

1. 行业认知

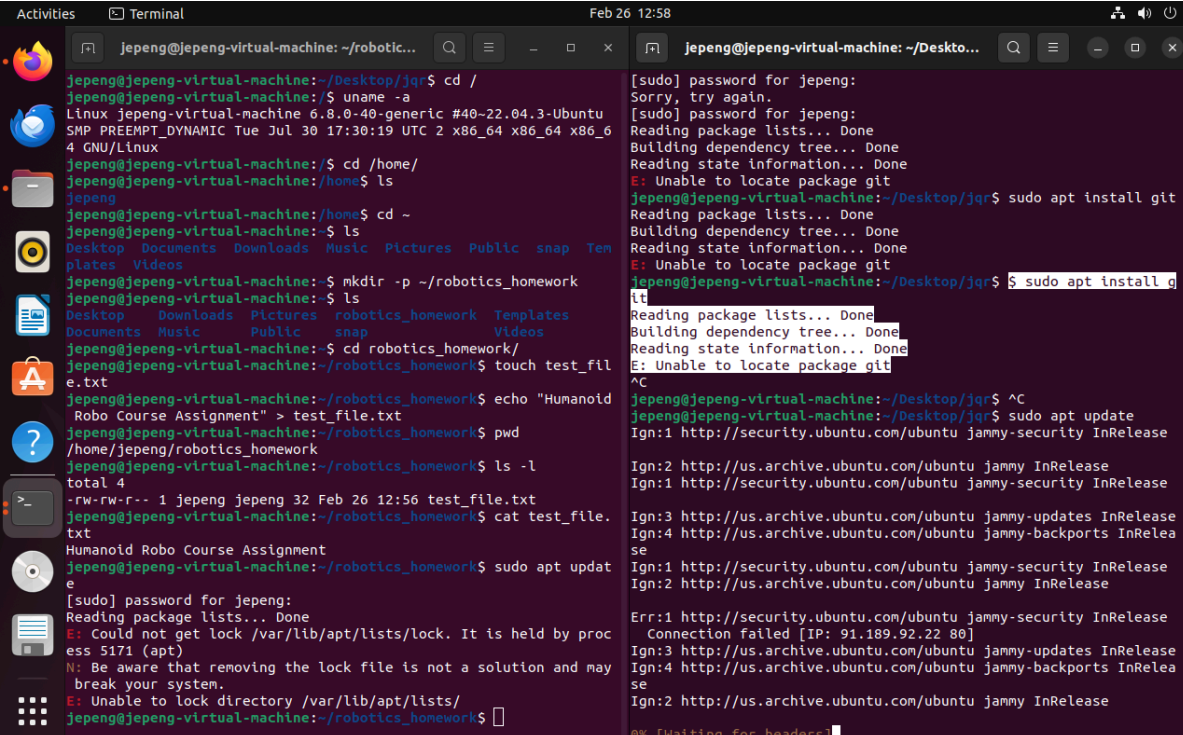
1、Unitree H1是宇树科技下面的一款机器人，其关键参数如下：

- 1、单腿自由度是5（髋关节 × 3 + 膝关节 × 1 + 踝关节 × 1），单手臂自由度是4（可拓展）。
- 2、3D激光雷达+深度相机

2、技术线路是：

使用Intel Core i5（平台功能） Intel Core i7（用户开发）的平台。使用M107电机，超强动力性能，显著提升，运动灵活度、速度、负载能力、续航等等。

2. 环境部署



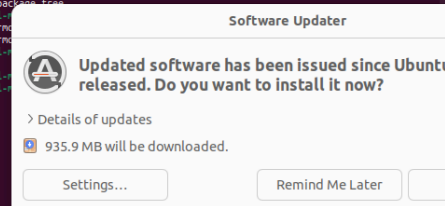
```
jepeng@jepeng-virtual-machine: ~/Desktop/jqr$ cd /
jepeng@jepeng-virtual-machine:/$ uname -a
Linux jepeng-virtual-machine 6.8.0-40-generic #40-22.04.3-Ubuntu
SMP PREEMPT_DYNAMIC Tue Jul 30 17:30:19 UTC 2 x86_64 x86_64 x86_64
GNU/Linux
jepeng@jepeng-virtual-machine:/$ cd /home/
jepeng@jepeng-virtual-machine:/home$ ls
jepeng
jepeng@jepeng-virtual-machine:/home$ cd ~
jepeng@jepeng-virtual-machine:/$ ls
Desktop Documents Downloads Music Pictures Public snap Tem
plates Videos
jepeng@jepeng-virtual-machine:/$ mkdir -p ~/robotics_homework
jepeng@jepeng-virtual-machine:/$ ls
Desktop Downloads Pictures robotics_homework Templates
Documents Music Public snap Videos
jepeng@jepeng-virtual-machine:/$ cd robotics_homework/
jepeng@jepeng-virtual-machine:~/robotics_homework$ touch test_file.txt
jepeng@jepeng-virtual-machine:~/robotics_homework$ echo "Humanoid
Robo Course Assignment" > test_file.txt
jepeng@jepeng-virtual-machine:~/robotics_homework$ pwd
/home/jepeng/robotics_homework
jepeng@jepeng-virtual-machine:~/robotics_homework$ ls -l
total 4
-rw-rw-r-- 1 jepeng jepeng 32 Feb 26 12:56 test_file.txt
jepeng@jepeng-virtual-machine:~/robotics_homework$ cat test_file.txt
Humanoid Robo Course Assignment
jepeng@jepeng-virtual-machine:~/robotics_homework$ sudo apt update
[sudo] password for jepeng:
Sorry, try again.
[sudo] password for jepeng:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package git
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt install git
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package git
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt install g
git
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package git
^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ ^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt update
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:2 http://us.archive.ubuntu.com/ubuntu jammy InRelease
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:3 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:4 http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:2 http://us.archive.ubuntu.com/ubuntu jammy InRelease
Err:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Connection failed [IP: 91.189.92.22 80]
Ign:3 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:4 http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:2 http://us.archive.ubuntu.com/ubuntu jammy InRelease
0% [Waiting for headers]
```

更新源和系统

```
Activities Terminal Feb 26 13:17
jepeng@jepeng-virtual-machine: ~/Desktop...
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt update
[sudo] password for jepeng:
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:2 http://us.archive.ubuntu.com/ubuntu jammy InRelease
Ign:3 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
0% [Waiting for headers] [Waiting for headers]^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ ^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ ^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ ^C
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt update
Get:1 http://mirrors.aliyun.com/ubuntu jammy InRelease [270 kB]
Get:2 http://mirrors.aliyun.com/ubuntu jammy-security InRelease [129 kB]
Get:3 http://mirrors.aliyun.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://mirrors.aliyun.com/ubuntu jammy-proposed InRelease [279 kB]
Get:5 http://mirrors.aliyun.com/ubuntu jammy-backports InRelease [127 kB]
Get:6 http://mirrors.aliyun.com/ubuntu jammy/universe Sources [17.8 MB]
Get:7 http://mirrors.aliyun.com/ubuntu jammy/multiverse Sources [304 kB]
Get:8 http://mirrors.aliyun.com/ubuntu jammy/main Sources [1,340 kB]
Get:9 http://mirrors.aliyun.com/ubuntu jammy/restricted Sources [23.7 kB]
Get:10 http://mirrors.aliyun.com/ubuntu jammy/main i386 Packages [1,040 kB]
Get:11 http://mirrors.aliyun.com/ubuntu jammy/main amd64 Packages [1,395 kB]
Get:12 http://mirrors.aliyun.com/ubuntu jammy/main Translation-en [510 kB]
Get:13 http://mirrors.aliyun.com/ubuntu jammy/main amd64 DEP-11 Metadata [423 kB]
Get:14 http://mirrors.aliyun.com/ubuntu jammy/main DEP-11 48x48 Icons [100.0 kB]
Get:15 http://mirrors.aliyun.com/ubuntu jammy/main DEP-11 64x64 Icons [148 kB]
```

安装和使用tree

```
Activities Terminal Feb 26 13:18
jepeng@jepeng-virtual-machine: ~
Reading state information... Done
373 packages can be upgraded. Run 'apt list --upgradable' to see them.
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt install tree -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
tree
0 upgraded, 1 newly installed, 0 to remove and 373 not upgraded.
Need to get 47.9 kB of archives.
After this operation, 116 kB of additional disk space will be used.
Get:1 http://mirrors.aliyun.com/ubuntu jammy/universe amd64 tree amd64 2.0.2-1 [47.9 kB]
Fetched 47.9 kB in 0s (371 kB/s)
Selecting previously unselected package tree.
(Reading database ... 163563 files and directories currently installed.)
Preparing to unpack .../tree_2.0.2-1_amd64.deb ...
Unpacking tree (2.0.2-1) ...
Setting up tree (2.0.2-1) ...
Processing triggers for man-db (2.10.2-1) ...
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ tree -L 2
.
0 directories, 0 files
jepeng@jepeng-virtual-machine:~/Desktop/jqr$ cd ~
jepeng@jepeng-virtual-machine:~$ tree -L 2
.
├── Desktop
│   └── jqr
├── Documents
├── Downloads
├── Music
├── Pictures
├── Public
├── robotics_homework
└── test file.txt
```



3.仿真器复现

```
Ubuntu20.04- VMware Workstation 17 Player (仅用于非商业用途)
Player(P) Feb 26 14:24
Jepeng@jepeng-virtual-machine: ~/robotics_homework

[Log] Pose: 20.91 m | Battery: 30.0% | Status: Running
[Log] Pose: 22.32 m | Battery: 25.0% | Status: Running
[Log] Pose: 23.89 m | Battery: 20.0% | Status: Running
[Log] Pose: 25.47 m | Battery: 15.0% | Status: Running
[WARNING] Low Battery! System Shutting Down...
system shutdown.
Jepeng@jepeng-virtual-machine:~/robotics_homework$ cat spimple_simulator.py
#!/usr/bin/env python3
"""
author: jepeng
"""
import time
import random

robot_name = "Jepeng H1"
battery = 100.0
position = 0.0
is_running = True

print(f"---system start{robot_name}---")

def move_forward(current_pose, speed):
    noise = random.uniform(-0.1, 0.1)
    distance = speed + noise
    new_pose = current_pose + distance
    return new_pose

while is_running:
    if battery < 20:
        print("[WARNING] Low Battery! System Shutting Down...")
        is_running = False
        break
    position = move_forward(position, 1.5)
    battery -= 5.0
    print(f"[Log] Pose: {position:.2f} m | Battery: {battery:.1f}% | Status: Running")
    time.sleep(0.5)

print("system shutdown.")
Jepeng@jepeng-virtual-machine:~/robotics_homework$
```

```
Ubuntu20.04- VMware Workstation 17 Player (仅用于非商业用途)
Player(P) Feb 26 14:23
Jepeng@jepeng-virtual-machine: ~/robotics_homework

Jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo apt install tree -y
[sudo] password for jepeng:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package tree
Jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo cp /etc/apt/sources.list /etc/ap
apg.conf      apparmor/      appport/      apt/
apm/          apparmor.d/   appstream.conf
Jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo cp /etc/apt/sources.list /etc/apt/sources.list.bak
Jepeng@jepeng-virtual-machine:~/Desktop/jqr$ sudo nano /etc/apt/sources.list
Jepeng@jepeng-virtual-machine:~/Desktop/jqr$ cd ~/robotics_homework/
Jepeng@jepeng-virtual-machine:~/robotics_homework$ nano spimple_simulator.py
Jepeng@jepeng-virtual-machine:~/robotics_homework$ python3 spimple_simulator.py
---system startJepeng H1---
[Log] Pose: 1.60 m | Battery: 95.0% | Status: Running
[Log] Pose: 3.00 m | Battery: 90.0% | Status: Running
[Log] Pose: 4.55 m | Battery: 85.0% | Status: Running
[Log] Pose: 5.96 m | Battery: 80.0% | Status: Running
[Log] Pose: 7.46 m | Battery: 75.0% | Status: Running
[Log] Pose: 8.98 m | Battery: 70.0% | Status: Running
[Log] Pose: 10.49 m | Battery: 65.0% | Status: Running
[Log] Pose: 12.03 m | Battery: 60.0% | Status: Running
[Log] Pose: 13.61 m | Battery: 55.0% | Status: Running
[Log] Pose: 15.02 m | Battery: 50.0% | Status: Running
[Log] Pose: 16.51 m | Battery: 45.0% | Status: Running
[Log] Pose: 17.95 m | Battery: 40.0% | Status: Running
[Log] Pose: 19.46 m | Battery: 35.0% | Status: Running
[Log] Pose: 20.91 m | Battery: 30.0% | Status: Running
[Log] Pose: 22.32 m | Battery: 25.0% | Status: Running
[Log] Pose: 23.89 m | Battery: 20.0% | Status: Running
[Log] Pose: 25.47 m | Battery: 15.0% | Status: Running
[WARNING] Low Battery! System Shutting Down...
system shutdown.
Jepeng@jepeng-virtual-machine:~/robotics_homework$
```