EIE3810 Microprocessor System Design Laboratory

Laboratory Report #3

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Date: March 23rd

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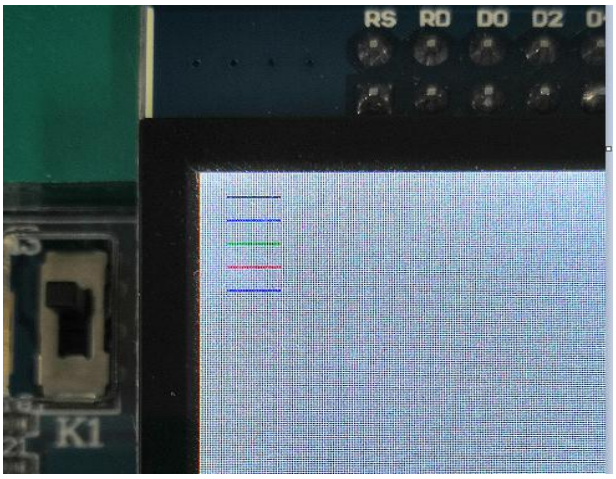
- Experiment A: e.g. learn to use the drawdot function to draw the expected line.
- Experiment B: e.g. understand how to write a subroutine to fill a rectangle with one color.
- Experiment C: e.g. Draw the digit number by drawing rectangle of the seven segment, and conduct the countdown function.
- Experiment D: e.g. Design the subroutine to show the character. Learn to use the program to show the expected ID in the screen.

I. Experiment A

(a) Basic procedure: 1.Download the EIE3810_TFTLCD.c 2. Try to achieve that make the whole screen into white. 3.Draw five different lines.

(b) Raw material:



Since the blue line can't be seen in the white background, here I change the color from white to blue. The result meet the requirement.

Figure 1 Draw 5 lines with different colors

(c) Experiment Code:

```
int main(void)
{
	EIE3810_TFTLCD_Init();
	Delay(1000000);
	EIE3810_TFTLCD_WrCmd(0x3600);
	EIE3810_TFTLCD_WrData(0x00);
	EIE3810_TFTLCD_DrawAll(0, 0, WHITE);
	EIE3810_exp1();
	EIE3810_exp2();
	EIE3810_exp4();
	EIE3810_exp3();}
```

```
void EIE3810_exp1()
{     int i;
          for(i=0;i<20;i++)
      {
          EIE3810_TFTLCD_DrawDot(10+i,10,BLACK);
          EIE3810_TFTLCD_DrawDot(10+i,20,WHITE);
          EIE3810_TFTLCD_DrawDot(10+i,30,GREEN);
          EIE3810_TFTLCD_DrawDot(10+i,40,RED);
          EIE3810_TFTLCD_DrawDot(10+i,50,BLUE);       }}

void EIE3810_TFTLCD_DrawAll(u16 x, u16 y, u16 color)
{
      int i;
      EIE3810_TFTLCD_WrCmd(0x2A00);
      EIE3810_TFTLCD_WrData(x>>8);
      EIE3810_TFTLCD_WrCmd(0x2A01);
      EIE3810_TFTLCD_WrData(x & 0xFF);
      EIE3810_TFTLCD_WrCmd(0x2B00);
      EIE3810_TFTLCD_WrData(y>>8);
      EIE3810_TFTLCD_WrCmd(0x2B01);
      EIE3810_TFTLCD_WrData(y & 0xFF);
      EIE3810_TFTLCD_WrCmd(0x2C00);
      for (i=0;i<384000;i++)
      {
          EIE3810_TFTLCD_WrData(color);
      }     }
```

II. Experiment B

(a) Procedure (1)Type the function supplied in the example (2)Change the Parameter and draw a rectangle with yellow color.

(b) Raw material

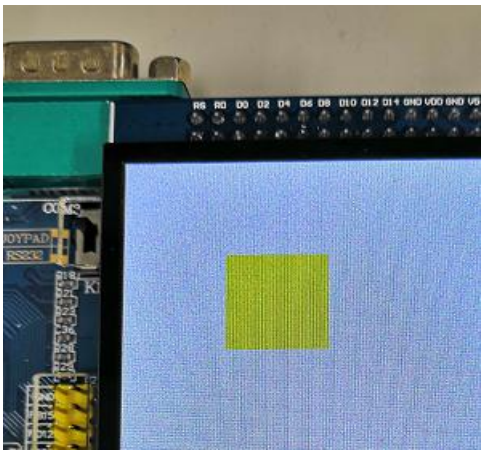


Figure 2 Yellow rectangle figure

(c) Code:

```
void EIE3810_exp2()
{
        EIE3810_TFTLCD_FillRectangle(100,100,100,100,YELLOW);
}
```

III. Experiment C

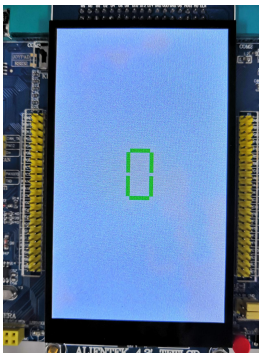
(a) Procedure

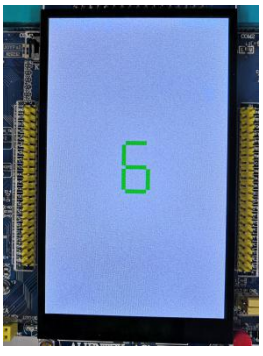
1) Create a subroutine “EIE3810_TFTLCD_SevenSegment(u16 start_x, u16 start_y, u8 digit, u16 color)”.

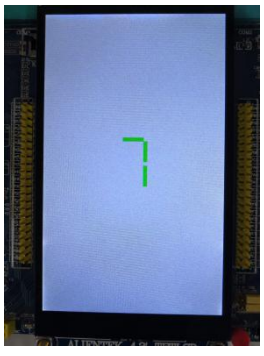
2) Use the rectangle subroutine to draw digit “8” (Seven-segment format) at the center of the screen with your favorite color.

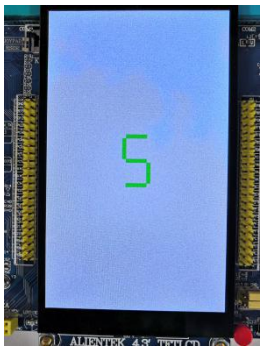
3) Write a program to display count-down digit from 9 to 0, periodically. After it comes to 0, go back to 9. The period of each count is around 1 second, which can be implemented with Delay().

(b) Raw Material:









The experiment result meet the expectation well.

(c) Source Code

```
void exp3(){
 while(1)
 {
  int i;
  for (i=9;i>=0;i--){
   EIE3810_TFTLCD_SevenSegment(202, 470, i, GREEN);
   Delay(10000000);
   EIE3810_TFTLCD_FillRectangle(202,76,330,141,WHITE);
  }
  for (i=0;i<10;i++){
   EIE3810_TFTLCD_SevenSegment(202, 470, i, YELLOW);
   Delay(10000000);
   EIE3810_TFTLCD_FillRectangle(202,76,330,141,WHITE);
  }
 }
}
```

```
void EIE3810_TFTLCD_SevenSegment(u16 start_x, u16 start_y, u8 digit, u16 color){
 if(digit == 0) segement_0(start_x,start_y,color);
 else if(digit == 1)segement_1(start_x,start_y,color);
 else if(digit == 2)segement_2(start_x,start_y,color);
 else if(digit == 3)segement_3(start_x,start_y,color);
 else if(digit == 4)segement_4(start_x,start_y,color);
 else if(digit == 5)segement_5(start_x,start_y,color);
 else if(digit == 6)segement_6(start_x,start_y,color);
 else if(digit == 7)segement_7(start_x,start_y,color);
 else if(digit == 8)segement_8(start_x,start_y,color);
 else if(digit == 9)segement_9(start_x,start_y,color);
}
```

```
void segement_0(u16 x, u16 y, u16 color)
{
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-140,11,color);//display of segment a
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-10,11,color);//display of segment d
 EIE3810_TFTLCD_FillRectangle(x,11,y-130,56,color);//display of segment f
 EIE3810_TFTLCD_FillRectangle(x,11,y-65,56,color);//display of segment e
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-130,56,color);//display of segment b
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-65,56,color);//display of segment c
}
void segement_1(u16 x, u16 y, u16 color)
{
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-130,56,color);//display of segment b
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-65,56,color);//display of segment c
}

void segement_2(u16 x,u16 y, u16 color)
{
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-140,11,color);
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-130,56,color);
 EIE3810_TFTLCD_FillRectangle(x,11,y-65,56,color);
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-75,11,color);
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-10,11,color);
}
void segement_3(u16 x, u16 y, u16 color)
{
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-140,11,color);//display of segment a
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-75,11,color);//display of segment g
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-10,11,color);//display of segment d
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-130,56,color);//display of segment b
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-65,56,color);//display of segment c
}
void segement_4(u16 x, u16 y, u16 color)
{
 EIE3810_TFTLCD_FillRectangle(x+10,56,y-75,11,color);//display of segment g
 EIE3810_TFTLCD_FillRectangle(x,11,y-130,56,color);//display of segment f
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-130,56,color);//display of segment b
 EIE3810_TFTLCD_FillRectangle(x+65,11,y-65,56,color);//display of segment c
}
```

IV. Experiment D

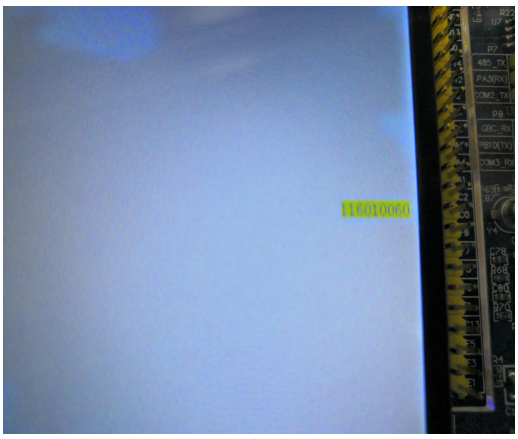
(a) Procedure

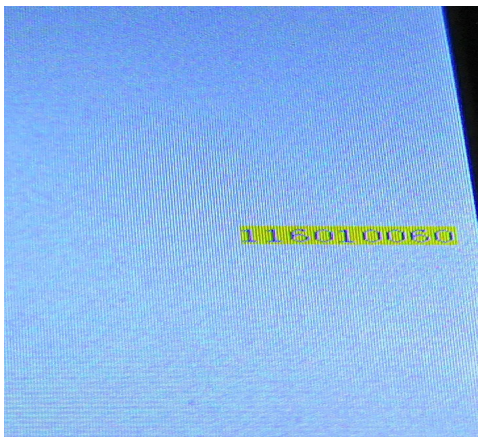
1) Download Font.H and add it into “board” folder. Include it in the EIE3810_TFTLCD.c as below and design the subroutine to show the character.

2) Write the program that uses the subroutine in to show my CUHKSZ ID on the screen. The background color should be any color other than white.

3) Include experiments 3.1-3.4 into the one main().

(b) Raw material





(c)Source code:

```
void exp4(){
 char cArr[] = {'1','1','6','0','1','0','0','6','0'};

 for (int i=0; i< sizeof(cArr);i++){
   EIE3810_TFTLCD_ShowChar(400+8*i,500,cArr[i],BLUE,YELLOW);
 }
}
```

```
void EIE3810_TFTLCD_ShowChar(u16 x,u16 y, u8 ascii, u16 color, u16 bgcolor)
{
  if (ascii <127 && ascii >31){
   EIE3810_TFTLCD_FillRectangle(x,8,y,16,bgcolor);

   u8 Pixelnum;

   for (int i=0;i<16;i++){
    Pixelnum = asc2_1608[ascii-32][i];

    if (i % 2 == 0){
     for (int bit=0;bit<8;bit++){
      if ((Pixelnum >> bit)& 1){
       EIE3810_TFTLCD_DrawDot(x+i/2,y+7-bit,color);
      }
     }
    }

    else{
     for (int bit=0;bit<8;bit++){
      if ((Pixelnum >> bit)&1){
       EIE3810_TFTLCD_DrawDot(x+(i-1)/2,y+15-bit,color);
```

（4）Question solution:

```
int main(void)
{
 EIE3810_TFTLCD_Init();
 Delay(1000000);
 EIE3810_TFTLCD_WrCmd(0x3600);
 EIE3810_TFTLCD_WrData(0x00);
 EIE3810_TFTLCD_DrawAll(0,0,WHITE);
while(1){
 exp1();
 exp2();
 exp3();
 exp4();}
}
```

Figure 3 The combination of th

1. The place of the pixel should not be overlapped, the x and y should be in the proper position.

2. For the digit count down, it is a infinite while loop. We should bring forward the while loop in the experiment 3.