Lesson 4 Voltage Detection and Low-voltage Alarm

1. Project Purpose

Use ADC to examine the battery voltage and realize the buzzer to make low-voltage alarm.

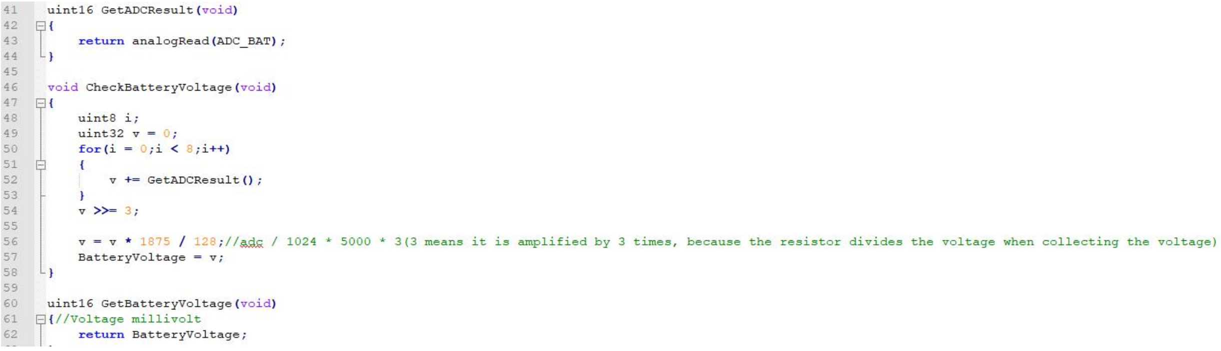
2. Project Principle

ADC (A/D converter) is short for analog-digital converter. In microcontroller application system, the input analog voltage signal is often converted into the digital signal that can be recognized by microcontroller, and the technology converting the continuously changing analogue signal into digital signal is called A/D conversion technology.

In practice, A/D can be connected between the input signal and the microcontroller to complete A/D conversion, or you can also choose to use a microcontroller with built-in A/D converter. Our controller has built-in A/D converter. When the analog signal is imported into the controller, it can be converted into the digital signal, and then process with the numerical analysis to calculate the voltage value.

3. Program Analyst

Let’s look at how to obtain the battery voltage. This function still be in App.cpp.

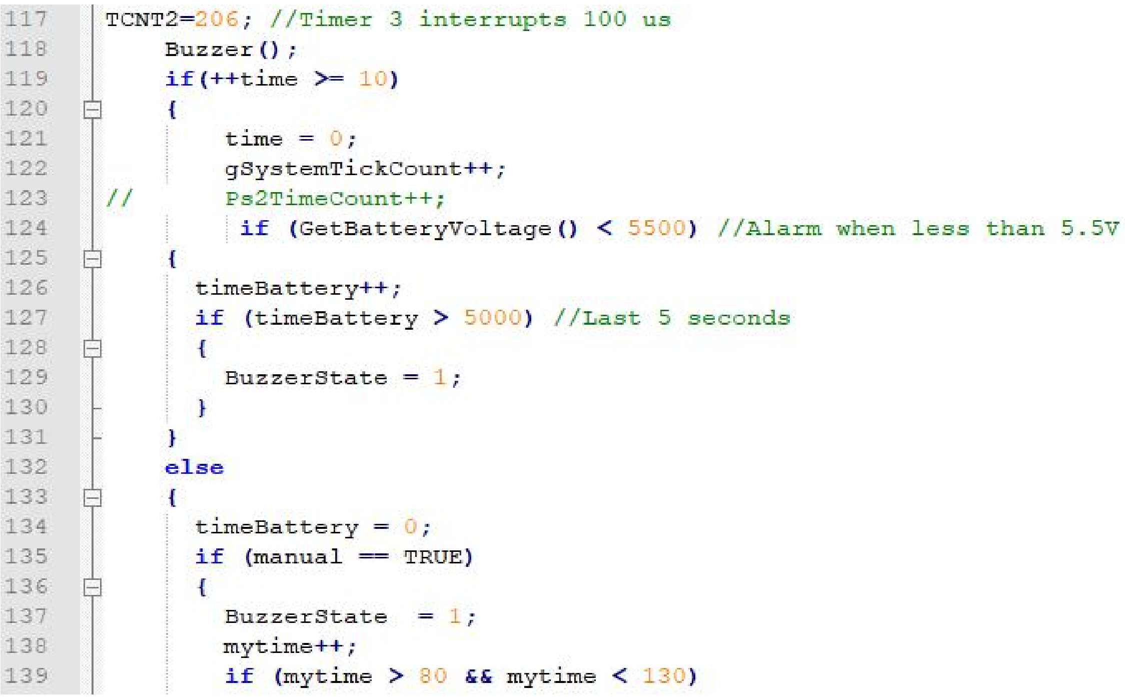


```
uint16 GetADCResult(void)
{
    return analogRead(ADC_BAT);
}

void CheckBatteryVoltage(void)
{
    uint8 i;
    uint32 v = 0;
    for(i = 0;i < 8;i++)
    {
        v += GetADCResult();
    }
    v >>= 3;

    v = v * 1875 / 128;//adc / 1024 * 5000 * 3(3 means it is amplified by 3 times, because the resistor divides the voltage when collecting the voltage)
    BatteryVoltage = v;
}

uint16 GetBatteryVoltage(void)
{//Voltage millivolt
    return BatteryVoltage;
```

1) Firstly, read the AD detection channel of battery voltage, that is, the analog value of ADC_BAT pin.

2) Then take the sample value 8 times through the “for” loop, and then shift the value

to the right by three places, that is, divide it by 8 to get the average value. Finally, the analog value is converted into the voltage, and the voltage value is returned through the GetBatteryVoltage function. The GetBatteryVoltage function is called in the interrupt of timer 3 as the figure shown below:



```
TCNT2=206; //Timer 3 interrupts 100 us
    Buzzer();
    if(++time >= 10)
    {
        time = 0;
        gSystemTickCount++;
//      Ps2TimeCount++;
         if (GetBatteryVoltage() < 5500) //Alarm when less than 5.5V
    {
      timeBattery++;
      if (timeBattery > 5000) //Last 5 seconds
      {
        BuzzerState = 1;
      }
    }
    else
    {
      timeBattery = 0;
      if (manual == TRUE)
      {
        BuzzerState  = 1;
        mytime++;
        if (mytime > 80 && mytime < 130)
```

3) If the battery voltage is less than 5.5V, it will be detected again after 5s. If the voltage is still less than 5.5V after 5s, BuzzerState will be set to 1 to make buzzer sound.