x22,0x22,0x22,0x62,0x62,0x62,0x7E,0x00};
byte hurufY[] = {0x22,0x22,0x22,0x3E,0x18,0x18,0x18,0x00};

byte a0[]= {0x1c,0x22,0x22,0x22,0x22,0x22,0x1c,0x00};
byte a1[]= {0x04,0x0C,0x04,0x04,0x04,0x04,0x0E,0x00};
byte a2[]= {0x1c,0x22,0x02,0x04,0x08,0x10,0x3e,0x00};
byte a3[]= {0x1c,0x22,0x02,0x0c,0x02,0x22,0x1c,0x00};
byte a4[]= {0x22,0x22,0x22,0x3e,0x02,0x02,0x02,0x00};
byte a5[]= {0x3e,0x20,0x3c,0x02,0x02,0x02,0x3c,0x00};
byte a6[]= {0x0e,0x10,0x20,0x3c,0x22,0x22,0x1c,0x00};
byte a7[]= {0x3e,0x02,0x04,0x08,0x10,0x20,0x20,0x00};
byte a8[]= {0x1c,0x22,0x22,0x1c,0x22,0x22,0x1c,0x00};
byte a9[]= {0x1c,0x22,0x22,0x1e,0x02,0x22,0x1c,0x00};
byte dot[]= {0x00,0x00,0x80,0x00,0x00,0x80,0x00,0x00};
```

Definisi bitmap angka
Untuk Led Dot Matrix

Code Program (lanjutan)

```
void setup()
{
  devices=lc.getDeviceCount();
  // setup LED 8x8 dot matrix
  for(int i=0;i<devices;i++) {
     lc.shutdown(i,false);  // Wake up displays
     lc.setIntensity(i,1);  // Set intensity levels
     lc.clearDisplay(i);  // Clear Displays
  }
  // set pin start
  pinMode (START, INPUT);
  pinMode (RESET, INPUT);
  pinMode (BUZZ,OUTPUT);
  //seting brightness maksimal
  display.setBrightness(0x0a);
  Serial.begin(9600);
  // Setiap detik panggil fungsi panggilTime
  t.every(1000,panggilTime);
  angka =0;
  display.showNumberDecEx(angka, 0x40, true);
  DisplayAngka("0000");
}
```

Setup LED dot Matrix

Setup timer setiap 1 detik

Code Program (lanjutan)

```
void loop()
{
  int temp;
    if(start == 0) {
        temp = digitalRead(START);
        if(temp == 1){
          digitalWrite(BUZZ,HIGH);
          delay(500);
          digitalWrite(BUZZ,LOW);
          start =1;
        }
        // Reset kembalikan ke nol
        if(digitalRead(RESET)==1) {
           digitalWrite(BUZZ,HIGH);
           delay(250);
           digitalWrite(BUZZ,LOW);
           angka = 0;
           detik = 0;
           menit = 0;
           jam = 0;
           display.showNumberDecEx(angka, 0x40, true);
           DisplayAngka("0000");
        }
    }
    else {
       t.update();
       temp = digitalRead(START);
       if(temp == 1) {
           digitalWrite(BUZZ,HIGH);
           delay(500);
           digitalWrite(BUZZ,LOW)              ;
           start = 0;
       }
    }
}
```

Jika tombol Start di tekan

Jika tombol reset ditekan

Kembalikan angka ke Nol

Update timer 1 detik lagi

Jika tombolStart ditekan saat berjalan
Artinya Stop

Code Program (lanjutan)

```
void panggilTime() {
  // konversi timer ke jam
  // 1 menit 60 detik, 1 jam 60 menit => 3600 detik, 24 jam => 24x3600=86400
detik
  String dsp;

  dsp = String(jam)+":"+String(menit)+":"+ String(detik);
  Serial.println(dsp);
  showTime();
  detik++;
  if(detik == 60) {
    detik = 0;
    menit++;
  }

  if(menit == 60) {
    menit = 0;
    jam++;
  }
  if(jam > 24) {
    jam=0;
  }
}
```

Code Program (lanjutan)

```
void showTime() {
  String disp;
  // Tampilkan menit dan detik saja
  angka = menit*100 + detik;
  // show
  display.showNumberDecEx(angka, 0x40, true);
  if (angka <= 9) {
      disp = "000"+String(angka);
    }
    if (angka <= 99 && angka >=10) {
       disp = "00"+ String(angka);
    }
    if (angka <= 999 && angka >=100) {
       disp = "0"+ String(angka);
    }
    if(angka>999) disp = String(angka);
  DisplayAngka(disp);
}
```

Code Program (lanjutan)

```
//-------------------------digit 0 left
switch(angka[3]) {
 case '0': showAngka(0,a0);
           break;
 case '1': showAngka(0,a1);
           break;
 case '2': showAngka(0,a2);
           break;
 case '3': showAngka(0,a3);
           break;
 case '4': showAngka(0,a4);
           break;
 case '5': showAngka(0,a5);
           break;
 case '6': showAngka(0,a6);
           break;
 case '7': showAngka(0,a7);
           break;
 case '8': showAngka(0,a8);
           break;
 case '9': showAngka(0,a9);
           break;
}
//-------------------------digit 1 left
 switch(angka[2]) {
 case '0': showAngka(1,a0);
           break;
 case '1': showAngka(1,a1);
           break;
 case '2': showAngka(1,a2);
           break;
 case '3': showAngka(1,a3);
           break;
 case '4': showAngka(1,a4);
           break;
 case '5': showAngka(1,a5);
           break;
 case '6': showAngka(1,a6);
           break;
 case '7': showAngka(1,a7);
           break;
```

```
 //------------------------- digit 2 left
switch(angka[1]) {
  case '0': showAngka(2,a0);
            break;
  case '1': showAngka(2,a1);
            break;
  case '2': showAngka(2,a2);
            break;
  case '3': showAngka(2,a3);
            break;
  case '4': showAngka(2,a4);
            break;
  case '5': showAngka(2,a5);
            break;
  case '6': showAngka(2,a6);
            break;
  case '7': showAngka(2,a7);
            break;
  case '8': showAngka(2,a8);
            break;
  case '9': showAngka(2,a9);
            break;
 }
```

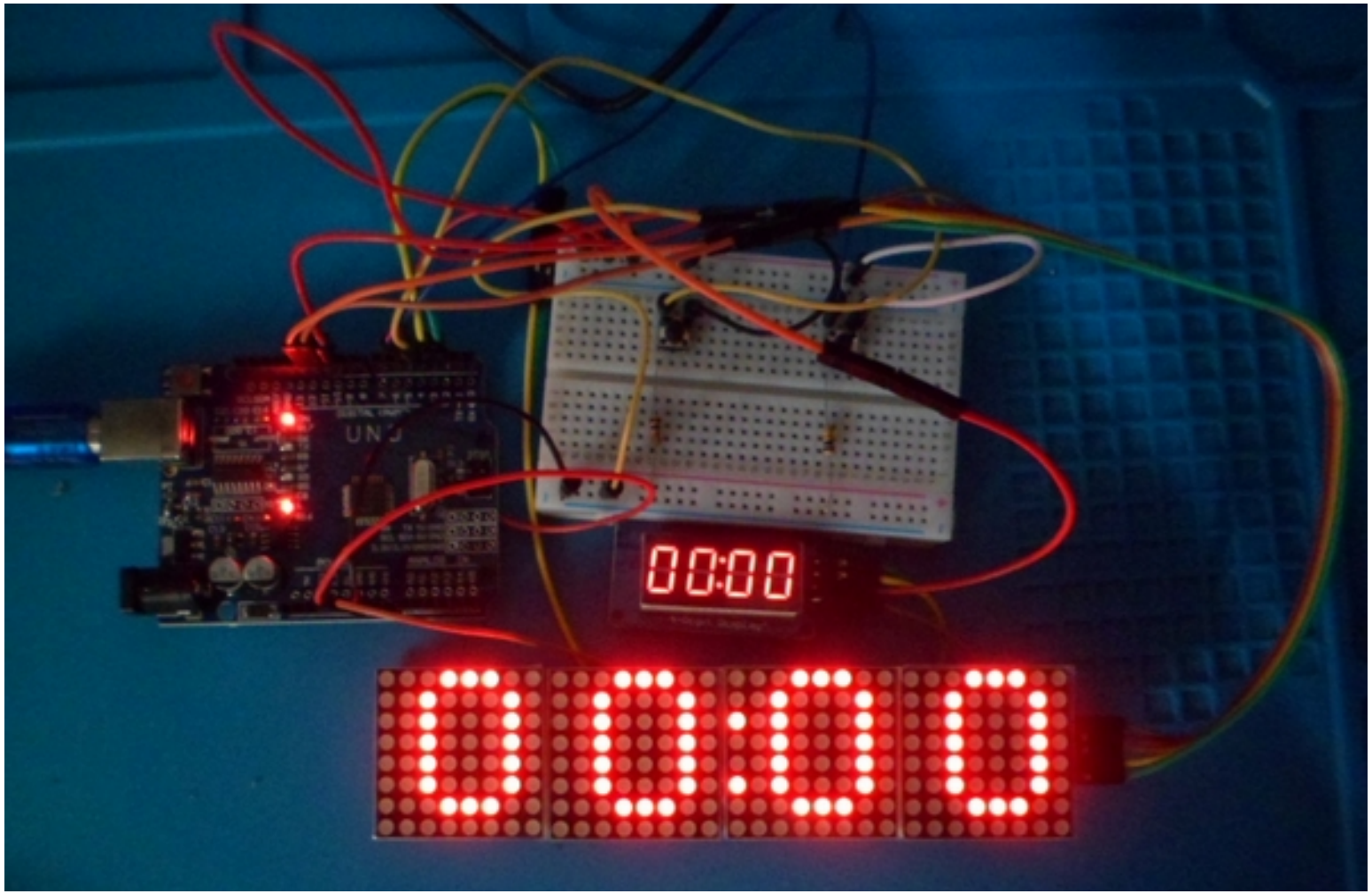
```
//-------------------------digit 3 left
 switch(angka[0]) {
  case '0': showAngka(3,a0);
            break;
  case '1': showAngka(3,a1);
            break;
  case '2': showAngka(3,a2);
            break;
  case '3': showAngka(3,a3);
            break;
  case '4': showAngka(3,a4);
            break;
  case '5': showAngka(3,a5);
            break;
  case '6': showAngka(3,a6);
            break;
  case '7': showAngka(3,a7);
            break;
  case '8': showAngka(3,a8);
            break;
  case '9': showAngka(3,a9);
            break;
 }
 //-------------------------
}
```

Code Program (lanjutan)

```
void showAngka(int dev,byte arr[8]) {

 for (int i = 0; i < 8; i++)
  {
    if (dev == 1) {
      lc.setRow(dev,i,arr[i]^dot[i]);
    }
    else {
      lc.setRow(dev,i,arr[i]);
    }
  }
}
```

Rangkaian Lengkap Stopwatch



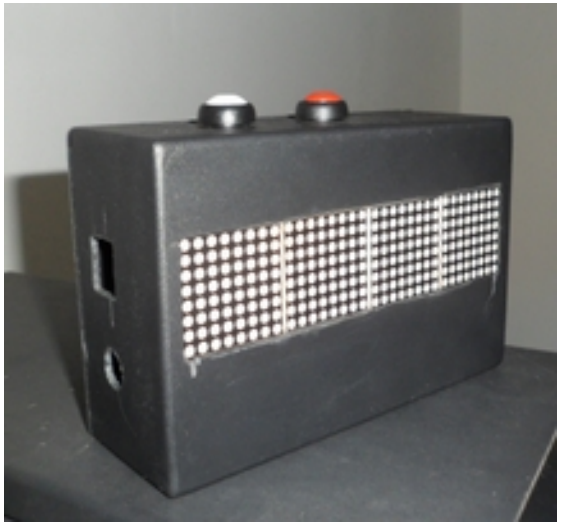
Test Fungsi

Lihat video yang berkaitan

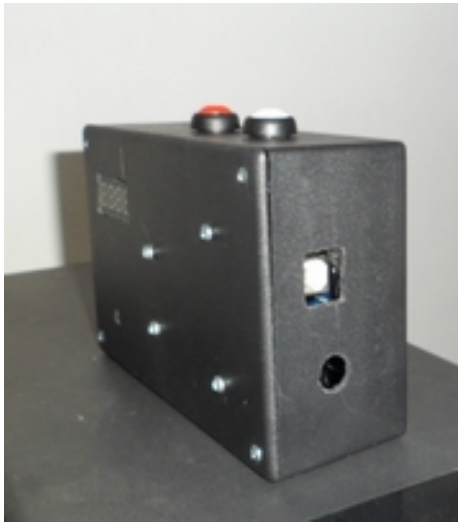
Ayo Bentuk Kemasan Produk

- Produk Stopwatch seharusnya Sederhana
- Gampang dugunakan.
- Bisa dijual jadinya……
- Silahkan rancang kemudian realisasikan.

Hasil Casing Produk Stop Watch



Depan
Big
LED



Samping
Power
Input

Belakang
Small
LED

Biaya Dasar Stopwatch

No	Deskripsi	Qty	Haga
1	Arduino uno	1	85,000
2	LED 7 Segment TM1637	1	20,000
3	LED 4 Dot Matrix MAX7219	1	85,000
4	Buzzer	1	6,000
5	Kotak	1	20,000
6	Switch Push Button	2	15,000
7	Kabel	1	20,000
8	Soldering	1	10,000
9	Programming	1	50,000
10	Assembly	1	100,000
	Total		411,000

Selesai

Terima Kasih