

## Lesson 1 Introducing Web Controller UI

### 1.1 Running webServer\_HAT\_V3.1.py Program

- Raspberry Pi will automatically run the program of the robot every time it reboots. Specifically, it will run [adeept\\_picar-b2/web/webServer\\_HAT\\_V3.1.py](#), but if the Raspberry Pi camera or the driver board Robot HAT V3.1 is not connected, *webServer\_HAT\_V3.1.py* will not run. It's normal because the program of the robot needs to use the camera and PCA9685 chip. The Adeept Adeept Robot HAT V3.1 controls servo via PCA9685, while the Raspberry Pi communicates with PCA9685 through I2C. If Adeept Robot HAT V3.1 is not installed on the Raspberry Pi, when instantiating the dependent library of PCA9685, a communication failure will occur with a program error.
- You can power off the Raspberry, install the camera module and Adeept Robot HAT V3.1, and reboot. Then *webServer\_HAT\_V3.1.py* can run successfully.
- Under normal circumstances, you don't need to manually run *webServer\_HAT\_V3.1.py* since the Raspberry Pi will automatically run the program when booting.
- If you failed to open the page, you can remotely log into the Raspberry Pi via SSH and type in the command as shown below to disable all auto-run programs to release resource. Otherwise, there may be issues like camera initialization failure or occupied port.

```
sudo killall python3
```

```
pi@raspberrypi:~$ sudo killall python3
```

- Type in the following code to run *webServer\_HAT\_V3.1.py*:

```
sudo python3 adeept_picar-b2/web/webServer_HAT_V3.1.py
```

```

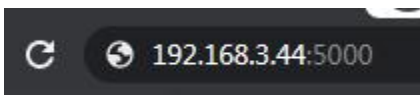
pi@raspberrypi:~$ sudo python3 adeept_picar-b2/web/webServer_HAT_V3.1.py
/usr/lib/python3/dist-packages/gpiozero/input_devices.py:852: PWMSoftwareFallback: For more accurate readings, use the pigpio pin
factory. See https://gpiozero.readthedocs.io/en/stable/api_input.html#distancesensor-hc-sr04 for more info
  warnings.warn(PWMSoftwareFallback(
.....pause.....
Starting camera thread.
[0:02:24.231028874] [2399] INFO Camera camera_manager.cpp:326 libcamera v0.5.0+59-d83ff0a4
[0:02:24.241456956] [2400] INFO RPI pisp.cpp:720 libpisp version v1.2.1 981977ff21f3 29-04-2025 (14:17:26)
[0:02:24.257821357] [2400] INFO RPI pisp.cpp:1179 Registered camera /base/axi/pcie@120000/rp1/i2c@80000/ov5647@36 to CFE device /
dev/media0 and ISP device /dev/media1 using PiSP variant BCM2712_C0
[0:02:24.260327360] [2399] WARN V4L2 v4l2_pixelformat.cpp:346 Unsupported V4L2 pixel format RPBP
[0:02:24.261075635] [2399] INFO Camera camera.cpp:1205 configuring streams: (0) 640x480-RGB888 (1) 640x480-GBRG_PISP_COMP1
[0:02:24.261200715] [2400] INFO RPI pisp.cpp:1483 Sensor: /base/axi/pcie@120000/rp1/i2c@80000/ov5647@36 - Selected sensor format:
640x480-SGBRG10_1X10 - Selected CFE format: 640x480-PC1g
.....pause.....
192.168.3.31
* Serving Flask app 'app'
* Debug mode: off
waiting for connection...
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:5000
* Running on http://192.168.3.31:5000

```

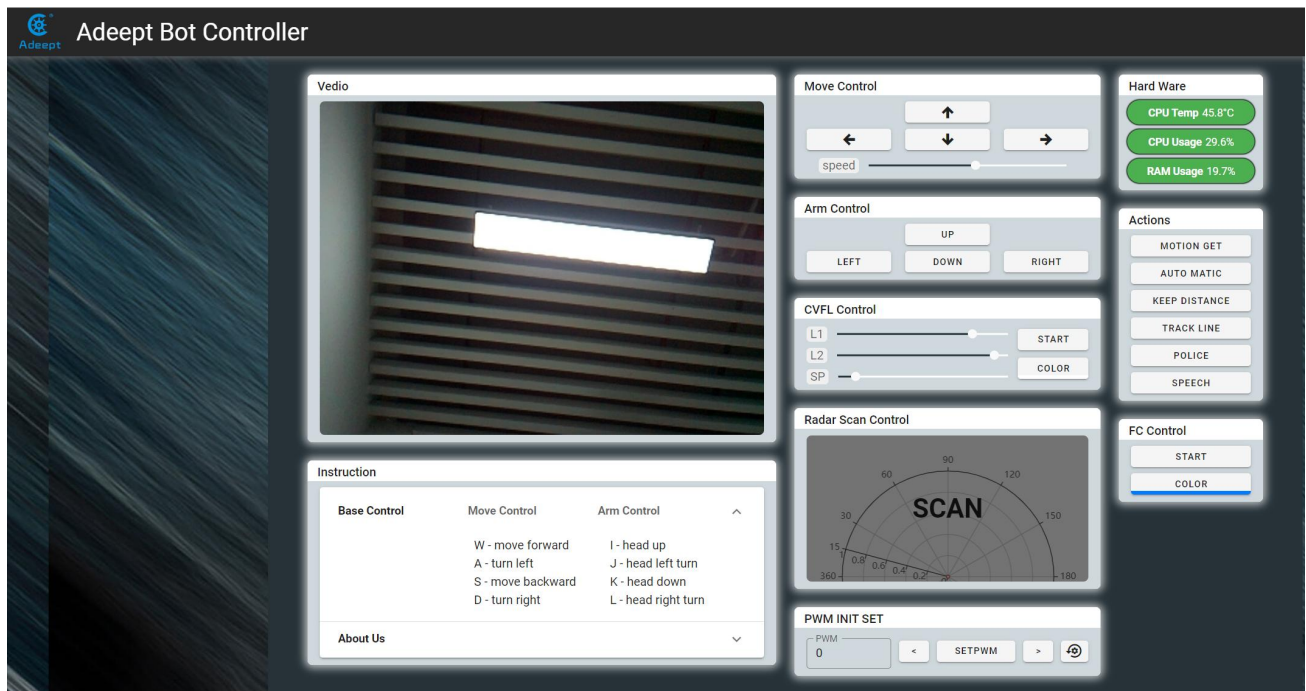
- You can access the Raspberry Pi by IP address through a web browser only when it can successfully run *webServer\_HAT\_V3.1.py*.

## 1.2 Getting Access to Web Controller

- A web controller is a web interface to control the robot product to perform various actions and it can be applied on any device that is able to run a browser, including PC, mobile phones, tablets, etc.
- If you've completed all installations based on the instructional document, it will be quite easy to open a web controller.
  1. Check that your device is under the same LAN with the Raspberry Pi.
  2. Obtain the Raspberry Pi's IP address (refer to the Software Installation section).
  3. Open a web browser (recommended to use Chrome in case of any possible incompatibility with other browsers), enter the Raspberry Pi's IP address with the port :5000, for instance: 192.168.3.44:5000



Then the web controller will be loaded into the browser.

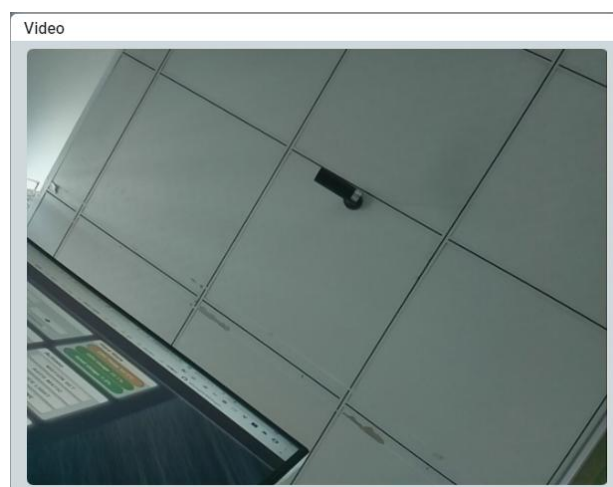


**Modules on the web controller may vary from products.** Most of them are explained below with the method for application. You can check modules on your web controller accordingly to better understand their functions and how to use them.

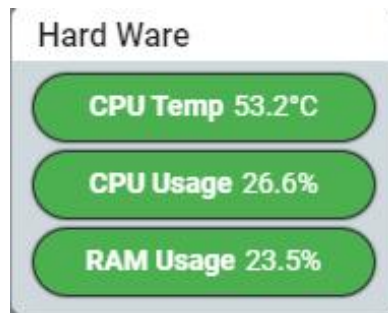
## 1.3 Function Overview of Web Controller

### 1. Video Module

Display the image captured by the camera.



## 2. Hard Ware Module



- CPU Temp: Shows the temperature of the Raspberry Pi CPU.
- CPU Usage: Shows the usage of the Raspberry Pi CPU
- RAM Usage: Shows the usage of the Raspberry Pi memory

## 3. Move Control Module

Control the movement of the robot towards the front, back, left, and right. (To turn left, you need to press "forward" and "left", To go back to the left, you need to press "back" and "left". The same to the right)



Speed: Slide to adjust the speed of the robot's movement, for robot with wheels. It can be controlled by keyboard keys, and the corresponding functions of the keys, please refer to the WEB interface.

## 4. Arm Control Module

Control the robotic's movements:



- UP: The robot head turns upward.
- DOWN: The robot head turns downward.
- LEFT: The robot head turns to the left.
- RIGHT: The robot head turns to the right.

## 5. Actions Module



- MOTION GET: switching watchdog mode. In this mode, the robot product stops moving and reacts to the moving objects detected in the camera, and the moving objects are framed in the video of the Video module.

- **AUTO MATIC:** Switch to automatic obstacle avoidance mode. In this mode, the robot product will automatically advance and use the ultrasonic module to detect obstacles. When encountering obstacles, try to find other paths.
- **KEEP DISTANCE:** The distance is detected by ultrasonic and keep a fixed distance from the object.
- **TRACK LINE:** switching hunting mode. In this mode, the robot product will try to move along the white lines on the black ground.
- **POLICE:** WS2812-LED light control based on multi-threading. It makes the WS2812-LED light on the robot blink red and blue alternately
- **SPEECH:** Control the rotation of the car's servo through simple speech recognition..

## 6. FC Control Module

Control the color detection function on/off and color setup.



- **COLOR:** Select the color to be detected.
- **START:** Turn on/off the color detection function.

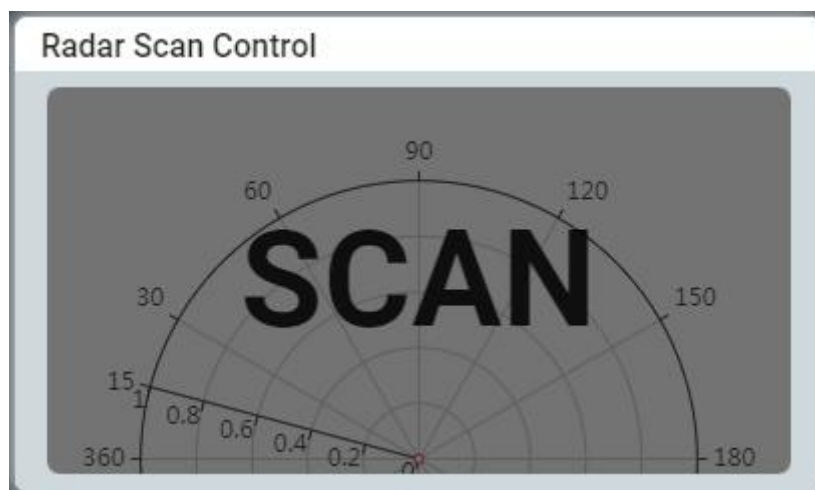
## 7. PWM INIT SET Module



Adjust the initial angle of servo to fix angle error during assembly. Servo will rotate to the initial position when initialized.

- ① Enter the number of the PWM port connected with the desired servo in the textbox under PWM. Click the PWM textbox and the buttons for increase and decrease will appear. Click to choose a PWM port number.
- ② Click the two buttons to control the servo to slightly rotate clockwise/counterclockwise.
- ③ Click to save the current angle of the servo as the initial.
- ④ Click to initialize the angle of all servos to the factory default settings.

## 8. Radar Scan Control Module



Used to perform the ultrasound scan function and display the scan results.

	Button	Instruction	Describe
	UP/The <b>W</b> key on the keyboard	forward/DS	move forward
	DOWN/The <b>S</b> key on	backward/DS	move backward

Move Control	the keyboard		
	LEFT/The <b>A</b> key on the keyboard	left/TS	turn left
	RIGHT/The <b>D</b> key on the keyboard	right/TS	turn right
	speed	wsB X	Adjusting speed
Arm Control	UP/The <b>I</b> key on the keyboard	up/UDstop	Camera up
	DOWN/The <b>K</b> key on the keyboard	down/UDstop	Camera down
	LEFT/The <b>J</b> key on the keyboard	lookleft/LRstop	Camera turn left
	RIGHT/The <b>L</b> key on the keyboard	lookright/LRstop	Camera turn right
CVFL Control	START	CVFL/stopCV	Switch video tracking line function
	COLOR	CVFLColorSet 0/CVFLColorSet 255	Switch to search for white lines on black or black lines on white.
	L1	CVFLL1 X	Set the height of L1 auxiliary line
	L2	CVFLL2 X	Set the height of L2 auxiliary line
Radar Scan Control	SCAN	scan	Used to perform the ultrasound scan function and display the scan results



PWM INIT SET	NUM		Servo connection channel number
	<	SiLeft X	Click the button to control the x-channel servo to rotate clockwise.
	>	SiRight X	Click the button to control the x-channel servo to rotate counterclockwise
	SETPWM	PWMMS X	Click the button to control the x-channel servo to 90 degrees
Hard Ware	CPU Temp		Shows the temperature of the Raspberry Pi CPU
	CPU Usage		Shows the usage of the Raspberry Pi CPU
	RAM Usage		Shows the usage of the Raspberry Pi memory
	MOTION GET	motionGet/stopCV	Switch to monitor mode, the robot stops moving and reacts to the moving objects detected by the camera, which are framed in the video module.
	AUTO MATIC	automatic/automaticOff	Switch to automatic obstacle avoidance mode

Actions	KEEP DISTANCE	KD/automaticOff	Following function
	TRACK LINE	trackLine/trackLineOff	Implement line tracking function using a 3-channel infrared module.
	POLICE	police/policeOff	Make the WS2812 LED lights on the robot flash alternately in red and blue.
	SPEECH	speech/speechOff	<p>Speech recognition requires downloading the <b>sherpa-ncnn</b> library to the <b>home</b> directory.</p> <p>After the voice recognition function is activated, you can say commands such as "lookleft", "lookright", "up", "down", or "stop", and the vehicle will execute the corresponding actions.</p>
FC Contorl	START	findColor/stopCV	Turn on/off the color detection function.
	COLOR	{'title': 'findColorSet', 'data': [r,g,b]}	Select the color to be detected

## 1.4 Q&A

- **After the Raspberry Pi boots, I can't access the web controller page via "Raspberry Pi's IP address + :5000 (port number)" (e.g., 192.168.3.230:5000)**

Take the following steps:

1. Enter the following command to restart the program:

```
sudo killall python3  
sudo python3 <your path of the webServer_HAT_V3.1.py
```

2. If error happens when running webServer\_HAT\_V3.1.py, please check whether the camera is connected appropriately (metals of the camera flex cable and camera module should be in contact with each other)

- **After the Raspberry Pi boots, I got access the web controller page via "Raspberry Pi's IP address + :5000 (port number)", but I saw a non-real-time, static video and couldn't control the robot to move.**

Take the following steps:

1. Check whether the Raspberry Pi has rebooted or not. If it has, the "Connect Failed" message would be prompted within 1 minute on the web controller page, and the terminal logged into Raspberry Pi via SSH would not respond.
2. Possible reason for this issue: Low power of the battery. It's suggested to change high power batteries for controlling the robot via web controller.
3. Use 18650 battery with "high rate discharge" mark or that can support large current output of up to 4A.