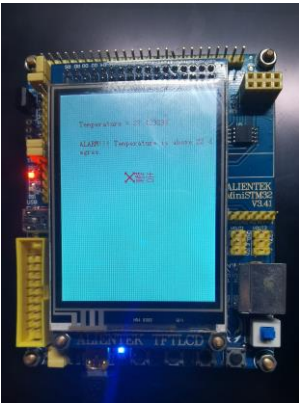


《Embedded System and Microcomputer Principle》 Lab Report

Topic	Temperature detection and alarm system		
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The interrupts code			
<pre> void HAL_TIM_PeriodElapsedCallback(TIM_HandleTypeDef *htim) { uint16_t raw; char msg[350]; double tem; HAL_ADC_Start(&hadc1); HAL_ADC_PollForConversion(&hadc1, HAL_MAX_DELAY); raw = HAL_ADC_GetValue(&hadc1); tem = (((1.43 - (double)raw * (3.3 / 4096)) / 0.0043) + 25); sprintf(msg, "Temperature = %f\r\n", tem); LCD_Clear(CYAN); BACK_COLOR = CYAN; POINT_COLOR = RED; HAL_UART_Transmit(&huart1, (uint8_t*)msg, strlen(msg), HAL_MAX_DELAY); LCD_ShowString(30, 40, 200, 24, 12, (uint8_t*) msg); } void HAL_ADC_LevelOutOfWindowCallback(ADC_HandleTypeDef* hadc) { char msg[350]; sprintf(msg, "ALARM!!! Temperature is above 22 degree."); LCD_ShowString(30, 70, 200, 24, 12, (uint8_t*) msg); LCD_ShowWarning(100, 120, 200, 200, 16); //Above is a function I wrote in lcd.c which means to draw a picture. } </pre>			
Results (screenshots and hardware photos)			
Both these three functions can demonstrate with the picture below.			
			

(1) Temperature value display

This is the function of displaying the temperature.

```
void HAL_TIM_PeriodElapsedCallback(TIM_HandleTypeDef *htim)
{
    uint16_t raw;
    char msg[350];
    double tem;
    HAL_ADC_Start(&hadc1);
    HAL_ADC_PollForConversion(&hadc1, HAL_MAX_DELAY);
    raw = HAL_ADC_GetValue(&hadc1);
    tem = (((1.43 - (double)raw * (3.3 / 4096)) / 0.0043) + 25);
    sprintf(msg, "Temperature = %f\r\n", tem);
    LCD_Clear(CYAN);
    BACK_COLOR = CYAN;
    POINT_COLOR = RED;
    HAL_UART_Transmit(&huart1, (uint8_t*)msg, strlen(msg), HAL_MAX_DELAY);
    LCD_ShowString(30, 40, 200, 24, 12, (uint8_t*) msg);
}
```

(2) Alarm information(a string information is supposed)

This is the code of the alarm system.

```
void HAL_ADC_LevelOutOfWindowCallback(ADC_HandleTypeDef* hadc)
{
    char msg[350];
    sprintf(msg, "ALARM!!! Temperature is above 22 degree.");
    LCD_ShowString(30, 70, 200, 24, 12, (uint8_t*) msg);
    LCD_ShowWarning(100, 120, 200, 200, 16);
}
```

(3) Alarm information(a picture information is supposed)

This is the code I use to display the picture I draw.

```

//Display 警告
void LCD_ShowWarning(uint16_t x, uint16_t y, uint16_t width, uint16_t height,
    uint8_t size) {
    uint8_t x0 = x;
    width += x;
    height += y;
    for(uint8_t i = 0; i < 6; i++) //判断是不是非法字符!
    {
        if (x >= width) {
            x = x0;
            y += size;
        }
        if (y >= height)
            break; //退出
        LCD_Showgraph(x, y, i, size, 0);
        x += size / 2;
    }
}

void LCD_Showgraph(uint16_t x, uint16_t y, uint8_t num, uint8_t size,
    uint8_t mode) {
    uint8_t temp, t1, t;
    uint16_t y0 = y;
    uint8_t csize = (size / 8 + ((size % 8) ? 1 : 0)) * (size / 2); //得到字体一个字符对应点阵所占的字节数
    for (t = 0; t < csize; t++) {
        if (size == 12)
            temp = asc2_1206[num][t]; //调用1206字体
        else if (size == 16)
            temp = warning[num][t];
        else if (size == 24)
            temp = asc2_2412[num][t]; //调用2412字体
        else
            return; //没有的字体
        for (t1 = 0; t1 < 8; t1++) {
            if (temp & 0x80)
                LCD_Fast_DrawPoint(x, y, POINT_COLOR);
            else if (mode == 0)
                LCD_Fast_DrawPoint(x, y, BACK_COLOR);
            temp <<= 1;
            y++;
            if (y >= lcddev.height)
                return; //超区域了
            if ((y - y0) == size) {
                y = y0;
                x++;
                if (x >= lcddev.width)
                    return; //超区域了
                break;
            }
        }
    }
}

```

Problems encountered and solutions

Question 1:

The alarm system work wrong at first. When the temperature is below 22 degree, it alarmed, right the opposite of what I want.

Solution:

I change the upper limit to the lower limit, and it correct.

Question 2:

The picture display wrong at first, it only shows a red block with nothing inside of it.

Solution:

Reconstruct my picture display function according to another function the library originally contained.

Summary & experience

It is an interesting homework, and I wonder how other people implement the picture display part. I think it is flexible and others should have better ways to achieve it.

Please only paste the codes you write in the report, do not paste the unnecessary HAL API functions!!