به نام خدا

امیررضا رجبی ۹۸۳۱۱۲۶

پروژه آز و آز اسمبلی ۱

پروژه آز :

برای انتقال آبشاری از دی فلیپ فلاپ استفاده کردم

برای هر چهار ردیف یک برد اسفاده کردم یعنی در مجموع از ۴ (اسلیو) + ۱(مستر) استفاده کردم نحوه ساختن حروف هم از عکس "حروف" استفاده کردم

Master’s coed:

```
#include <SPI.h>


#define SS0 47

#define SS1 46

#define SS2 45

#define SS3 44


int PINs[4] = {SS0, SS1, SS2, SS3};


char M[100];

int index = 0;


void setup() {
```

```
  // put your setup code here, to run once:
  Serial.begin(9600);
  for(int i = 0; i < 4; i++){
    pinMode(PINs[i], OUTPUT);
    digitalWrite(PINs[i], HIGH);
  }
  SPI.begin();
}

void sendData(int i){
  digitalWrite(PINs[i], LOW);
  SPI.transfer(M[i]);
  digitalWrite(PINs[i], HIGH);
}

void loop() {
  // put your main code here, to run repeatedly:
  if (Serial.available() > 0) {
    char c = Serial.read();
```

```
    if (c == '-') {
      index = 0;
      for (int i = 0; i < 4; i++)
        sendData(i);
    }
    else {
      M[index] = c;
      index++;
    }
  }
}
```

Slave’s code:

```
#include <SPI.h>

#define LED0 7
#define LED1 6
#define LED2 5
#define LED3 4
#define MISO 50
```

```
#define MOSI 51
#define SCK 52
#define SS 53
#define t 50

int LEDs[] = {LED0, LED1, LED2, LED3};
char M[10];
volatile boolean isFinished = false;



void setup() {
  // put your setup code here, to run once:
  for (int i = 0; i < 4; i++) {
    pinMode(LEDs[i], OUTPUT);
  }
  pinMode(MISO, OUTPUT);
  pinMode(MOSI, INPUT);
  pinMode(SCK, INPUT);
  pinMode(SS, INPUT_PULLUP);
```

```
  SPCR |= _BV(SPE);
  SPI.attachInterrupt();
}

void displayLetter(int i0, int i1, int i2, int i3, int
delayTime) {
  digitalWrite(LED0, i0);
  digitalWrite(LED1, i1);
  digitalWrite(LED2, i2);
  digitalWrite(LED3, i3);
  delay(delayTime);
}

void displayAlphabets(char c){
  if (c == 'A'){
    displayLetter(HIGH, LOW, LOW, HIGH, t);
    displayLetter(HIGH, LOW, LOW, HIGH, t);
    displayLetter(HIGH, LOW, LOW, HIGH, t);
    displayLetter(HIGH, HIGH, HIGH, HIGH, t);
```

```
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'B'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
}
else if (c == 'C'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
```

```
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'D'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
}
else if (c == 'E'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
```

```
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'F'){
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'G'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
```

```
}
else if (c == 'H'){
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
}
else if (c == 'I'){
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
}
```

```
else if (c == 'J'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
}
else if (c == 'K'){
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'L'){
```

```
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
}
else if (c == 'M'){
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'N'){
  displayLetter(LOW, LOW, LOW, LOW, t);
```

```
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'O'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'P'){
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
```

```
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'Q'){
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'R'){
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
```

```
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'S'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
}
else if (c == 'T'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
```

```
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, LOW, t);
}
else if (c == 'U'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
}
else if (c == 'V'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
```

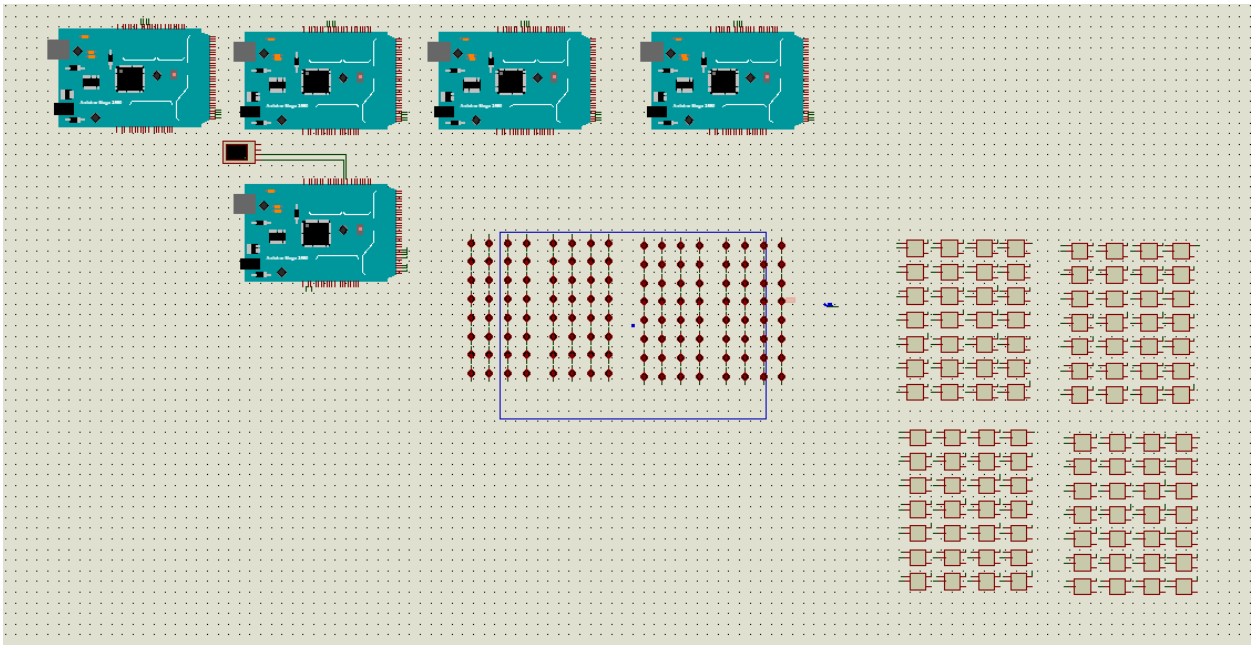
```
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
}
else if (c == 'W'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
}
else if (c == 'X'){
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
```

```
  displayLetter(HIGH, LOW, LOW, HIGH, t);
}
else if (c == 'Y'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
  displayLetter(HIGH, LOW, LOW, HIGH, t);
}
else if (c == 'Z'){
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(LOW, LOW, LOW, LOW, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(LOW, LOW, LOW, HIGH, t);
  displayLetter(HIGH, HIGH, HIGH, HIGH, t);
```

```
  }
  displayLetter(LOW, LOW, LOW, LOW, t);
}

void loop() {
  // put your main code here, to run repeatedly:
  if (isFinished){
    displayAlphabets(M[0]);
    isFinished = false;
  }
}

ISR (SPI_STC_vect)
{
  byte c = SPDR;
  M[0] = c;
  isFinished = true;
}
```



آز اسمبلی ۱:

گزارش از اسمبلی ۱

STR Rd, [Rx] : ذخیره می کند Rd توی محلی از حافظه Rx

MOV R1, #0x0F : ۱ بایت را داخل ثبات قرار می دهد که 0x0F

می تواند به شکل های دسیمال باینری و هگزا دسیمال باشد

LDR Rd, [Rx] : مقدار حافظه Rx را در Rd نوشته می کند

ایده ی پیاده سازی delay : استفاده از یک حلقه هست برای

گذراندن زمان تا کاما فیزیکی وجود آید یعنی یک متغیر را زیاد

کرده تا به یک مقداری برسد

translate : ترجمه کد به کد باینری را می کند

build : کد قابل اجرا تولید می کند

batch build : چند فایل را build کرد

stop build هم build را متوقف می کند

Farhang Gostar

interrupt vector : table است که در آن هندلرهای اینترایپت ها آمده است

reset handler : پس از تنظیم مجدد CPU اجرا شده و SystemInit را صدا می‌کند و تنظیمات اولیه را انجام می‌دهد.

برای ساخت تاخیرهای مختلف در مورد آزمایش توضیحات ریاضی و نموداری در فایل "چگونه دیلی را ساختم" آمده است