Quick Setup Guide for Atlas 200DK

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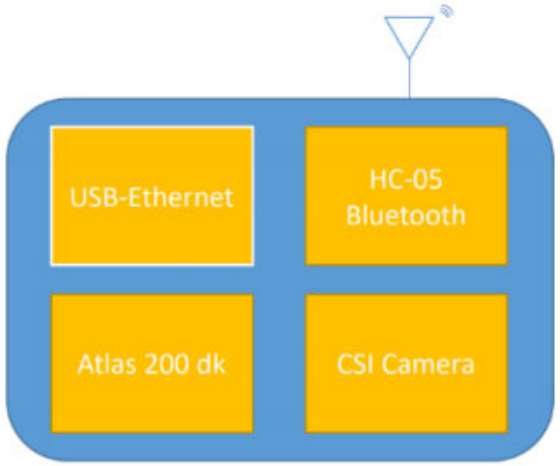
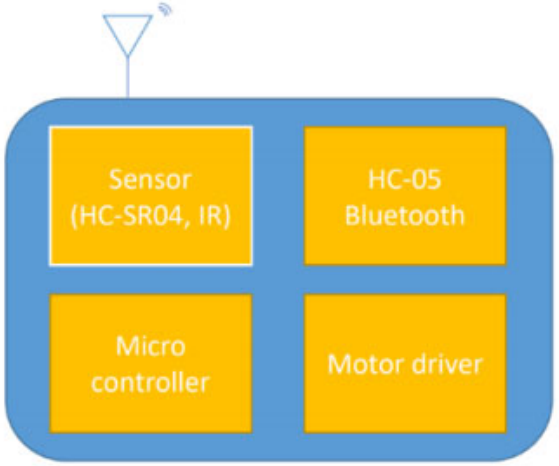
Introduction to Hand Pose RC car

Purpose: remote control car movement through different hand gestures (forward, backward, left, right etc.)

- Atlas 200dk (left);
- Wireless remote-control car (right);

First, the camera will capture the picture of the palm, after Atlas 200dk processing, identify and send the corresponding instructions to the Remote-control car through the HC-08 Bluetooth module. The car controls the forward or reverse rotation of the motor according to the corresponding instructions.





Something U have to prepare

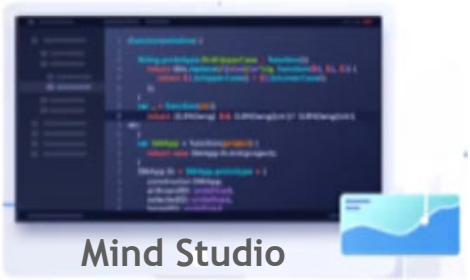
1. **Atlas 200 development kit (*)**
   - Hardware (camera, Bluetooth module);
   - Build the Development Environment;
   - Develop the algorithm for hand pose; (Mindstudio)

2. Remote control car development
   - Hardware (Car body, Battery, Bluetooth);
   - Develop the algorithm for parsing instruction and motion control (Arduino);

3. Bluetooth configuration (optional)
   - Hardware (USB to UART module);

4. Knowledge in
   - Basic C++ programming;(class, pointer, DS)
   - ~~Override, polymorphic~~
   - Basic Linux operation;
   - Basic ML algorithm (CNN, lose function);
   - Arduino program;

Atlas 200 DK Development Environment: Logical Layers



Mind Studio

Level 2 - Software

Level 1 - OS

ubuntu-16.04.xx-desktop-amd64

ubuntu-18.04.xx-server-arm64

Ubuntu server

Level 0 - Hardware

Atlas 200 DK

Atlas 200 DK Development Environment: Hardware Preparation

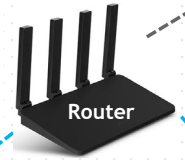
Raspiberry PI Camera

Atlas 200DK

MicroSD

A/C Adapter

Card reader



Internet

Or

Or

User PC
(Ubuntu server)

Atlas 200 DK Development Environment: Setup Workflow

01 Prepare hardware.
- Atlas 200 Developer Kit
- PC (Ubuntu)

02 Prepare software.
- Mind Studio installation package
- ADK (including ACLlib, ATC, OPP, Toolkit)
- Ubuntu arm64 package
- Driver package and running package of the Atlas 200 DK

03 Prepare environment.
- Host (deployed with Mind Studio) Ubuntu
  Set the **apt-get** permission.
  Memory space: ≥ 4 GB

01 Connect card reader to Window system.
Use W32diskImager write the .iso file to the MicroSD card;

02 Start Atlas 200 DK.
Insert the SD card into the slot on the Atlas 200 DK. The Atlas 200 DK automatically boots upon power-on.

01 Upload installation package.
Upload the software package to a directory of the Mind Studio user on the PC (Ubuntu).

02 Decompress Mind Studio installation package.
Run the **tar -zxvf** command to decompress the Mind Studio installation package **mindstudio.tar.gz**.

03 Install Mind Studio.
Go to the **MindStudio-ubuntu/bin** directory generated after the installation package is decompressed and run the following command: ./MindStudio.sh
Install the ADK when installing Mind Studio.

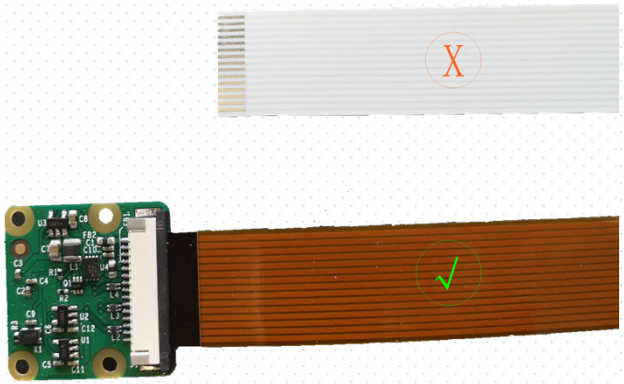
01 Connect Atlas 200 DK to PC.
- Connection through a router
- Direct connection through the USB port
- Direct connection through a network cable
- Modify the network file and restart the network service.

02 Set Atlas 200 DK.
- Add the Atlas 200 DK to the **Device Manager** of Mind Studio.
- Check the Atlas 200 DK status.

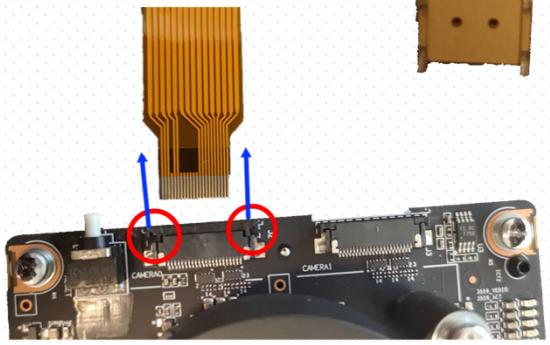
03 Set up compilation environment.
Install the compiler aarch64-linux-gnu-g++ as the Mind Studio installation user.

Atlas 200 DK Development Environment: Hardware Assemble

1. Write the image file to the SD card with Win32 Disk Imager;
2. Replace the 15 pins CSI camera ribbon flexible cable with new FPC cable, as is shown below;



3. Assemble the CSI Camera with Camera Holder;
4. Remove the cover of the board;
5. Loosen the CAMERA 0 Connector and connect the camera to the board;
6. Connect the Bluetooth module to the board UART1



Quick Setup Guide for Atlas 200DK

1. To run the Atlas 200DK, it requires to setup two environments:
    a) **Host Virtual Machine** – Download the Ubuntu 16.04.5 VM image and open it using VMware Workstation. (link)
    b) **Atlas 200DK** – Download the Atlas 200DK SD card image and clone it into the Micro SD card. (link)
2. **Configure a USB connection** to build linkage between the VM host and Atlas 200DK.

Host

Step 1: Download the VM

1. Download the pre-installed virtual machine from the following link. The compressed file is about 14.1GB, and another 30GB is required for the unzipped files.

    link

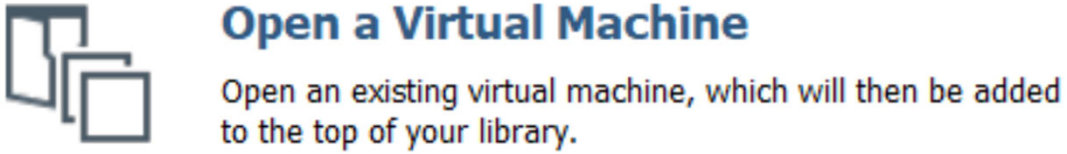
2. Unzip the file and make sure the following files are ready:

- **ascend.vmdk**

Step 2: VMware Environment Setup

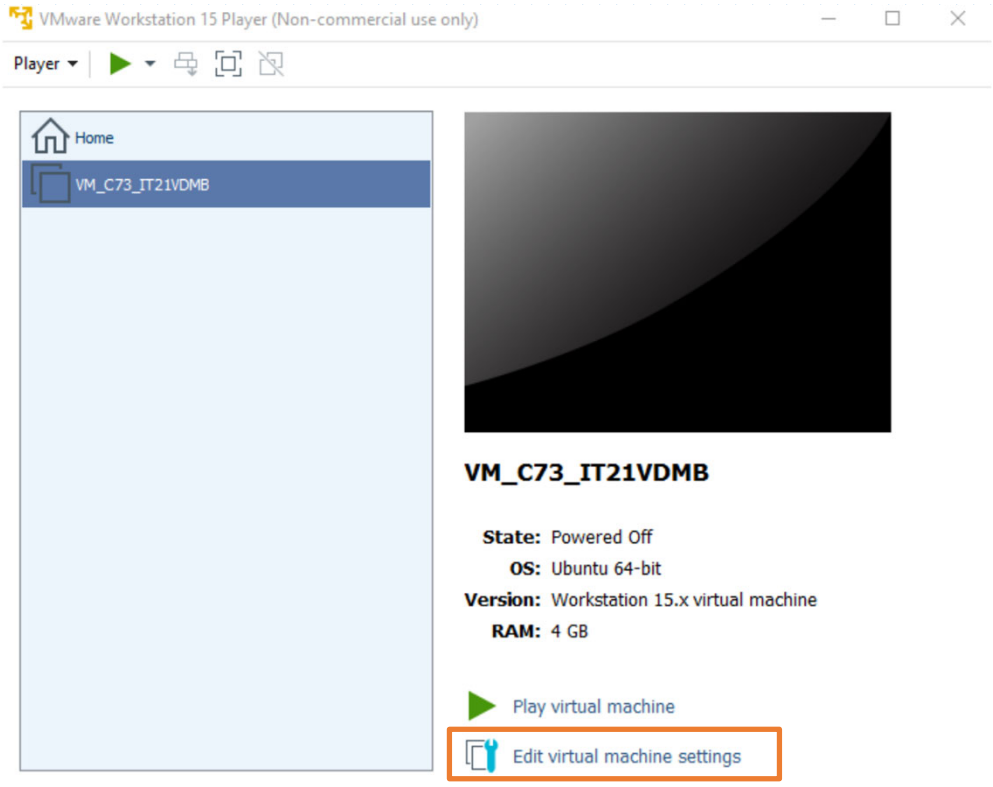
1. Download and install VMware Workstation Player: VMware Player for Windows (Not Vmware Station)

2. After the installation, open VMware Workstation. Click "Open a virtual machine" and locate the "**ascend.vmdk**" file from Step 1.



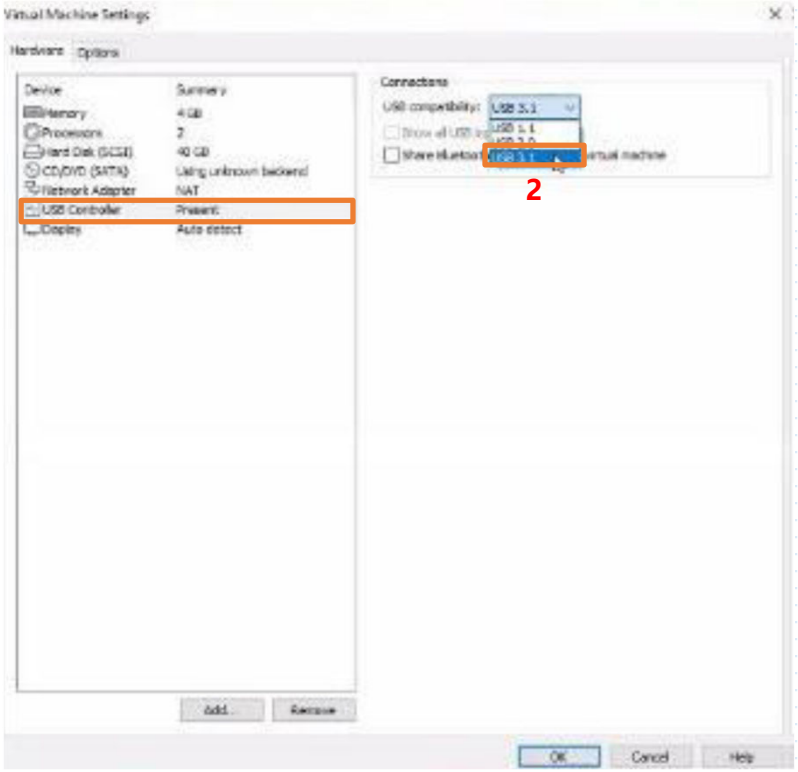
Step 2: VMware Environment Setup (cont.)

3. After importing the VM, right click on the VM "VM_C73_IT21VDMB" at the left panel in the VMware Workstation and click "Edit virtual machine settings"



Step 2: VMware Environment Setup (cont.)

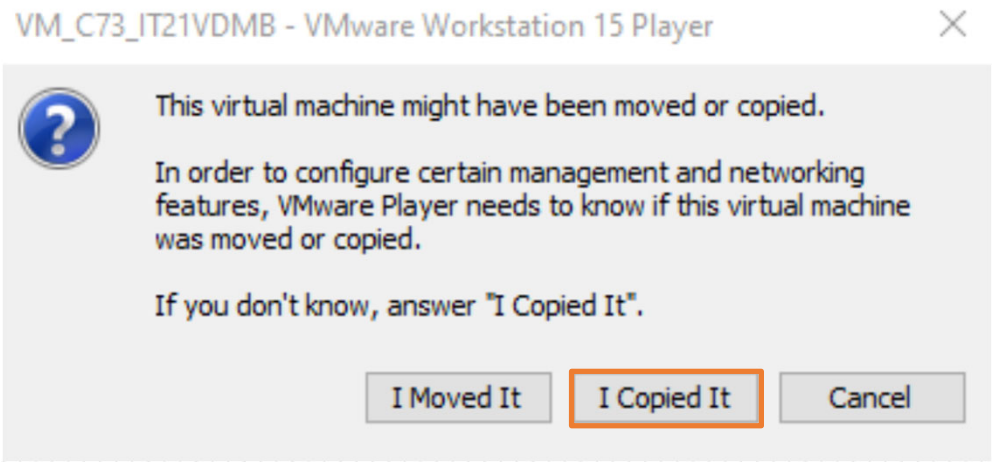
4. Allocate at least 4096MB memory to the VM and configure the USB compatibility to “USB 3.0” or above



Step 2: VMware Environment Setup (cont.)

5. Play the VM.

Choose “I Copied it” in the dialog window.



Step 2: VMware Environment Setup (cont.)

6. The username and password of the VM is:

Username: **ascend**

Password: **123**

Password of root: **123**

7. **[Information]** Some required software are pre-installed in the VM, such as Python3.7.5, pip3.7.5, Ascend Toolkit for both x86 and arm64, Ascend310 driver, MindStudio, Presenter Agent.

The OpenCV and FFmpeg libraries installed on the Atlas 200 DK has been imported and the paths of the environment variables has been configured in the **~/.bashrc** file.

Atlas 200DK

Step 1: Ready all files

1. Download Atlas 200 DK pre-installed SD card image:

link

2. Make sure the following file is downloaded from the above link:

- **200DK_C73_IT21DMDA.rar**

3. Format the SD card with SD Format (optional)

4. Unzip the file. Restore the SD image onto a Mirco SD card that size is 16GB or above by Win32DiskImager or Rufus. Refer to the link below for cloning the SD image:

https://computers.tutsplus.com/articles/how-to-clone-your-raspberry-pi-sd-cards-with-windows--mac-59294

Step 3: Insert the Micro SD card

1. After the SD card image is successfully cloned onto the Micro SD card. Insert it into the Micro SD card slot in the Atlas 200 DK.

Step 4: Connect to the virtual machine

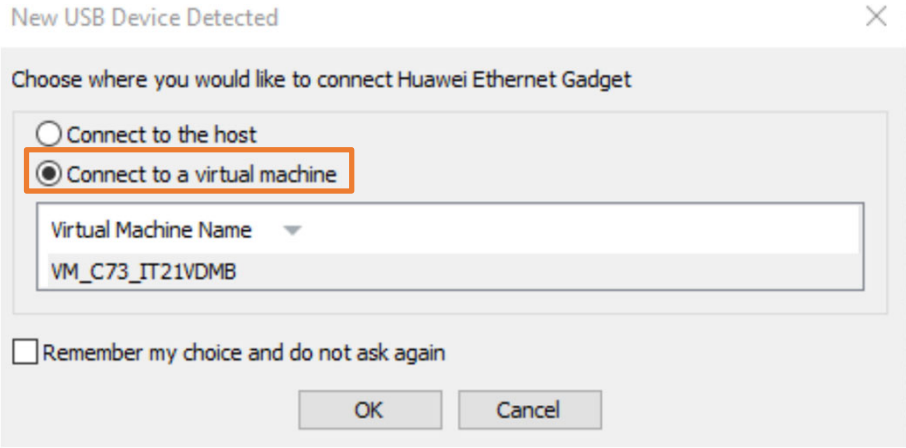
1. Power on the Atlas 200 DK.

2. Wait until all the 4 LEDs (on the mainboard inside the Atlas 200 DK) light up.

Step 4: Connect to the virtual machine (cont.)

3. Connect the Atlas 200 DK via a USB cable to the computer.

4. Choose “Connect to a virtual machine” and choose the correct VM name. Click OK to connect the Atlas 200 DK to the VM.



Step 4: Connect to the virtual machine (cont.)

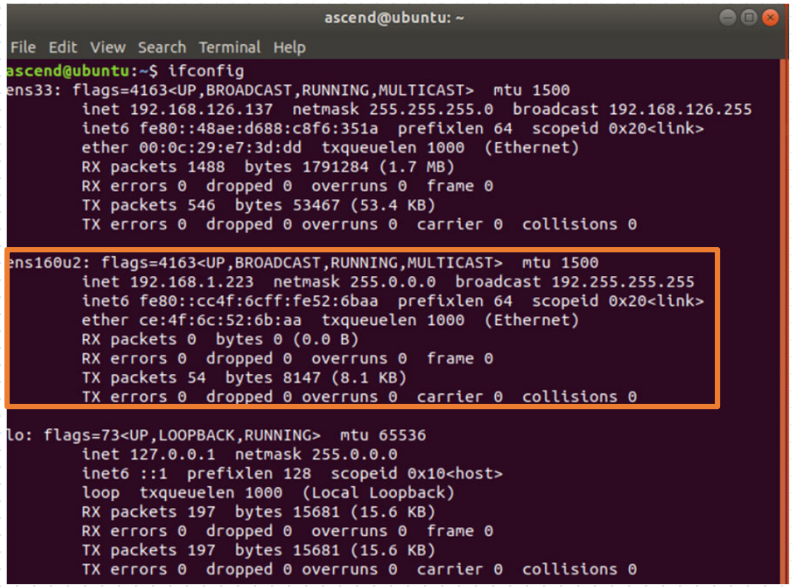
5. **[Information]** Some required software packages have been preinstalled, such as OpenCV and FFmpeg. The Presenter Agent library has been copied into the Atlas 200 DK.

6. **[Information]** The IP address of the USB port on the Atlas 200 DK has been configured as 192.168.1.2, The IP address of the LAN port on the Atlas 200 DK will be obtain automatically by DHCP protocol when the LAN cable is plugged in from the DHCP server.

Check the Connection

Step 1: Check the IP address of the VM

1. Open a terminal in the VM and run “ifconfig” to check the IP address. The network port with the second last two letter “u” is the USB Ethernet port that connecting to the Atlas 200 DK (for example ens160u2 as show below). An IPv4 address (192.168.1.x) should be assigned automatically when the Atlas 200 DK is connected correctly.



Check the Connection

Step 2: Connect by SSH

1. By default, the IP of the USB connection of the 200 DK has been set as 192.168.1.2. SSH to the Atlas 200 DK to confirm the connection by the following commands.

   "*ssh HwHiAiUser@192.168.1.2*"

   The password for both accounts **HwHiAiUser** and **root** is **Mind@123**

Remark: If the connection fails due the "Host key verification failed", you may remove the stored key of the SSH connection and reconnect it again.

"*rm ~/.ssh/known_hosts*"

```
ascend@ubuntu:~$ ssh HwHiAiUser@192.168.1.2 1
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@    WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!     @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that a host key has just been changed.
The fingerprint for the ECDSA key sent by the remote host is
SHA256:o+L+0xVOIrr46TlVAjsTD1DvV08Zy0lkPo5rkyCYAsg.
Please contact your system administrator.
Add correct host key in /home/ascend/.ssh/known_hosts to get rid of this message
.
Offending ECDSA key in /home/ascend/.ssh/known_hosts:1
  remove with:
  ssh-keygen -f "/home/ascend/.ssh/known_hosts" -R "192.168.1.2"
ECDSA host key for 192.168.1.2 has changed and you have requested strict checkin
g.
Host key verification failed. If fail
ascend@ubuntu:~$ rm ~/.ssh/known_hosts 2
```

Permission to UART

After SSH, Type
“sudo chmod 777 dev/ttyAMA1”

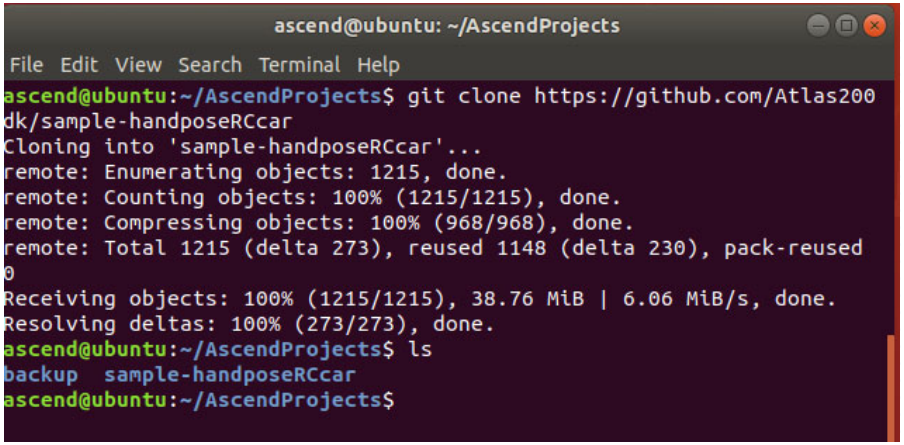
Run the hand pose car on Atlas 200dk

1. Connect the Atlas 200dk to the host virtual machine with USB cable;
2. Power On the Atlas 200dk (4 led on);
3. Ping 192.168.1.2 –c 4 ;

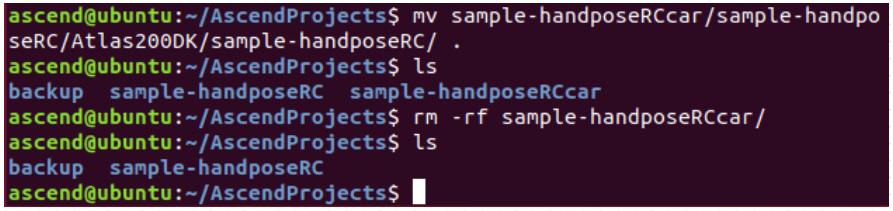
```
ascend@ubuntu:~$ ping 192.168.1.2 -c 4
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.
64 bytes from 192.168.1.2: icmp_seq=1 ttl=64 time=8.81 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=64 time=1.42 ms
64 bytes from 192.168.1.2: icmp_seq=3 ttl=64 time=1.40 ms
64 bytes from 192.168.1.2: icmp_seq=4 ttl=64 time=4.18 ms

--- 192.168.1.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3010ms
rtt min/avg/max/mdev = 1.407/3.955/8.810/3.022 ms
ascend@ubuntu:~$
```

Run the hand pose car on Atlas 200dk

4. Clone the hand pose car project from https://github.com/Atlas200dk/sample-handposeRCcar
By git clone https://github.com/Atlas200dk/sample-handposeRCcar



5. Extract the Mindstudio Project from the directory /sample-handposeRCcar

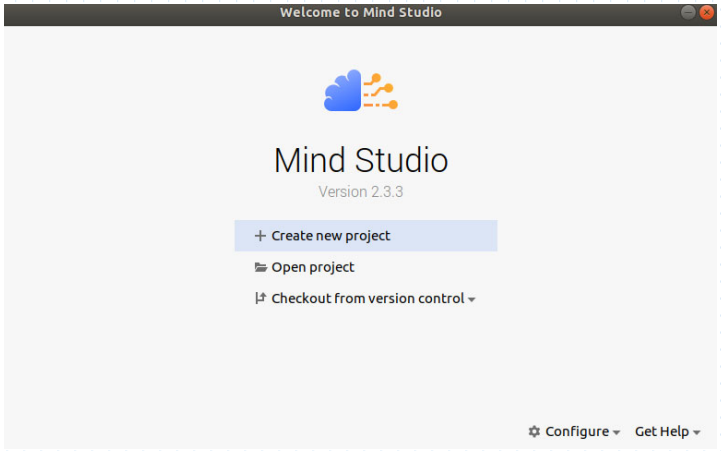


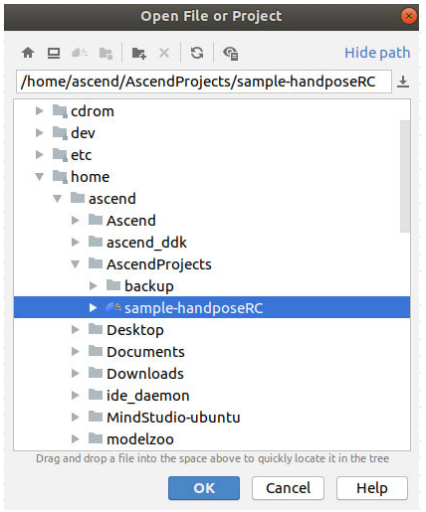
Run the hand pose car on Atlas 200dk

6. Open the MindStudio

```
ascend@ubuntu:~/AscendProjects$ ~/MindStudio-ubuntu/bin/MindStudio.sh

Checking Mind Studio environment dependencies...
Success

Checking Python environment dependencies...
```

7. Open the project





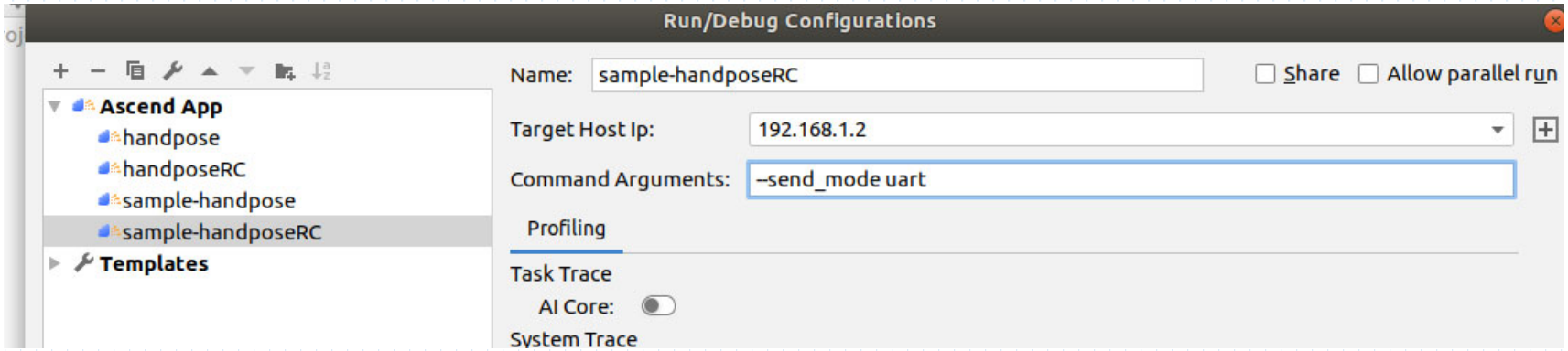
Change the Baud Rate to 9600

- Open “hand_pose.cpp” in “src” folder
- Go to the Line 60
- “~~38400~~” -> “9600”;

```
56          if(uart_ctrl.uart_open() < 0)
57          {
58          ERROR_LOG("uart_open error");
59          }                                   9600
60          if(uart_ctrl.uart_set_option(38400,8,'N',1) < 0)
61          {
62          ERROR_LOG("uart_set_option error");
63          }
```

Run the hand pose car on Atlas 200dk

8. “Run” -> “Edit Configuration ” type “***—send_mode uart***” in Command Argument



9. Build the project

Tips: Command Argument in C and C++

int main() – No argument;
int main(int argc, char** argv); - with (argc – 1) arguments

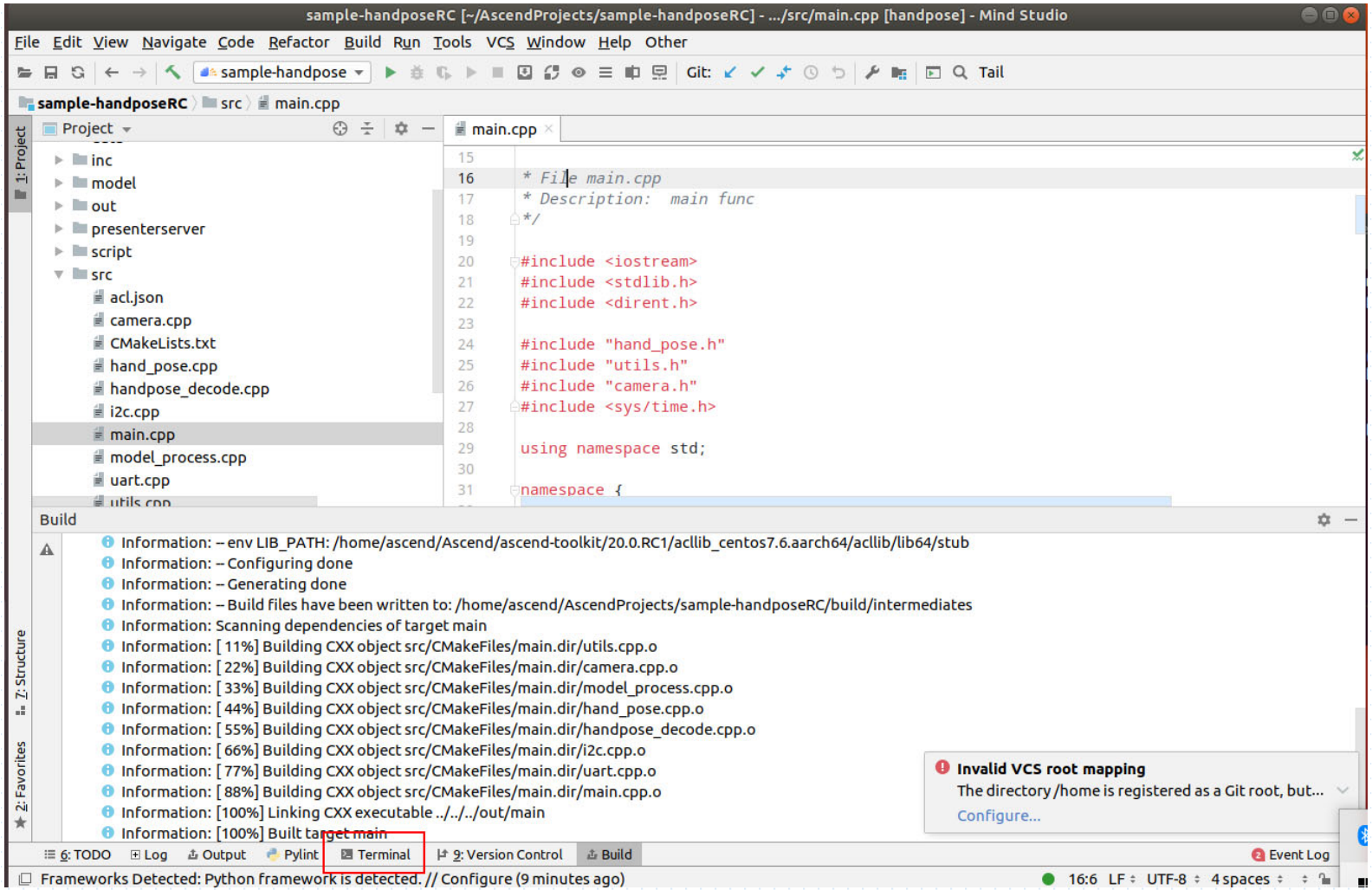
argc – argument counter (>=1);
argv – argument vector (or an array of string);

Demo:

```
#include <stdio.h>
int main(int argc,char **argv)
{
    printf("Argument number:%d\n",argc);
    for (int i=0;i<argc;i++) printf("Argument %d is %s\n",i,*(argv+i));
}
```

The function of Command Argument in the configuration is to automatically add Command Argument when the environment run the code.

10. Open the Terminal;



11. change the access permissions of script/run_presenter_server.sh and run
chmod +x script/run_presenter_server.sh
./script/run_presenter_server.sh

```
presenter_view_ip is 192.168.1.223
check ip 192.168.1.223
Use 192.168.1.223 to connect to Atlas DK Developerment Board...
Use 192.168.1.223 to show information in browser...
Finish to prepare hand_pose presenter server ip configuration.
ascend@ubuntu:~/AscendProjects/sample-handposeRC$ Presenter socket server listen on 192.168.1.223:7006

Please visit http://192.168.1.223:7007 for hand pose
```

12. Visit the presenter server and Run the project

```
2021-01-15 01:03:10 - [INFO] Start synchronizing "/home/ascend/AscendProjects/sample-handposeRC/out/out.tar" to "~/HIAI_PROJECTS/workspace_
2021-01-15 01:03:10 - [INFO] Send compressed file success.
2021-01-15 01:03:10 - [INFO] "/home/ascend/AscendProjects/sample-handposeRC/out/out.tar" has been synchronized to "~/HIAI_PROJECTS/workspac
2021-01-15 01:03:10 - [INFO] Start synchronizing "/home/ascend/AscendProjects/sample-handposeRC/out/acl.json.tar" to "~/HIAI_PROJECTS/works
2021-01-15 01:03:11 - [INFO] Send compressed file success.
2021-01-15 01:03:11 - [INFO] "/home/ascend/AscendProjects/sample-handposeRC/out/acl.json.tar" has been synchronized to "~/HIAI_PROJECTS/wor
2021-01-15 01:03:11 - [INFO] Renaming "main" on the remote host to "workspace_mind_studio_sample-handposeRC".
2021-01-15 01:03:11 - [INFO] Assigning execute permission to workspace_mind_studio_sample-handposeRC on the remote host.
2021-01-15 01:03:11 - [INFO] The path "/home/ascend/AscendProjects/sample-handposeRC/data" of the same content is found on the remote host.
2021-01-15 01:03:12 - [INFO] The path "/home/ascend/AscendProjects/sample-handposeRC/model" of the same content is found on the remote host
2021-01-15 01:03:12 - [INFO] Start running "workspace_mind_studio_sample-handposeRC" on the remote host.
2021-01-15 01:03:12 - [INFO] There is no dump path and no need to dump.
2021-01-15 01:03:12 - [INFO] Synchronizing "/home/ascend/AscendProjects/sample-handposeRC/out/run.sh" to "~/HIAI_PROJECTS/workspace_mind_st
2021-01-15 01:03:12 - [INFO] Assigning execute permission to run.sh on the remote host.
```

11. Refresh the presenter server and click on “person”