



ROS



ESP-WROOM-32 ROS2



bilibili 照祥同学

ESP32 && ROS2 Robot Tutorials

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

整个项目的目标：构建基于ESP32-WROOM-32开发的ROS机器人

1、设计一款 ESP32-WROOM-32 的扩展板，具备以下功能：

- 带 两路霍尔编码器的直流减速电机接口
- 带 3路舵机 PWM 控制接口
- 带 1路HC-SR04 超声波接口
- 带 MPU6050 模块
- 带 GPS 模块
- 带 6路 LED 控制接口
- 带 5V/3A 的负载输出
- 带 A4950T 模组接口
- 电量显示模组接口

2、ESP32 和 该扩展板将实现如下功能

2、基于micro ros 与ROS2 主机进行通信

- 订阅 速度话题 cmd_vel
- 发布 IMU 、GPS 、Ultra 话题数据
- 适配两轮差速小车、差速履带小车、基于舵机转向的阿克曼小车
- 可通过Wifi、Serial的方式控制上
- 后续还需要开发 App （展望）

3、设计对应的硬件结构

- 差速小车
- 差速履带小车

· 基于舵机转向的阿克曼小车

PS. 边学边更新，我之前的项目中有详细的 ROS1 学习教程，及ROS2 foxy 的仿真，链接如下：

neor mini

https://github.com/COONEO/neor_mini

Chapter 1 install_Arduino_ROS2_ESP32



01-install_Arduino_ROS2_ESP32

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学: [第一节：搭建ESP32和Arduino的ROS2开发环境](#)

First : Install ROS2 Foxy in Ubuntu 20.04

Reference to:

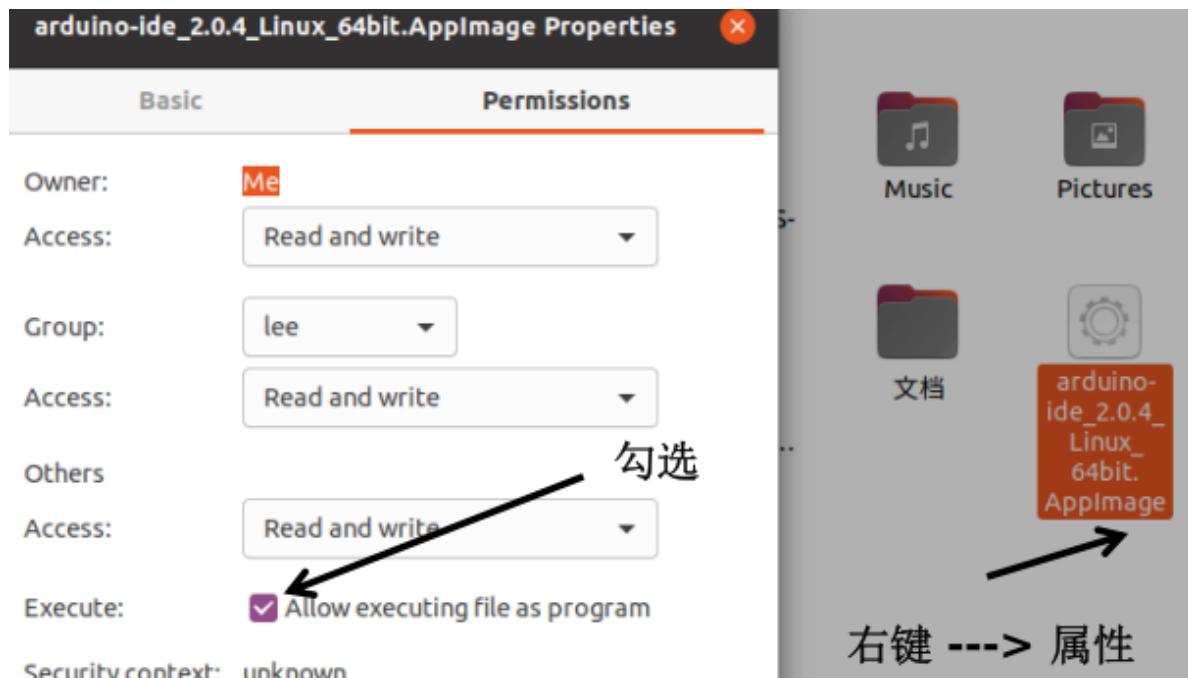
1、鱼香ROS一键安装 Page: <https://fishros.com/install/install1s/docs/index.html#/>

```
wget http://fishros.com/install -o fishros && . fishros
```

2. ROS Foxy Page: <https://docs.ros.org/en/foxy/Installation/ubuntu-Install-Debians.html>

Second :Download Arduino IDE 2.0.4 and Install ESP32-WROOM-32 Board

1.Download Arduino IDE 2.0 [Download the latest release.](#)

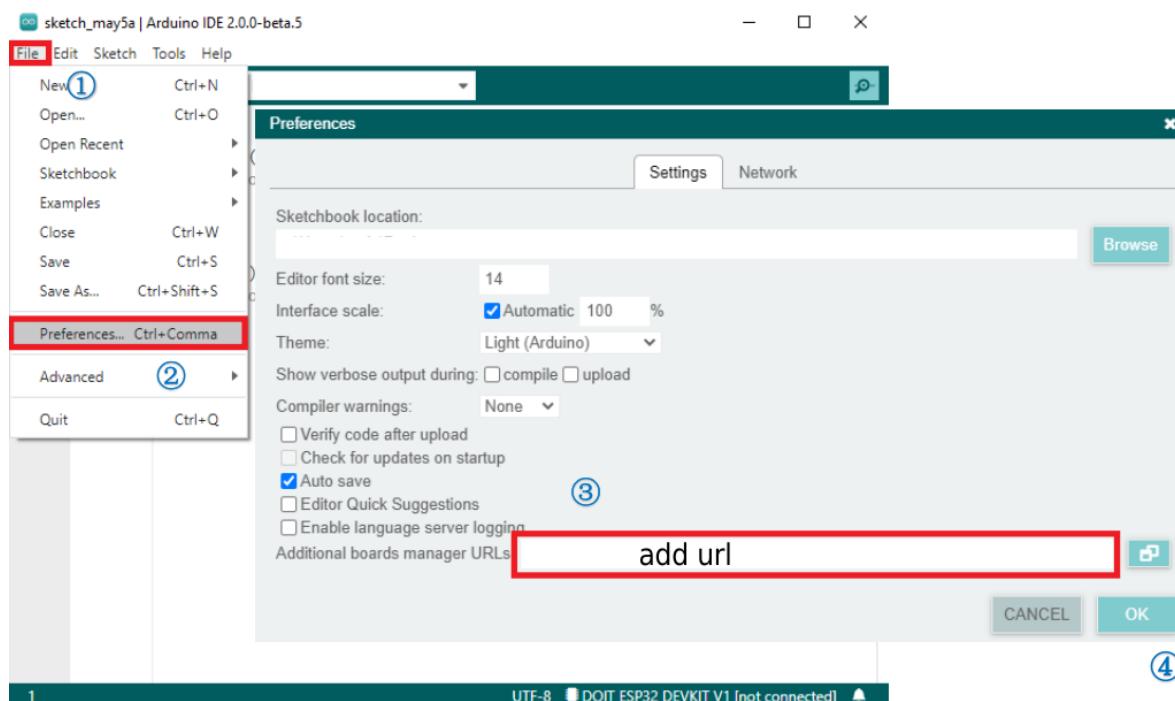


2. Install ESP32-Board in Arduino IDE

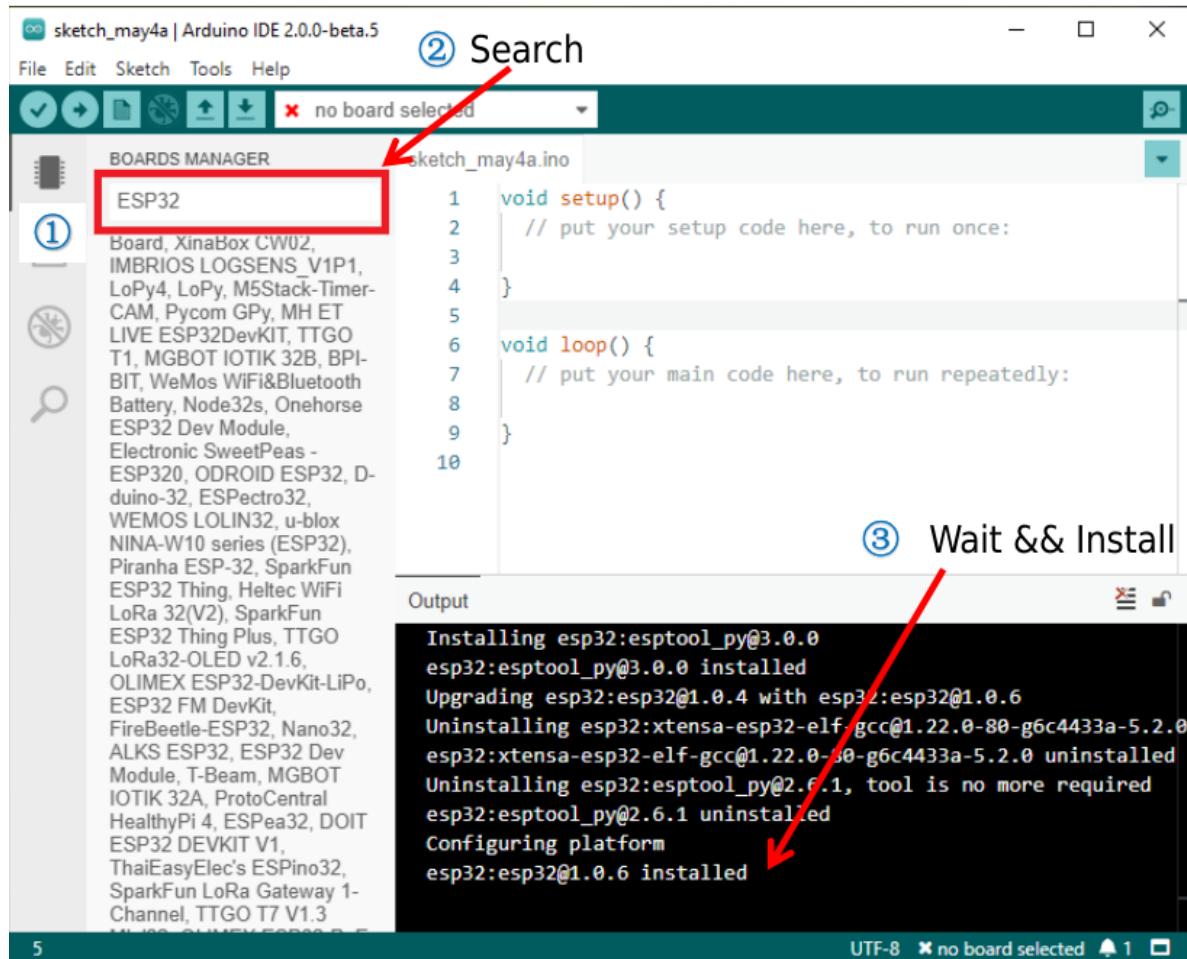
·ESP32 Board URL

https://espressif.github.io/arduino-esp32/package_esp32_dev_index.json

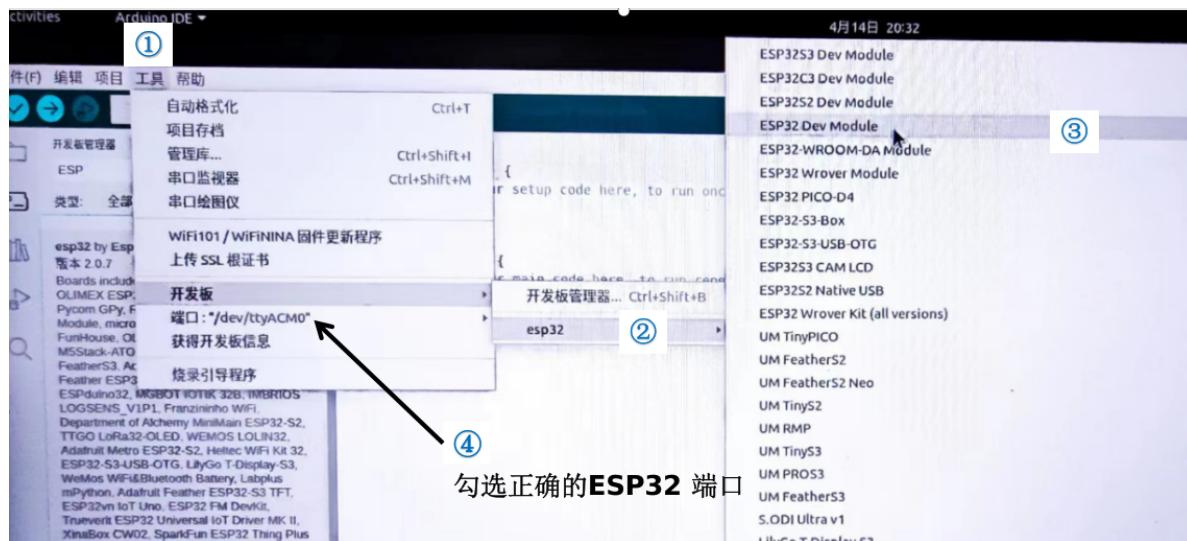
·Additional Boards Manager



·Install ESP32 Board



· Select ESP32 Dev Module && Port ID



Chapter 2 install_micro_ros



02-install_micro_ros

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学: [第二节：安装micro_ros 的 Arduino 开发环境](#)

First : Install micro-ROS Application On Ubuntu 20.04

Ref Url : [Teensy with Arduino](#)

```
# Source the ROS 2 installation
source /opt/ros/$ROS_DISTRO/setup.bash

# Create a workspace and download the micro-ROS tools
mkdir microros_ws
cd microros_ws
git clone -b $ROS_DISTRO https://github.com/micro-ROS/micro_ros_setup.git
src/micro_ros_setup

# Update dependencies using rosdep
sudo apt update && rosdep update
rosdep install --from-paths src --ignore-src -y

# Install pip
sudo apt-get install python3-pip

# Build micro-ROS tools and source them
colcon build
source install/local_setup.bash
```

Second : Creating a new firmware workspace

```
# Download micro-ROS agent packages
ros2 run micro_ros_setup create_agent_ws.sh
```

Tips: May need update your cmake version to 3.16.3

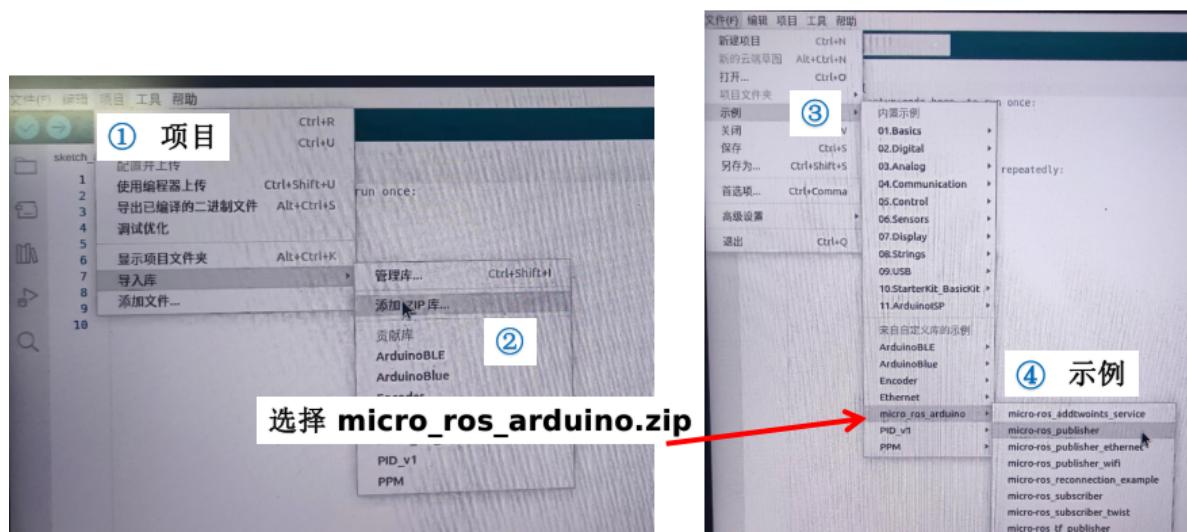
```
# Build step
ros2 run micro_ros_setup build_agent.sh
source install/local_setup.bash
```

```
lee@lee:~/microros_ws$ ros2 run micro_ros_setup build_agent.sh
Building micro-ROS Agent
Starting >>> micro_ros_msgs
Finished <<< micro_ros_msgs [1.76s]
Starting >>> micro_ros_agent
Finished <<< micro_ros_agent [1.09s]

Summary: 2 packages finished [3.07s]
lee@lee:~/microros_ws$ ls src/
micro_ros_setup  ros2.repos  uros
```

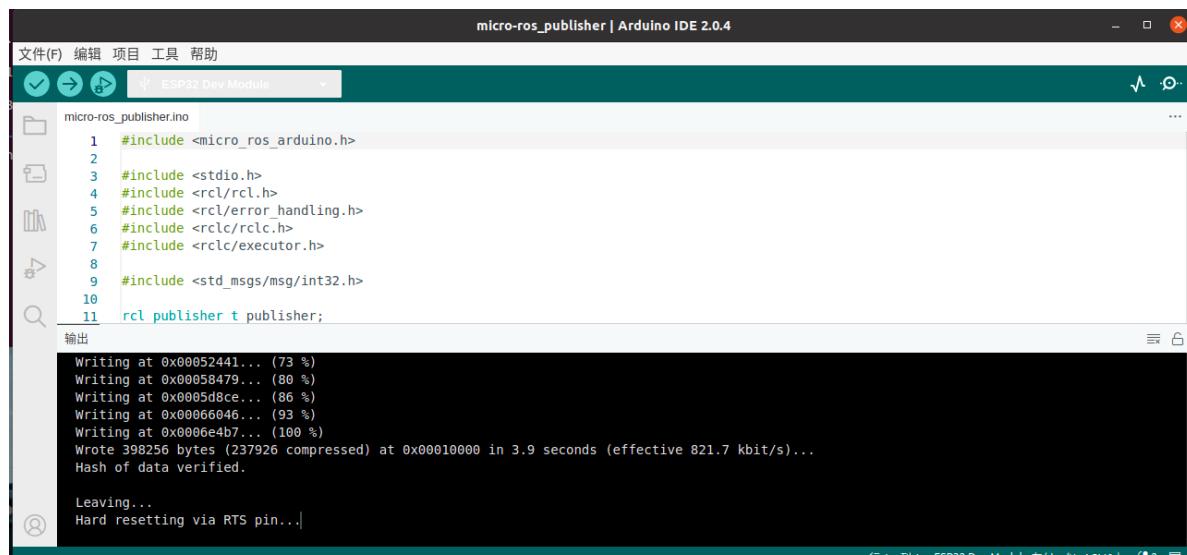
Third : Download micro_ros_arduino Library from github

Download URI : [micro ros arduino](#) (Tips: branch: foxy)



Fourth : communication with serial

example : [micro_ros_publisher](#)



Tips: May be need Permission before upload code into esp32 board.

```
sudo chmod 0777 /dev/ttyACM0
```

·Run micro_ros_agent

```
cd microros_ws  
source install/setup.bash  
ros2 run micro_ros_agent micro_ros_agent serial --dev /dev/ttyACM0
```

Tips: Run the ros2 node ,and then press the boot button on the ESP32 Board, you will see.

```
lee@lee:~/microros_ws$ ros2 run micro_ros_agent micro_ros_agent serial --dev /dev/ttyACM0  
[1681479233.015057] [INFO] | TermiosAgentLinux.cpp | init | running... | fd: 3  
[1681479233.015198] [INFO] | Root.cpp | set_verbose_level | logger setup | verbose_level: 4  
[1681479261.977911] [INFO] | Root.cpp | create_client | create | client_key: 0x3AD27E20, session_id: 0x81  
[1681479261.977954] [INFO] | SessionManager.hpp | establish_session | session established | client_key: 0x3AD27E20, address: 0  
[1681479262.003198] [INFO] | ProxyClient.cpp | create_participant | participant created | client_key: 0x3AD27E20, participant_id: 0x000(1)  
[1681479262.018557] [INFO] | ProxyClient.cpp | create_topic | topic created | client_key: 0x3AD27E20, topic_id: 0x000(2), participant_id: 0x000(1)  
[1681479262.027041] [INFO] | ProxyClient.cpp | create_publisher | publisher created | client_key: 0x3AD27E20, publisher_id: 0x000(3), participant_id: 0x000(1)  
[1681479262.036826] [INFO] | ProxyClient.cpp | create_datawriter | datawriter created | client_key: 0x3AD27E20, datawriter_id: 0x000(5), publisher_id: 0x000(3)
```

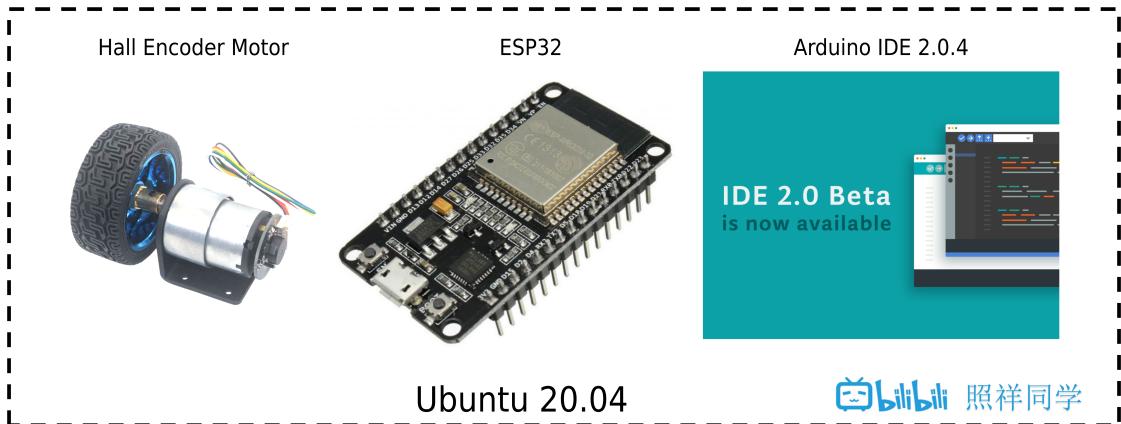
·Open another Terminal and Subscribe the Topic by ESP32 pub

```
lee@lee:~$ ros2 topic list  
/micro_ros_arduino_node_publisher  
/parameter_events  
/rosout  
lee@lee:~$ ros2 topic echo /micro_ros_arduino_node_publisher  
data: 236  
---  
data: 237  
---  
data: 238  
---  
data: 239  
---  
data: 240
```

You can try other example !!!

update by zhaoxiangli 2023.04.14

Chapter 3 ESP32_Hall_Encoder_Motor

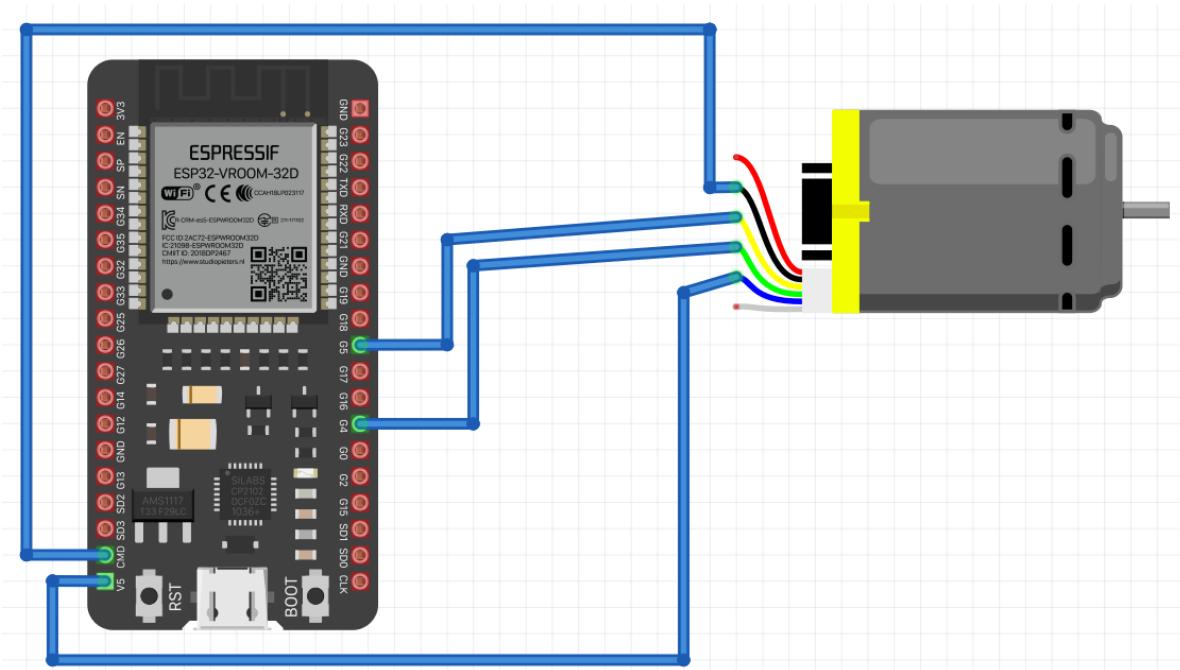


03-EPS32_Hall_encoder_motor

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学: [第三节：ESP32捕获霍尔编码电机的脉冲](#)

First : Connect Motor's Hall Encoder Sensor with ESP32



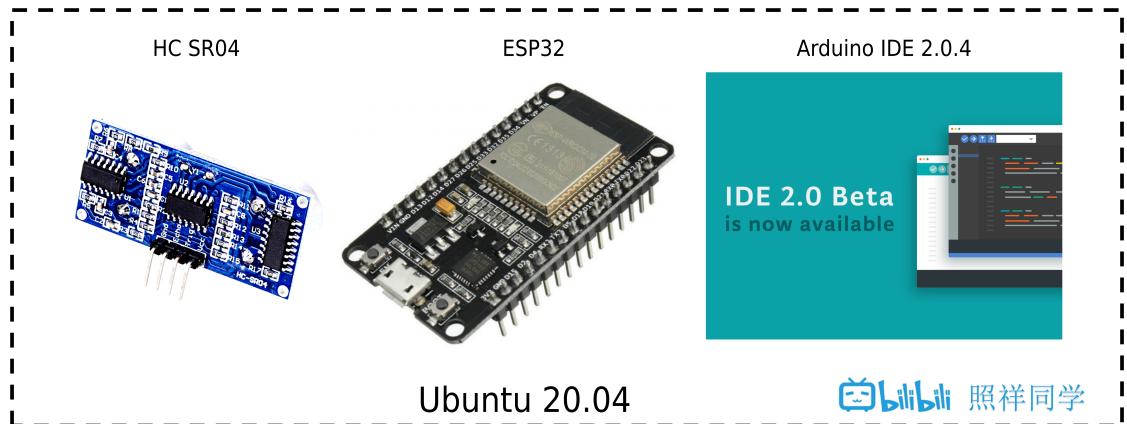
(From

Fritzing)

接线说明:

- | | | |
|--------------------|---------|---------------------|
| 霍尔传感器正极 + (蓝色) | <-----> | ESP32_Vin (5.0V) |
| 霍尔传感器负极 - (黑色) | <-----> | ESP32_Gnd (0V) |
| 编码器 Encoder A (绿色) | <-----> | ESP32_GPIO4 (Input) |
| 编码器 Encoder B (黄色) | <-----> | ESP32_GPIO5 (Input) |

Chapter 4 ESP32_HC_SR04

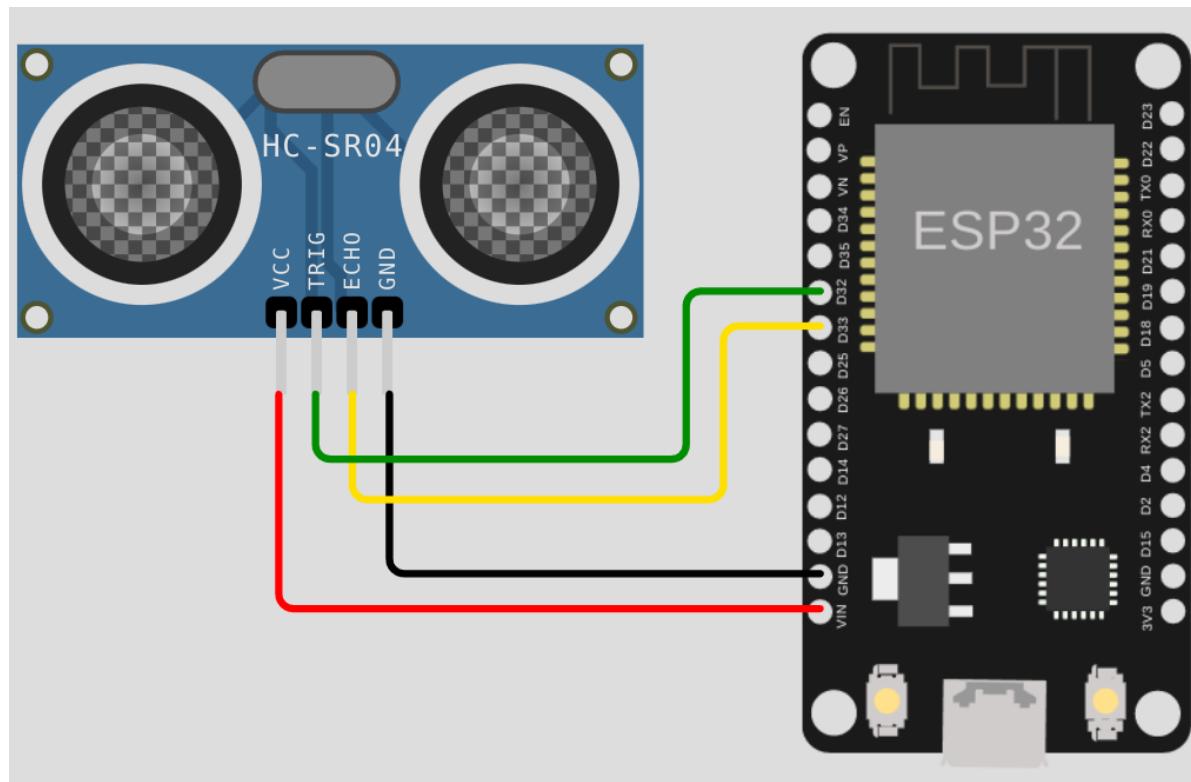


04-ESP32_HC_SR04

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学: [第四节：使用ESP32获取超声波传感器的测量值](#)

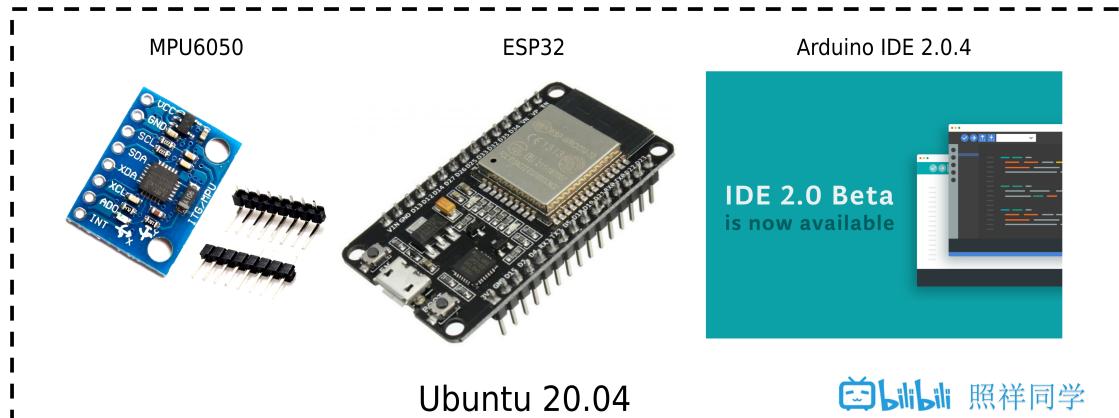
First : Connect HC_SR04 Sensor with ESP32



接线说明:

超声波传感器正极 + (红色)	<----->	ESP32_vin (5.0V)
超声波传感器负极 - (黑色)	<----->	ESP32_Gnd (0V)
声波发生引脚 TRIG (绿色)	<----->	ESP32_GPIO32 (Output)
声波接收引脚 ECHO (黄色)	<----->	ESP32_GPIO33 (Input)

Chapter 5 ESP32_MPU6050_Module



Ubuntu 20.04

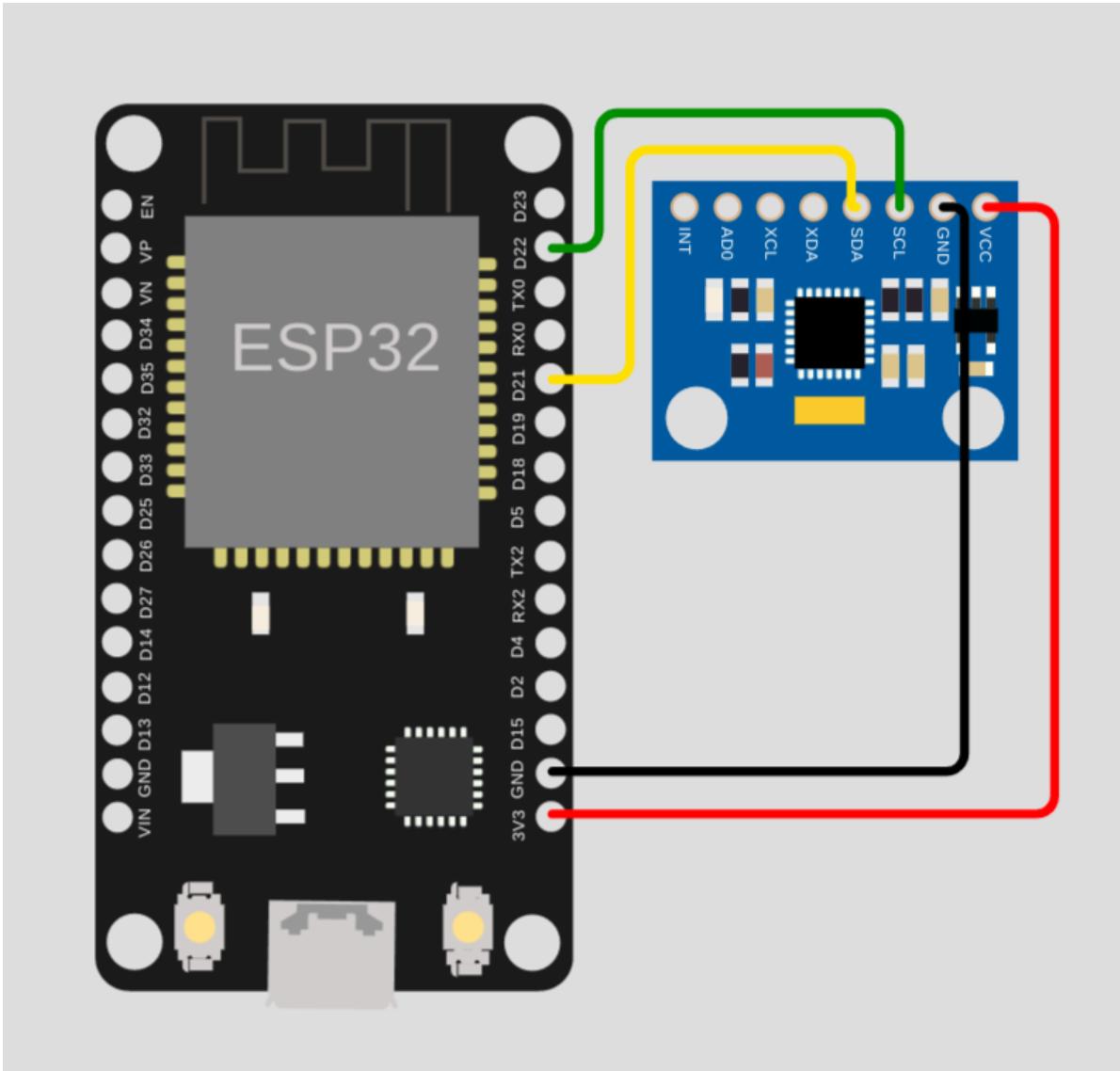
照祥同学

05-ESP32_MPU6050_Module

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学:

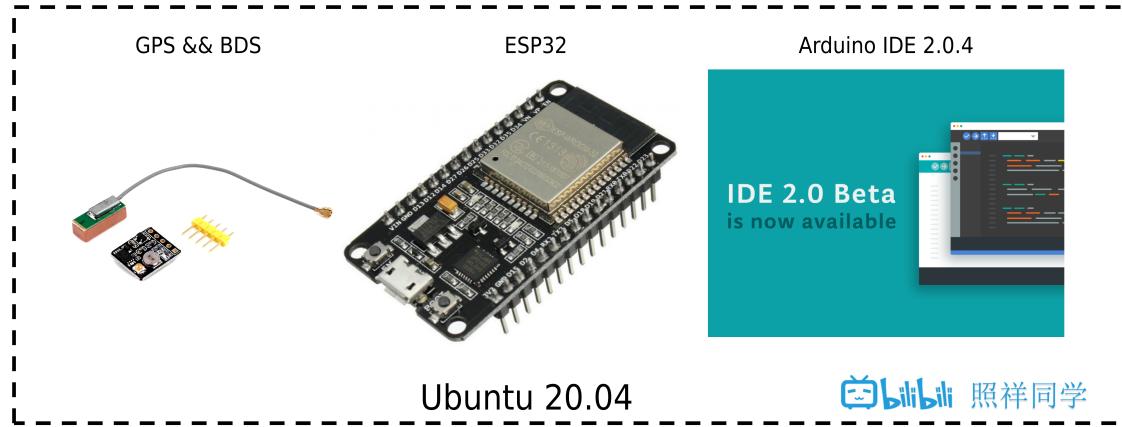
First : Connect MPU6050 Module with ESP32



接线说明:

MPU6050 正极 + (红色) <-----> ESP32_Vin (3.3V)
MPU6050 负极 - (黑色) <-----> ESP32_Gnd (0V)
数据引脚 SCL (绿色) <-----> ESP32_GPIO22 (Output)
数据引脚 SDA (黄色) <-----> ESP32_GPIO21 (Input)

Chapter 6 ESP32_GPS_BDS_Module



Ubuntu 20.04

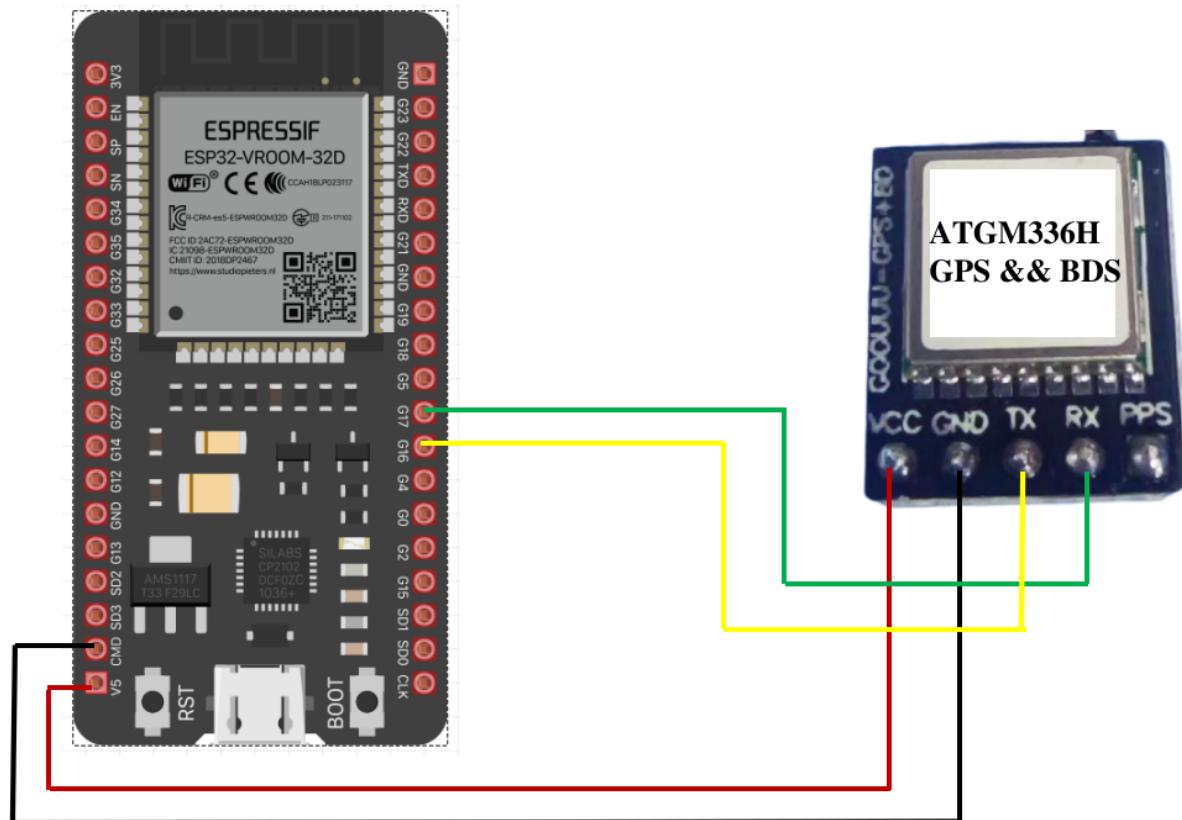


06-ESP32_GPS_BDS_module

URL: https://github.com/ZhaoXiangBox/esp32_ros2_robot

Videos from Bilibili 照祥同学:

First : Connect MPU6050 Module with ESP32



接线说明:

GPS 正极 + (红色) <-----> **ESP32_Vin** (5.0V)
GPS 负极 - (黑色) <-----> **ESP32_Gnd** (0V)
数据引脚 **RX** (绿色) <-----> **ESP32_GPIO17** (Tx2 Output)
数据引脚 **TX** (黄色) <-----> **ESP32_GPIO16** (Rx2 Input)

