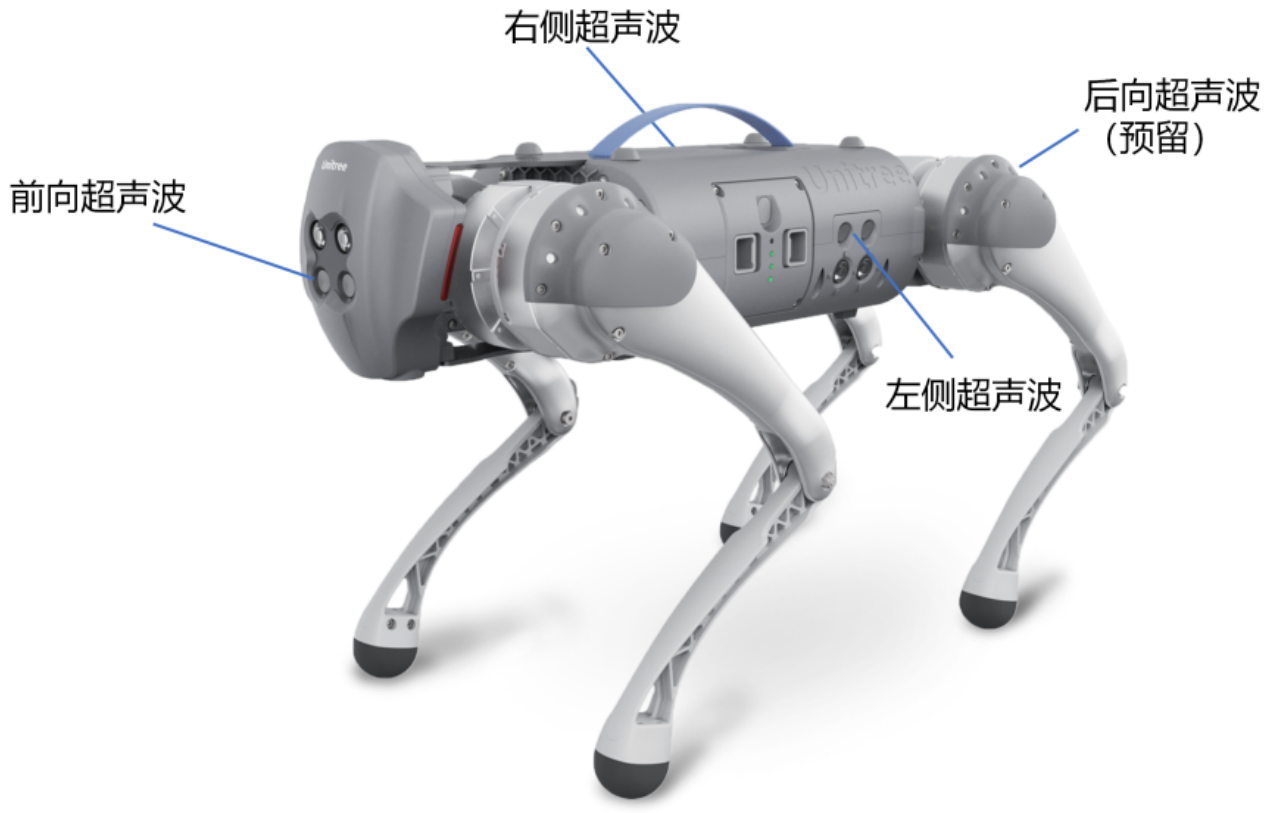
Development and use of Go1 ultrasonic module

The head and body of Go1-Edu are distributed with 3 sets of ultrasonic modules, which can be developed and used by using the programs provided by us.

> Due to the general feedback distance and obstacle avoidance effect of the ultrasonic module, the ultrasonic module will be canceled in subsequent hardware versions.

1. Hardware

3 sets of ultrasonic modules are distributed on the front face, left and right sides of the fuselage. On the hardware, the forward ultrasonic is connected to the head Nano (192.168.123.13) `ttyTHS1` , the two sides of the fuselage are ultrasonically connected to the RasPi (192.168.123.161) `ttyAMA0` On the software design, the backward ultrasonic wave is reserved, but it is not installed on the actual hardware. The schematic diagram is as follows:



Ultrasonic installation diagram

> ttyTHS1 and ttyAMA0 are the serial ports on Nano and RasPi respectively, which have been configured on the system. Do not modify the system configuration when using it, so as not to make the device unusable.

2. SDK

There are two ways to use ultrasound on Go1, one is to use the lcm topic provided by Unitree to receive all ultrasound data, and the other is to directly read serial data. Yushu recommends using the former.

2.1 Use the lcm topic provided by Unitree to receive all ultrasound data

The path of the sample program provided in this way on the dog is `~/Unitree/autostart/utrack/ultrasonic_listener_example/` , you can compile and run directly on RasPi. You can also directly download the following package to run on RasPi.

ultrasonic_listener_example.zip (5kB)

- Introduction

> Some details about the format of ultrasonic data is here:
>
> - The ultrasonic lcm topic is published only at the `RasperryPi` in `Go1` Robot.
> - The valid distance range is $(0, 2.0)$ in meters.
>   The publisher returns 2.0 when the sound wave is emitted but lost for the corresponding probe.
>   The publisher returns 10.0 for the corresponding probe when there is no update for the corresponding probe.
> - The LCM topic is published at constant frequency, which is around $100Hz$.
>   The update frequency for each single probe is around $30Hz$.
>
> The LCM topic to listen ultrasonic data is:
>
> - "/unitree/ultrasonic"
>
> The LCM message file is:
>
> - "include/lcm_msgs/ultrasonic_data.lcm"

- compile

```shell
mkdir build
cd build
cmake ..
make
```

- use

```shell
cd bin
./ultrasonic_listener_lcm
```

2.2 Directly read serial port data

This method is to use the serial port of the board to directly read the information of the ultrasonic module. Yushu provides the sdk for use. The sdk is located in `~/Unitree/sdk/ultraSoundSDK_RasPi` (The one on Nano13 is also in the corresponding position), since Yushu's own program will occupy the serial port after starting, so before using this method, you need to kill the program that occupies the device.

ultraSoundSDK.zip (28kB)

The above package is the compiled sdk, it is recommended to use this. The following introduction is mainly based on this version, and the version that comes with the dog is similar.

The SDK includes the following:

`example` -- sample program

`include` -- head File

`lib` -- Library file

`CmakeLists.txt` --cmake file

`readme.md` --ReadMe

The following sample program is provided in example:

> example_UltraSound_Nano.cpp -- the head Nano uses the UltraSound method to get data
>
> example_UltraSound_RasPi.cpp -- The fuselage RasPi uses the UltraSound method to obtain data
>
> example_UltraSoundGroup_Nano.cpp -- the head Nano uses the UltraSoundGroup method to obtain data
>
> example_UltraSoundGroup_RasPi.cpp -- The RasPi of the fuselage uses the UltraSoundGroup method to obtain data

As can be seen from the sample program, the SDK provides 2 methods to obtain ultrasonic data, `UltraSound` and `UltraSoundGroup` .

`UltraSound` The data is acquired one by one according to the device number. Device numbers 0, 1, 2, and 3 represent the forward, left, right and backward ultrasound respectively. As mentioned above, backward ultrasonic waves are reserved in the software design. In fact, there is no such equipment as backward ultrasonic waves, so be careful when using them.

`UltraSoundGroup` is used `vector` Made a package, users can choose by themselves.

Before use, you need to put the SDK package on the corresponding board! For local use only.

- Release hardware occupancy

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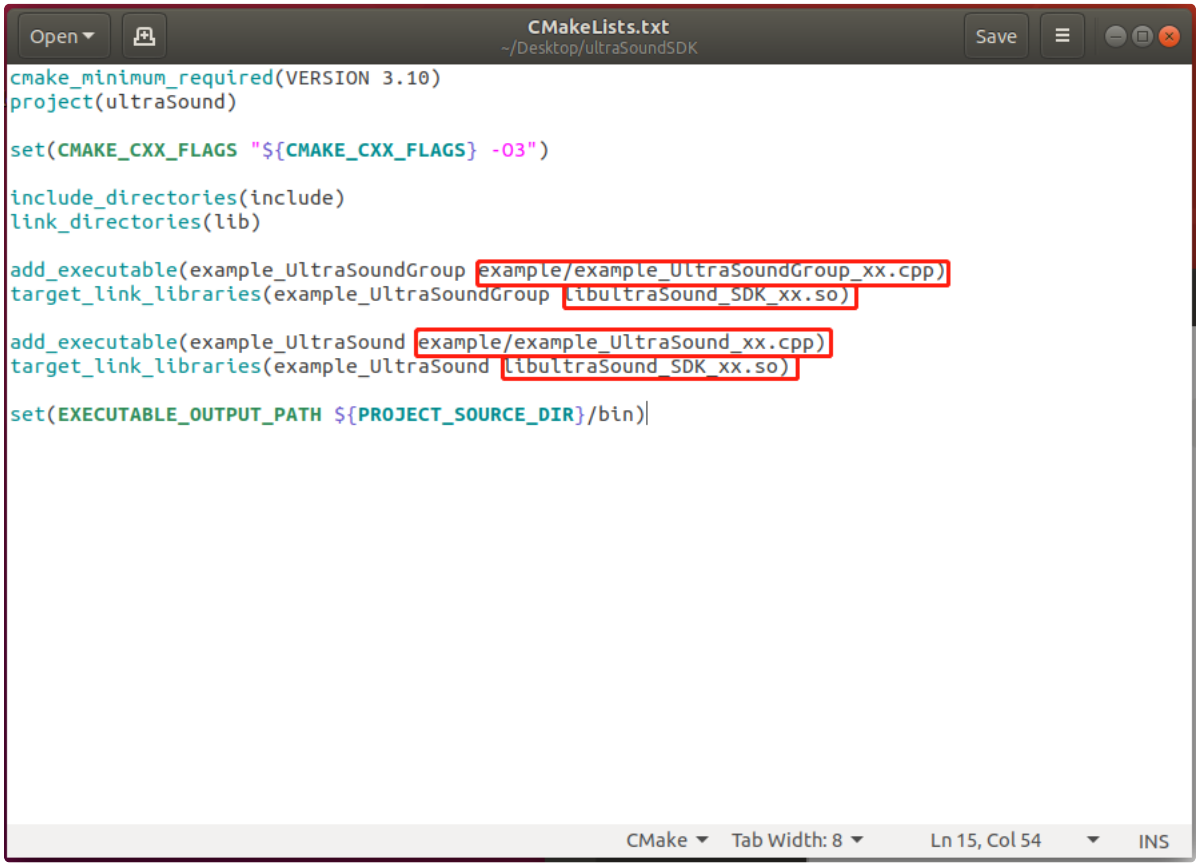
```
#查询
ps -aux | grep g1_ultrasonic
#kill
ps -aux | grep g1_ultrasonic | awk '{print $2}' | xargs kill -9
```

- Modify the CMakeLists.txt file



Put the CMakeLists.txt file in**xx**Replace according to the actual situation**Nano**or**RasPi**.

- compile

```shell
mkdir build
cd build
cmake ..
make
```

- use

```shell
cd bin
./example_UltraSound
./example_UltraSoundGroup
```