

使用 Nano130控制MPU9250传感器

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	本示例代码使用 Nano130 控制传感器 MPU9250
BSP Version	Nano100B_Series_BSP_CMSIS_v3.03.000
Hardware	NuEdu-EVB-Nano130

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1 功能描述

本范例介绍如何使用 NANO130 与运动传感器 MPU9250 通讯以获取设备的运动轨迹和方向。首先，Nano130 通过 I2C 接口对 MPU9250 进行初始化，设定模式为 Measurement Mode，取样频率为 125Hz, 频宽为 5Hz, 加速度测量范围 $\pm 2g$ ，角速度测量范围 ± 2000 dps。然后，通过 I2C 总线发出指令获取 MPU9250 测量到的九个数值，我们可以拿这些数值来做一些有趣的应用，比如，用加速度及角速度值记录移动轨迹，用磁力数值判断移动方向。

2 代码描述

首先初始化 MPU9250：

```
void Init_MPU9250(void)
{
    I2C0_Write(GYRO_ADDRESS,PWR_MGMT_1, 0x00);
    I2C0_Write(GYRO_ADDRESS,SMPLRT_DIV, 0x07);
    I2C0_Write(GYRO_ADDRESS,CONFIG, 0x06);
    I2C0_Write(GYRO_ADDRESS,GYRO_CONFIG, 0x18);
    I2C0_Write(GYRO_ADDRESS,ACCEL_CONFIG, 0x01);
}
```

MCU 通过 I2C 获取 MPU9250 传感器测量到的加速度值，角速度值和磁力计值：

```
void READ_MPU9250_ACCEL(void)
{
    BUF[0]=I2C0_Read(ACCEL_ADDRESS,ACCEL_XOUT_L);
    BUF[1]=I2C0_Read(ACCEL_ADDRESS,ACCEL_XOUT_H);
    T_X= (BUF[1]<<8)|BUF[0];
    T_X/=164;

    BUF[2]=I2C0_Read(ACCEL_ADDRESS,ACCEL_YOUT_L);
    BUF[3]=I2C0_Read(ACCEL_ADDRESS,ACCEL_YOUT_H);
    T_Y= (BUF[3]<<8)|BUF[2];
    T_Y/=164;

    BUF[4]=I2C0_Read(ACCEL_ADDRESS,ACCEL_ZOUT_L);
    BUF[5]=I2C0_Read(ACCEL_ADDRESS,ACCEL_ZOUT_H);
    T_Z= (BUF[5]<<8)|BUF[4];
    T_Z/=164;
}

void READ_MPU9250_GYRO(void)
{
    BUF[0]=I2C0_Read(GYRO_ADDRESS,GYRO_XOUT_L);
    BUF[1]=I2C0_Read(GYRO_ADDRESS,GYRO_XOUT_H);
    T_X= (BUF[1]<<8)|BUF[0];
    T_X/=16.4;

    BUF[2]=I2C0_Read(GYRO_ADDRESS,GYRO_YOUT_L);
    BUF[3]=I2C0_Read(GYRO_ADDRESS,GYRO_YOUT_H);
```

```

T_Y= (BUF[3]<<8)|BUF[2];
T_Y/=16.4;

BUF[4]=I2C0_Read(GYRO_ADDRESS,GYRO_ZOUT_L);
BUF[5]=I2C0_Read(GYRO_ADDRESS,GYRO_ZOUT_H);
T_Z= (BUF[5]<<8)|BUF[4];
T_Z/=16.4;

}

void READ_MPU9250_MAG(void)
{
    I2C0_Write(GYRO_ADDRESS,0x37,0x02);//turn on Bypass Mode
    CLK_SysTickDelay(10000);
    I2C0_Write(MAG_ADDRESS,0x0A,0x01);
    CLK_SysTickDelay(10000);
    BUF[0]=I2C0_Read (MAG_ADDRESS,MAG_XOUT_L);
    BUF[1]=I2C0_Read (MAG_ADDRESS,MAG_XOUT_H);
    T_X=(BUF[1]<<8)|BUF[0];

    BUF[2]=I2C0_Read(MAG_ADDRESS,MAG_YOUT_L);
    BUF[3]=I2C0_Read(MAG_ADDRESS,MAG_YOUT_H);
    T_Y= (BUF[3]<<8)|BUF[2];

    BUF[4]=I2C0_Read(MAG_ADDRESS,MAG_ZOUT_L);
    BUF[5]=I2C0_Read(MAG_ADDRESS,MAG_ZOUT_H);
    T_Z= (BUF[5]<<8)|BUF[4];
}

```

通过串口 1 将获取的数值打印出来：

```

READ_MPU9250_ACCEL();
printf("ACCEL:  X: %4d  Y: %4d  Z: %4d   /0.01 g\n", T_X, T_Y, T_Z);
READ_MPU9250_GYRO();
printf("GYRO :  X: %4d  Y: %4d  Z: %4d   /1 dps\n", T_X, T_Y, T_Z);
READ_MPU9250_MAG();
printf("MAG   :  X: %4d  Y: %4d  Z: %4d   /0.6 uT\n\n\n", T_X, T_Y, T_Z);

```

3 软件和硬件环境

● 软件环境

■ BSP 版本

◆ Nano100B_Series_BSP_CMSIS_v3.03.000

■ IDE 版本

◆ Keil uVersion 4.6

● 硬件环境

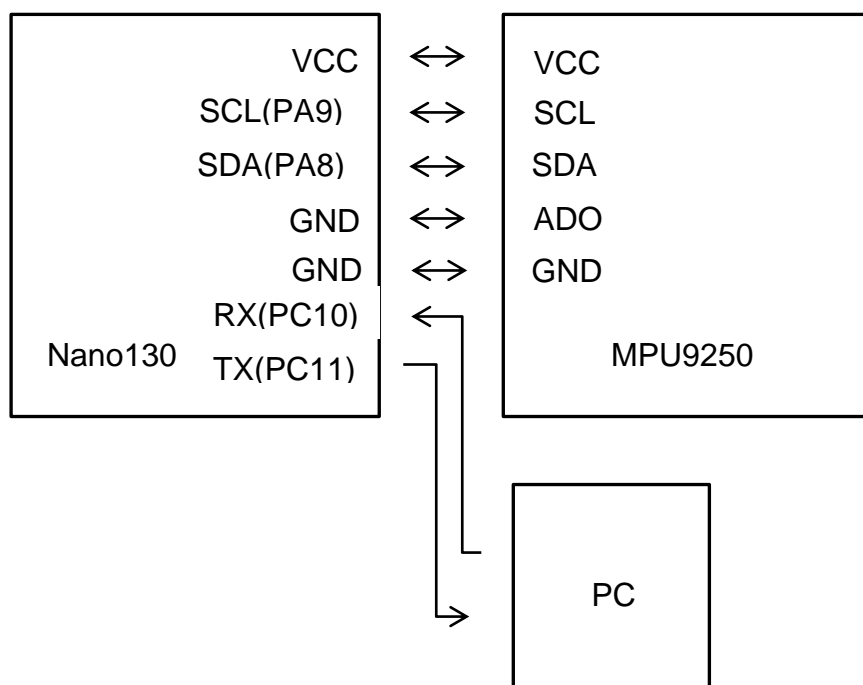
■ 电流元件

◆ NuEdu-EVB-Nano130









◆ MPU9250

■ 示意图

Nano130 使用 I2C 来传输控制命令至 MPU9250 传感器，使用 UART1 来打印数据。



4 目录信息

 EC_Nano130_Control_MPU9250_Sensor_V1.00	
 Library	Sample code header and source files
 CMSIS	Cortex [®] Microcontroller Software Interface Standard (CMSIS) by Arm [®] Corp.
 Device	CMSIS compliant device header file
 NuEdu	Library for NuEdu board
 StdDriver	All peripheral driver header and source files
 SampleCode	
 ExampleCode	Source file of example code

5 如何执行示例代码

1. 根据目录章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 Nano130_Control_MPU9250_Sensor.uvproj
2. 进入编译模式界面
 - a. 编译
 - b. 下载代码至内存
 - c. 进入/离开除错模式
3. 进入除错模式界面
 - a. 执行代码

6 修订纪录

Date	Revision	Description
Sep.25, 2019	1.00	1. 初始发布.

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