

IMU 的 ROS 驱动使用方法

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一、安装 ROS serial

安装 ROS serial 软件包，本例程依赖 ROS 提供的 serial 包实现串口通信。

首先执行如下命令，下载安装 serial 软件包：

```
sudo apt-get install ros-melodic-serial
```

然后输入 `roscd serial` 命令，进入 serial 下载位置，如果安装成功，就会出现如下信息：

```
/opt/ros/melodic/share/serial
```

二、编译代码

```
cd serial_imu_ros_v1.1/
```

```
catkin_make
```

```
source devel/setup.bash
```

```
File Edit View Search Terminal Help
Scanning dependencies of target std_srvs_generate_messages_py
Scanning dependencies of target geometry_msgs_generate_messages_eus
Scanning dependencies of target roscpp_generate_messages_nodejs
Scanning dependencies of target serial_imu_generate_messages_py
[ 0%] Built target geometry_msgs_generate_messages_eus
[ 0%] Built target std_srvs_generate_messages_py
[ 0%] Built target roscpp_generate_messages_nodejs
[ 0%] Built target serial_imu_generate_messages_py
Scanning dependencies of target serial_imu_generate_messages_eus
Scanning dependencies of target serial_imu_generate_messages_nodejs
Scanning dependencies of target serial_imu_generate_messages_lisp
[ 25%] Generating EusLisp manifest code for serial_imu
[ 25%] Built target serial_imu_generate_messages_nodejs
[ 25%] Built target serial_imu_generate_messages_lisp
[ 25%] Built target serial_imu_generate_messages_eus
Scanning dependencies of target serial_imu_generate_messages
Scanning dependencies of target serial_imu
[ 25%] Built target serial_imu_generate_messages
[ 75%] Building CXX object CMakeFiles/serial_imu.dir/serial_imu.cpp.o
[ 75%] Building CXX object CMakeFiles/serial_imu.dir/serial_parse.cpp.o
[100%] Linking CXX executable /home/wenfeng/serial_imu_ros_v1.1/devel/lib/serial_imu/serial_imu
[100%] Built target serial_imu
wenfeng@ubuntu:~/serial_imu_ros_v1.1$
```

编译完成。

三、将 IMU 通过 USB 接入系统

查看是否接入：

```
lsusb
```

```
wenfeng@ubuntu:~$ lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 005: ID 0403:6001 Future Technology Devices International, Ltd FT
232 USB-Serial (UART) IC
Bus 002 Device 004: ID 0e0f:0008 VMware, Inc.
Bus 002 Device 003: ID 0e0f:0002 VMware, Inc. Virtual USB Hub
Bus 002 Device 002: ID 0e0f:0003 VMware, Inc. Virtual Mouse
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
wenfeng@ubuntu:~$
```

查看 USB 端口号

```
ls /dev/ttyU*
```

```
wenfeng@ubuntu:~$ ls /dev/ttyU*
/dev/ttyUSB0
wenfeng@ubuntu:~$
```

配置打开 USB 转串口权限

```
sudo chmod 777 /dev/ttyUSB0
```

四、查看 IMU 数据

1、打开另一个终端，执行roscore 开启 ROS

```
roscore
```

回到 serial_imu_ws文件夹下 执行

```
source devel/setup.bash
```

执行启动 rosrn

```
roslaunch serial_imu serial_imu
```

```
wenfeng@ubuntu:~/serial_imu_ros_v1.1$ roslaunch serial_imu serial_imu
[ INFO] [1695435837.063520266]: /dev/ttyUSB0 is opened.
```

2、打开新窗口

```
source devel/setup.bash
```

输入命令查看 IMU 数据

```
rostopic echo IMU_data
```

```
File Edit View Search Terminal Help
header:
  seq: 4633
  stamp:
    secs: 1695435883
    nsecs: 325995690
  frame_id: "imu"
orientation:
  x: 0.0
  y: -0.0
  z: 0.0
  w: 1.0
orientation_covariance: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]
angular_velocity:
  x: 0.00804581212681
  y: 0.0109928844889
  z: -0.00444353149091
angular_velocity_covariance: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]
linear_acceleration:
  x: -0.00116058683489
  y: -0.0153694618493
  z: 1.01611483097
linear_acceleration_covariance: [0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]
---
```

注意其中的陀螺数据单位是 rad/s，加速度计的单位是 g。

IMU 本身的坐标系输出是前右下(FRD)，比如 X 轴方向垂直朝向地面，则此轴的加速度计值约为-1g。

ROS 驱动使用的是前左上坐标系（FLU），所以驱动里将坐标进行了转换。

```
/**
 * AHRS 帧
 */
if(_parse.id==0x02)
{
    sensor_msgs::Imu imu_data;
    sensor_msgs::MagneticField mag_data;
    imu_data.header.stamp = ros::Time::now();
    imu_data.header.frame_id = "imu";

    imu_data.linear_acceleration.x = rxdata_union.AHRS_DATA_9axis.imu[0];
    imu_data.linear_acceleration.y = -rxdata_union.AHRS_DATA_9axis.imu[1];
    imu_data.linear_acceleration.z = -rxdata_union.AHRS_DATA_9axis.imu[2];

    imu_data.angular_velocity.x = rxdata_union.AHRS_DATA_9axis.imu[3]*DEG_TO_RAD;
    imu_data.angular_velocity.y = -rxdata_union.AHRS_DATA_9axis.imu[4]*DEG_TO_RAD;
    imu_data.angular_velocity.z = -rxdata_union.AHRS_DATA_9axis.imu[5]*DEG_TO_RAD;

    attitude[0] = rxdata_union.AHRS_DATA_9axis.roll;
    attitude[1] = rxdata_union.AHRS_DATA_9axis.pitch;
    attitude[2] = rxdata_union.AHRS_DATA_9axis.yaw;

    imu_data.orientation=tf::createQuaternionMsgFromRollPitchYaw(attitude[0]*DEG_TO_RAD,-attitude[1]*DEG_TO_RAD,
    -attitude[2]*DEG_TO_RAD);

    IMU_pub.publish(imu_data);

}
```

如果需要其他坐标系，可以进行相应修改。

3、使用rviz 查看 IMU 数据，首先安装 imu_tool

```
sudo apt-get install ros-melodic-imu-tools
```

打开 rviz，选择 Fixed_Frame 为 imu，Add 添加 imu，且 Topic 为/IMU_data，则可以显示三轴姿态。

