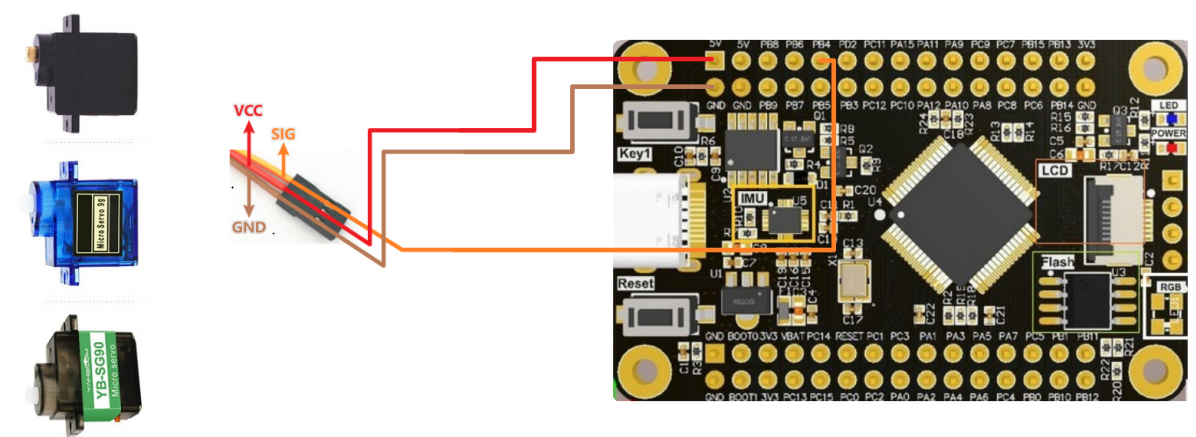


9G Servo Module: Timer (PWM)

Hardware wiring



Note: The servo wiring is the same, pin connection according to color.

9G servo module	STM32F103RCT6
VCC(Red)	5V
SIG(Yellow)	PB4
GND(Brown)	GND

Brief principle

Generally speaking, the PWM signal received by the servo has a frequency of 50HZ, that is, the period is 20ms.

When the pulse width of the high level is different, the servo can rotate to different angles.

9G servo (180°)	High level pulse width (us)
0°	500
45°	1000
90°	1500
135°	2000
180°	2500

Main code

main.c

```
#include "stm32f10x.h"
#include "PWM.h"
#include "SysTick.h"
```

```

int main(void)
{

    SysTick_Init();//滴答定时器初始化
    TIM3_PWM_Init();//定时器PWM输出初始化(TIM3_CH1)

    while(1)
    {
        /* 转动角度0度 */
        TIM_SetCompare1(TIM3, 500);//定时器设置比较值函数和通道有关 时间参数单位是us
        Delay_us(1000000);
        /* 转动角度45度 */
        TIM_SetCompare1(TIM3, 1000);//定时器设置比较值函数和通道有关 时间参数单位是us
        Delay_us(1000000);
        /* 转动角度90度 */
        TIM_SetCompare1(TIM3, 1500);//定时器设置比较值函数和通道有关 时间参数单位是us
        Delay_us(1000000);
        /* 转动角度135度 */
        TIM_SetCompare1(TIM3, 2000);//定时器设置比较值函数和通道有关 时间参数单位是us
        Delay_us(1000000);
        /* 转动角度180度 */
        TIM_SetCompare1(TIM3, 2500);//定时器设置比较值函数和通道有关 时间参数单位是us
        Delay_us(1000000);
    }
}

```

SysTick.c

```

#include "SysTick.h"

unsigned int Delay_Num;

void SysTick_Init(void)//滴答定时器初始化
{
    while(SysTick_Config(72));//设置重装载值 72 对应延时函数为微秒级
    //若将重装载值设置为72000 对应延时函数为毫秒级
    SysTick->CTRL &= ~(1 << 0);//定时器初始化后关闭，使用再开启
}

void Delay_us(unsigned int NCount)//微秒级延时函数
{
    Delay_Num = NCount;
    SysTick->CTRL |= (1 << 0);//开启定时器
    while(Delay_Num);
    SysTick->CTRL &= ~(1 << 0);//定时器初始化后关闭，使用再开启
}

void SysTick_Handler(void)
{
    if(Delay_Num != 0)
    {
        Delay_Num--;
    }
}

```

SysTick.h

```
#ifndef __SYSTICK_H__
#define __SYSTICK_H__

#include "stm32f10x.h"

void SysTick_Init(void); //滴答定时器初始化
void Delay_us(unsigned int NCount); //微秒级延时函数

#endif
```

PWM.c

```
#include "PWM.h"

void TIM3_PWM_Init(void) //定时器PWM输出初始化(TIM3_CH1)
{
    TIM_TimeBaseInitTypeDef TIM_TimeBaseStructure;
    TIM_OCInitTypeDef TIM_OCInitStructure;
    GPIO_InitTypeDef GPIO_InitStructure;

    /* TIM3 clock enable */
    /* TIM3 时钟使能 */
    RCC_APB1PeriphClockCmd(RCC_APB1Periph_TIM3, ENABLE);

    /* GPIOB and AFIO clock enable */
    /* 使能GPIOB端口时钟和AFIO时钟 */
    RCC_APB2PeriphClockCmd(RCC_APB2Periph_GPIOB | RCC_APB2Periph_AFIO, ENABLE);

    /*GPIOB Configuration: TIM3 channel1 */
    /* PB4配置复用推挽输出模式 */
    GPIO_InitStructure.GPIO_Pin = GPIO_Pin_4;
    GPIO_InitStructure.GPIO_Mode = GPIO_Mode_AF_PP;
    GPIO_InitStructure.GPIO_Speed = GPIO_Speed_50MHz;
    GPIO_Init(GPIOB, &GPIO_InitStructure);

    /* JTAG-DP Disabled and SW-DP Enabled */
    /* 禁用JTAG 启用SWD */
    GPIO_PinRemapConfig(GPIO_Remap_SWJ_JTAGDisable, ENABLE);
    /* 把TIM3_CH1部分映射到PB4引脚上 */
    GPIO_PinRemapConfig(GPIO_PartialRemap_TIM3, ENABLE);

    /* Time base configuration */
    /* 定时计数器配置 频率 100Hz*/
    TIM_TimeBaseStructure.TIM_Period = 20000 - 1; //舵机控制脉冲周期20ms 对应20000us
    TIM_TimeBaseStructure.TIM_Prescaler = 72 - 1; //72MHz / 72 =1MHz 1
    TIM_TimeBaseStructure.TIM_ClockDivision = 0;
    TIM_TimeBaseStructure.TIM_CounterMode = TIM_CounterMode_Up;
    TIM_TimeBaseInit(TIM3, &TIM_TimeBaseStructure);

    /* PWM1 Mode configuration: Channel1 */
    /* PWM1 模式配置: TIM3_CH1 */
    TIM_OCInitStructure.TIM_OCMode = TIM_OCMode_PWM1; //PWM模式1
```

```

TIM_OCInitStructure.TIM_OutputState = TIM_OutputState_Enable;//PWM输出使能
TIM_OCInitStructure.TIM_Pulse = 0;//设置比较值 决定占空比
TIM_OCInitStructure.TIM_OCPolarity = TIM_OCPolarity_High;//有效电平 高电平
TIM_OC1Init(TIM3, &TIM_OCInitStructure);

/* 使能预装载寄存器 */
TIM_OC1PreloadConfig(TIM3, TIM_OCPreload_Enable);

/* 使能自动重装载寄存器 */
TIM_ARRPreloadConfig(TIM3, ENABLE);

/* TIM3 enable counter */
/* 使能TIM3计数 */
TIM_Cmd(TIM3, ENABLE);
}

```

PWM.h

```

#ifndef __PWM_H__
#define __PWM_H__

#include "stm32f10x.h"

void TIM3_PWM_Init(void);//定时器PWM输出初始化(TIM3_CH1)

#endif

```

Phenomenon

After downloading the program, the brick helmsman rotates from 0°→45°→90°→135°→180°.