A new method of motor control

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Abstract: During the control of the DC motor, it takes a period of time to speed up the motor from the motor to the predetermined value. If the error between the set value and the current value can be calculated each time, a variety of control methods can be used to control it, such as a typical PID algorithm. However, the algorithm is more complex. After many experiments, the parameters of P and I and D are determined. If we increase the error value of PWM output value to the next output, if the difference is positive, the output will increase. If the difference is negative, then it will be subtracted. This can achieve rapid control of the motor, and it is more simple to realize.

1. Introduction:

In the engineering practice, it is very important to control the speed of the DC motor. In order to maintain the stability of the speed, there can be a variety of algorithms, typically the PID algorithm. By calculating the difference between the set value and the current value, the error value is obtained. Through a large number of experiments, the ratio coefficient, differential coefficient and integral coefficient are determined. But the method is more complex to determine the parameters, and it should be determined through a large number of experiments. To solve this problem, a simple control algorithm is proposed, which adds an error value to the output value at each time. It acts as the current control volume and can control quickly.

2. Hardware Design

The system block diagram is shown in Figure 1. In Figure 1, the main control is MSP430, and the motor is driven by L298, and the maximum current can reach 2A. It is shown that the 1602 LCD screen can display the current error value, set value and current value. The power supply voltage of the DC motor is 6V, and the data can be transmitted to the upper computer through the serial port. The results are saved and the data can be analyzed by MATLAB. The key can adjust the speed value.

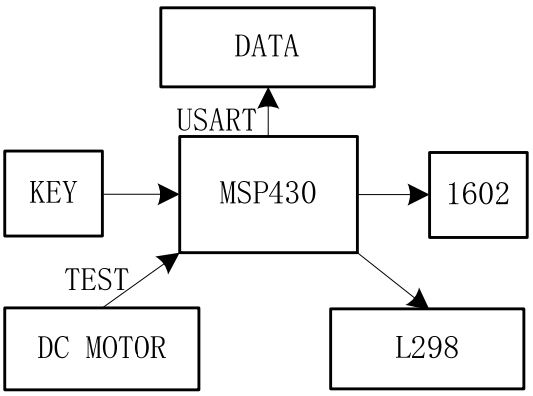

Fig 1 System block diagram

3. Software Program

In this design, it is programmed in the C language under KEIL 5. The speed is controlled at every

interval of 5ms in the timer, and a part of the code is given below:

```
 void USART1_IRQHandler(void)
{
    u8 res;
#if SYSTEM_SUPPORT_OS
    OSIntEnter();
#endif
    if(USART1->SR&(1<<5))
    {
        res=USART1->DR;
        if((USART_RX_STA&0x8000)==0)
        {
            if(USART_RX_STA&0x4000)
            {
                if(res!=0x0a)USART_RX_STA=0;
                else USART_RX_STA|=0x8000;
            }else
            {
                if(res==0x0d)USART_RX_STA|=0x4000;
                else
                {
                    USART_RX_BUF[USART_RX_STA&0X3FFF]=res;
                    USART_RX_STA++;
                    if(USART_RX_STA>(USART_REC_LEN-1))USART_RX_STA=0;
            }
            }
        }
    }
#if SYSTEM_SUPPORT_OS
    OSIntExit();
#endif
}
void uart_init(u32 pclk2,u32 bound)
{
    float temp;
    u16 mantissa;
    u16 fraction;
    temp=(float)(pclk2*1000000)/(bound*16);
    mantissa=temp;
    fraction=(temp-mantissa)*16;
     mantissa<<=4;
    mantissa+=fraction;
    RCC->APB2ENR|=1<<2;
    RCC->APB2ENR|=1<<14;
    GPIOA->CRH&=0XFFFFF00F;
    GPIOA->CRH|=0X000008B0;
    RCC->APB2RSTR|=1<<14;
    RCC->APB2RSTR&=~(1<<14);
    USART1->BRR=mantissa;
    USART1->CR1|=0X200C;
#if EN_USART1_RX
    USART1->CR1|=1<<5;
```

```
    MY_NVIC_Init(3,3,USART1_IRQn,2);
#endif
}
 void EXTI0_IRQHandler(void)
{
    delay_ms(10);
    if(KEY0==0)
    {
        LED0=0;
        LED1=1;
        key_flag=1;

        tim3_pwm+=180;
        printf("\r\nKey1 pwm=%d",tim3_pwm);
            if(tim3_pwm>35999) tim3_pwm=3000;

                TIM3_PWM_Set(35999,0,3,1,tim3_pwm);
               TIM3_PWM_Set(35999,0,3,2,tim3_pwm);
               TIM3_PWM_Set(35999,0,3,3,tim3_pwm);
               TIM3_PWM_Set(35999,0,3,4,tim3_pwm);

    }
    EXTI->PR=1<<0;
}
```

4. Summary

A new method of adjusting DC motor by error is described in this paper. The method is simple and fast. By calculating the error value, the output PWM is adjusted once every 5ms to increase the upper error value every time in the timer. If the error value is positive, it increases the output of PWM. If it is negative, it decreases the output of PWM, if it is just, then it keeps the original output.

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