

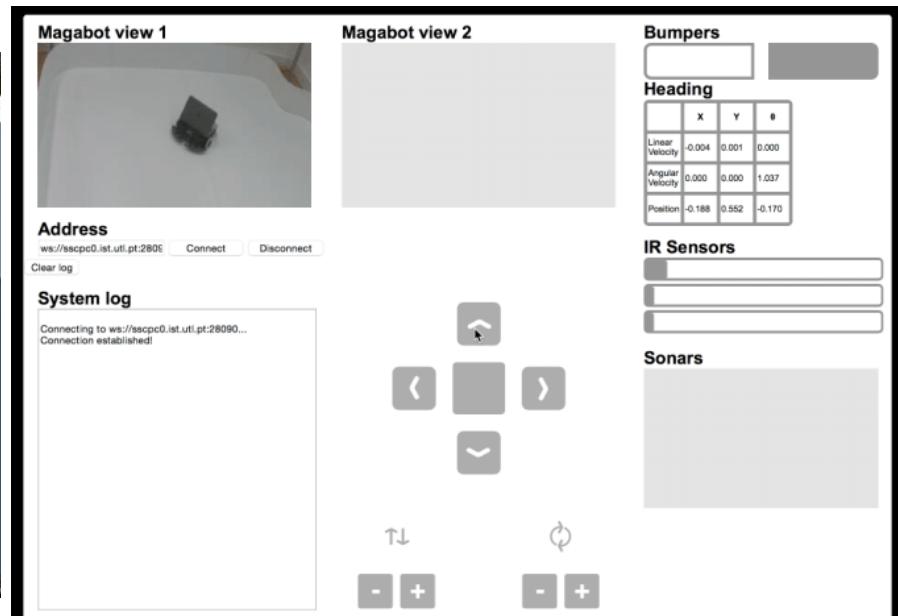
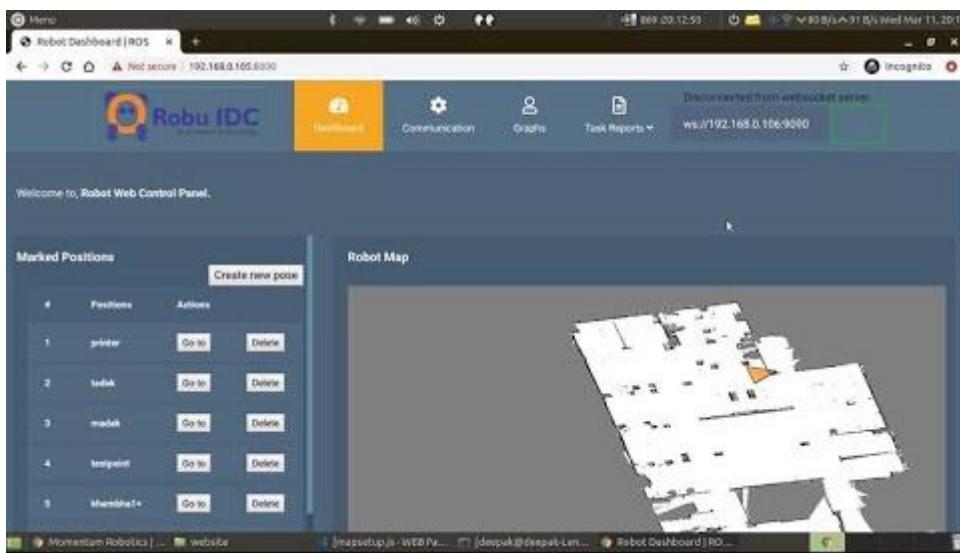
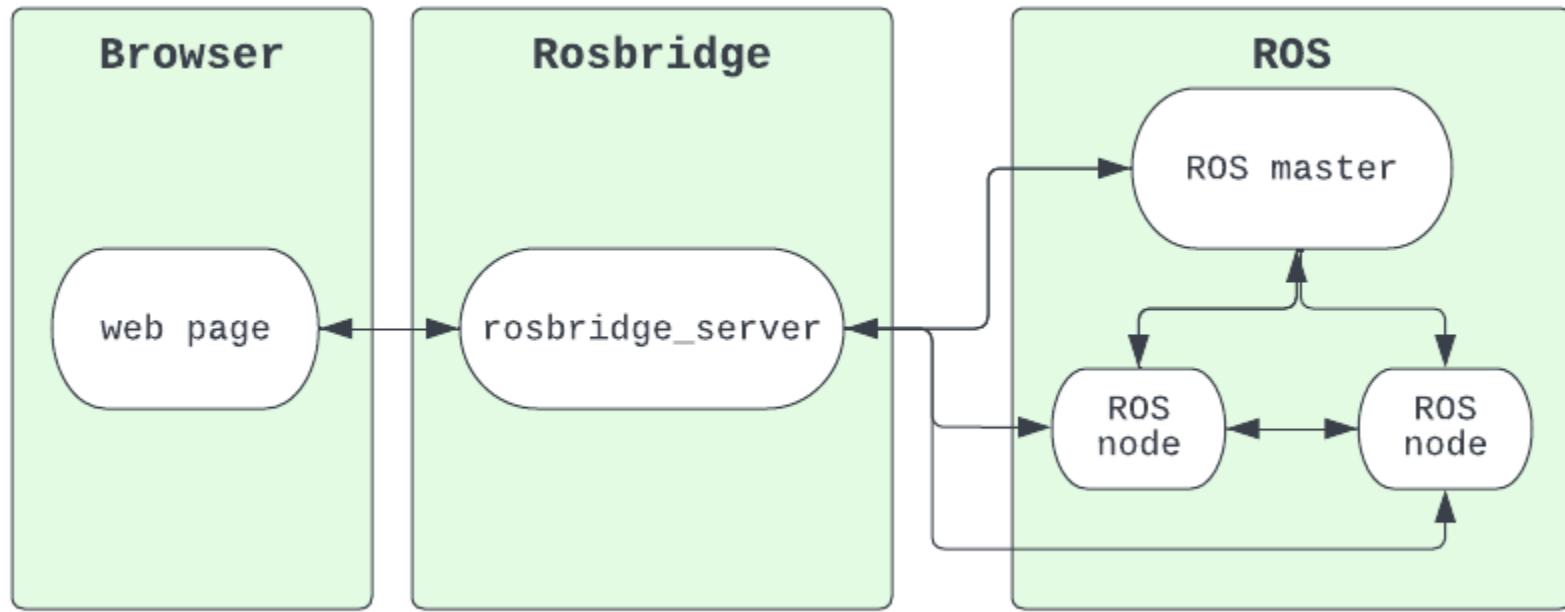
無人載具技術與應用

ROS roslibjs

徐瑋隆

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rosbridge



安裝 rosbridge

ROS ROSLIBJS

rosbridge-離線安裝1

下載並解壓縮
rosbridge_install.zip

cd ~/Downloads/
cd rosbridge_install/
../rosbridge_install.sh

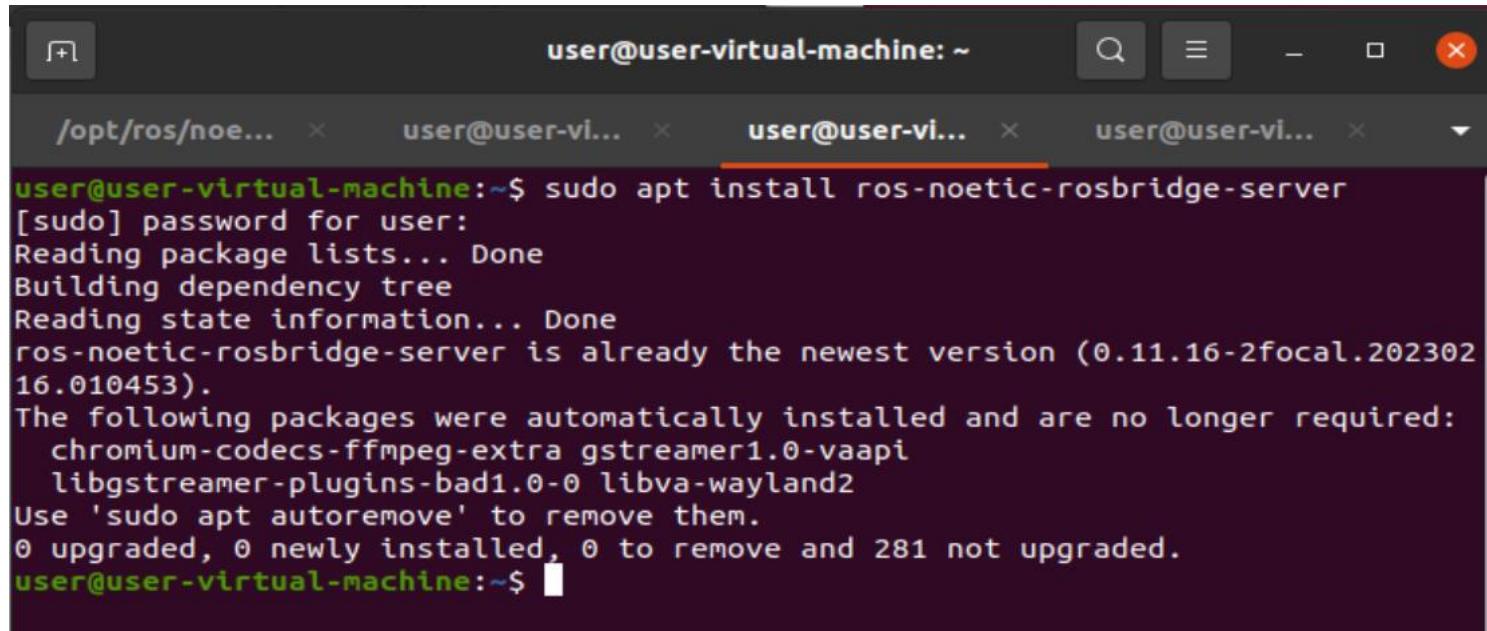
```
user@user-virtual-machine:~/Downloads/  
user@user-virtual-machine:~/Downloads$ cd rosbridge_install/  
user@user-virtual-machine:~/Downloads/rosbridge_install$ ls -lh  
total 648K  
-rw-r--r-- 1 user user 34K 三 12 2020 python3-bson_3.10.1-0ubuntu2_amd64.deb  
-rw-r--r-- 1 user user 298K 四 23 2020 python3-tornado_6.0.3+really5.1.1-3_amd64.deb  
-rw-rw-r-- 1 user user 1.1K 五 1 21:53 read.txt  
-rwxrwxr-x 1 user user 392 五 1 22:05 rosbridge_install.sh  
-rw-r--r-- 1 user user 89K 二 16 09:01 ros-noetic-rosapi_0.11.16-2focal.20230216.010035_amd64.deb  
-rw-r--r-- 1 user user 39K 二 16 05:41 ros-noetic-rosauth_1.0.1-1focal.20230215.213843_amd64.deb  
-rw-r--r-- 1 user user 120K 二 16 09:00 ros-noetic-rosbridge-library_0.11.16-2focal.20230216.005805_amd64.deb  
-rw-r--r-- 1 user user 16K 十二 3 02:56 ros-noetic-rosbridge-msgs_0.11.16-2focal.20221202.185438_amd64.deb  
-rw-r--r-- 1 user user 33K 二 16 09:07 ros-noetic-rosbridge-server_0.11.16-2focal.20230216.010453_amd64.deb  
user@user-virtual-machine:~/Downloads/rosbridge_install$ ./rosbridge_install.sh  
[sudo] password for user: Selecting previously unselected package python3-tornado.  
O.  
(Reading database ... 278664 files and directories currently installed.)  
Preparing to unpack python3-tornado_6.0.3+really5.1.1-3_amd64.deb ...  
Unpacking python3-tornado (6.0.3+really5.1.1-3) ...  
Setting up python3-tornado (6.0.3+really5.1.1-3) ...  
Selecting previously unselected package python3-bson.  
(Reading database ... 278781 files and directories currently installed.)  
Preparing to unpack python3-bson_3.10.1-0ubuntu2_amd64.deb ...  
Unpacking python3-bson (3.10.1-0ubuntu2) ...  
Setting up python3-bson (3.10.1-0ubuntu2) ...  
Selecting previously unselected package ros-noetic-rosbridge-library.  
(Reading database ... 278803 files and directories currently installed.)  
Preparing to unpack ros-noetic-rosbridge-library_0.11.16-2focal.20230216.005805_amd64.deb ...  
Unpacking ros-noetic-rosbridge-library (0.11.16-2focal.20230216.005805) ...  
Setting up ros-noetic-rosbridge-library (0.11.16-2focal.20230216.005805) ...  
Selecting previously unselected package ros-noetic-rosapi.  
(Reading database ... 279061 files and directories currently installed.)  
Preparing to unpack ros-noetic-rosapi_0.11.16-2focal.20230216.010035_amd64.deb .
```

安裝完後 執行以下測試
roslaunch rosbridge_server rosbridge_websocket.launch

rosbridge-網路安裝

在有網路的環境下 用以下指令安裝

sudo apt install ros-noetic-rosbridge-server



The screenshot shows a terminal window titled "user@user-virtual-machine: ~". It has four tabs open, with the fourth tab being the active one. The terminal displays the following command and its execution:

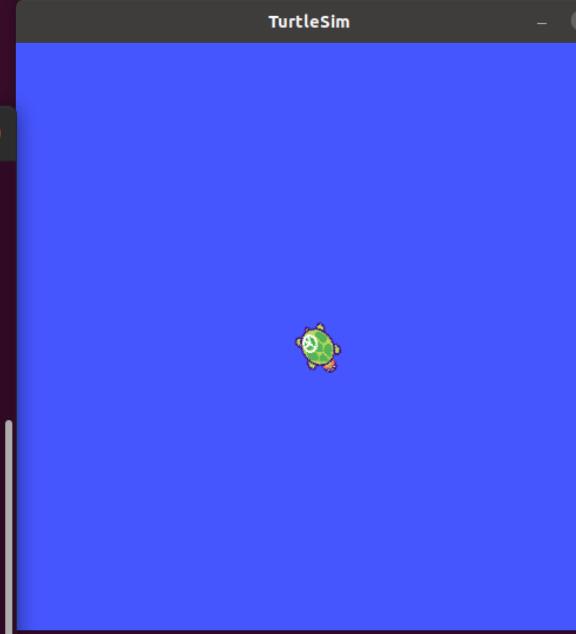
```
user@user-virtual-machine:~$ sudo apt install ros-noetic-rosbridge-server
[sudo] password for user:
Reading package lists... Done
Building dependency tree
Reading state information... Done
ros-noetic-rosbridge-server is already the newest version (0.11.16-2focal.20230216.010453).
The following packages were automatically installed and are no longer required:
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi
  libgstreamer-plugins-bad1.0-0 libva-wayland2
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 281 not upgraded.
user@user-virtual-machine:~$
```

Topic

ROS ROSLIBJS

ros roslibjs – topic 01

```
roscore http://user-virtual-machine:11311
Done checking log file disk usage. Usage is <1GB.
started roslaunch server http://user-virtual-machine:34903
ros_comm version 1.15.15
user@user-virtual-machine:~$ rosrun turtlesim turtlesim_node
[ INFO] [1681035320.831519357]: Starting turtlesim with node name /turtlesim
[ INFO] [1681035320.837634922]: Spawning turtle [turtle1] at x=[5.544445], y=[5.544445], the
ta=[0.000000]
SUMMARY
=====
PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.15.15
NODES
auto-starting new master
process[master]: started with pid [3870]
ROS_MASTER_URI=http://user-virtual-machine:11311/
setting /run_id to 6a85d492-d6bf-11ed-b9ac-cf0f6b8b36cd
process[rosout-1]: started with pid [3880]
started core service [/rosout]
user@user-virtual-machine:~$ Moving around:
 u i o
 j k l
 m , .
For Holonomic mode (strafing), hold down the shift key:
-----
 u I O
 J K L
 M < >
t : up (+z)
b : down (-z)
anything else : stop
q/z : increase/decrease max speeds by 10%
w/x : increase/decrease only linear speed by 10%
e/c : increase/decrease only angular speed by 10%
CTRL-C to quit
currently:      speed 0.5      turn 1.0
user@user-virtual-machine:~$
```



The screenshot shows a terminal window titled "roscore http://user-virtual-machine:11311" on the left and a "TurtleSim" window on the right. The terminal displays logs from the turtlesim_node and instructions for controlling the turtle using a keyboard. The TurtleSim window shows a single green turtle icon on a solid blue background.

rosrun turtlesim turtlesim_node

rosrun teleop_twist_keyboard teleop_twist_keyboard.py /cmd_vel:=/turtle1/cmd_vel

ros roslibjs – topic 02

複習rosservice

rosservice list

rosservice call /spawn 1 2 0 kk

rosparam list

rosparam get /turtlesim/background_r

rosparam set /turtlesim/background_r 150

rosparam get /turtlesim/background_r

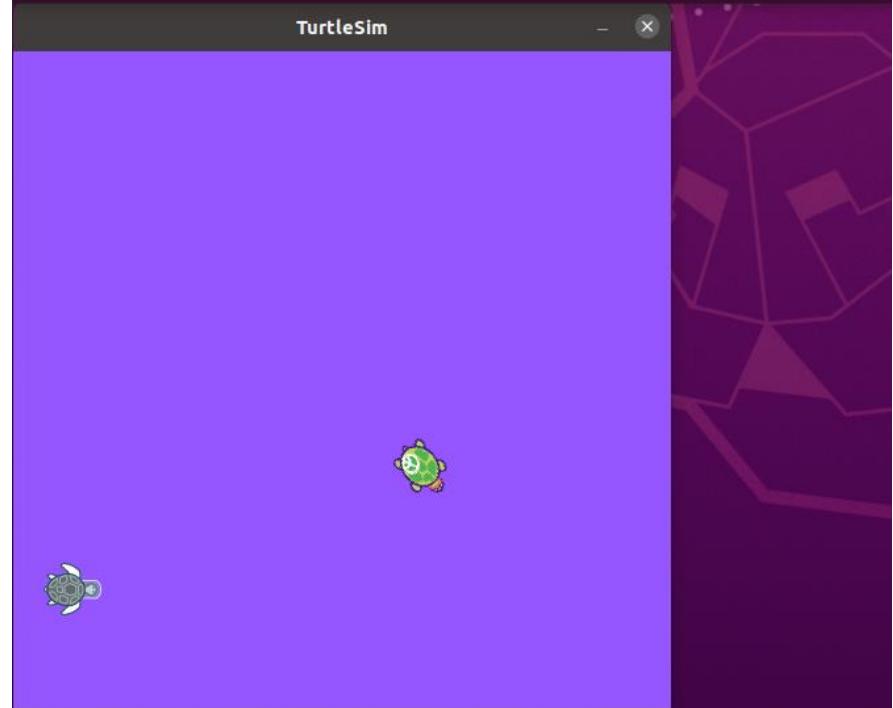
rosservice call /clear

清潔背景(強制程式讀取取ros param改變才會生效)

rosparam set /turtlesim/background_r 50

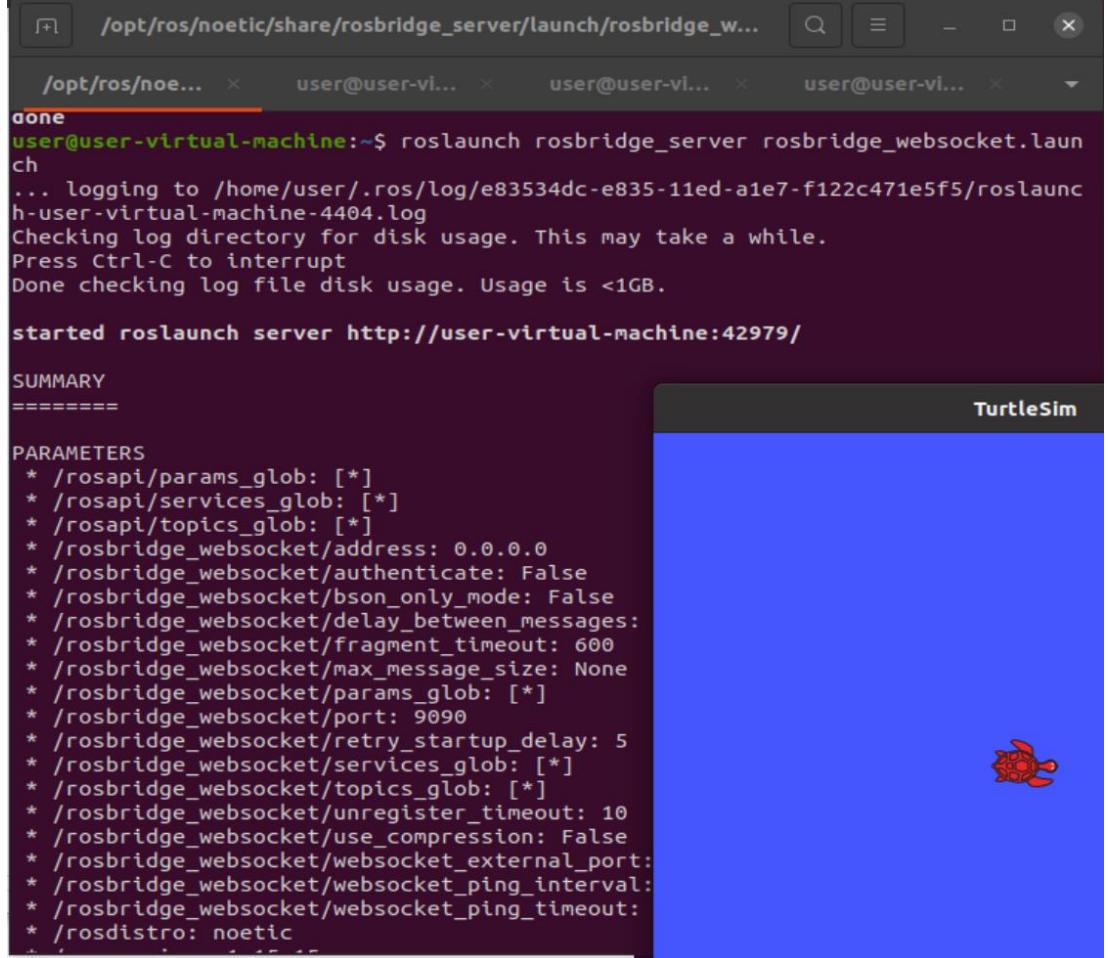
rosservice call /clear

```
roscore http://127.0.0.1:11311 rosparam list  
user@user-virtual-machine:~$ rospack list  
/rosdistro  
/rosinstall  
/rosinstall_generator  
/rosinstall_index  
/run_id  
/turtlesim/background_b  
/turtlesim/background_g  
/turtlesim/background_r  
user@user-virtual-machine:~$ rospack get /turtlesim/background_r  
69  
user@user-virtual-machine:~$ rospack set /turtlesim/background_r 150  
user@user-virtual-machine:~$ rospack get /turtlesim/background_r  
150  
user@user-virtual-machine:~$ rosservice call /clear  
user@user-virtual-machine:~$ 
```



ros roslibjs – topic 03

```
roslaunch rosbridge_server rosbridge_websocket.launch  
rosrun turtlesim turtlesim_node
```



The terminal window displays the command `roslaunch rosbridge_server rosbridge_websocket.launch` being run. The output shows the server starting up and listening on port 42979. A summary of parameters is provided, and the process concludes with a success message. In the background, a separate window titled "Turtlesim" shows a red turtle icon on a blue background.

```
done  
user@user-virtual-machine:~$ roslaunch rosbridge_server rosbridge_websocket.launch  
... logging to /home/user/.ros/log/e83534dc-e835-11ed-a1e7-f122c471e5f5/roslaunc  
h-user-virtual-machine-4404.log  
Checking log directory for disk usage. This may take a while.  
Press Ctrl-C to interrupt  
Done checking log file disk usage. Usage is <1GB.  
  
started roslaunch server http://user-virtual-machine:42979/  
  
SUMMARY  
=====
```

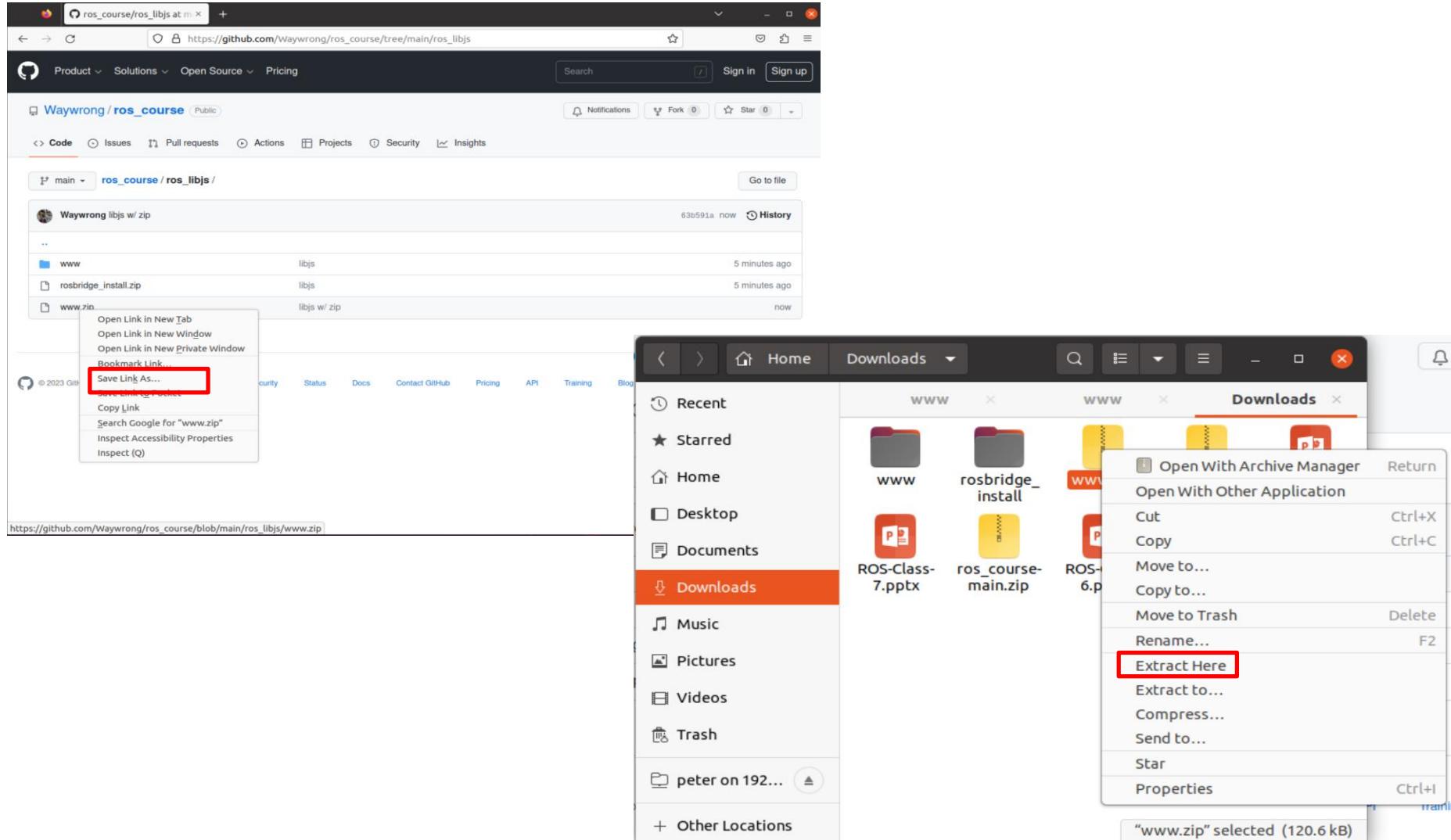
PARAMETERS

- * /rosapi/params_glob: [*]
- * /rosapi/services_glob: [*]
- * /rosapi/topics_glob: [*]
- * /rosbridge_websocket/address: 0.0.0.0
- * /rosbridge_websocket/authenticate: False
- * /rosbridge_websocket/bson_only_mode: False
- * /rosbridge_websocket/delay_between_messages:
- * /rosbridge_websocket/fragment_timeout: 600
- * /rosbridge_websocket/max_message_size: None
- * /rosbridge_websocket/params_glob: [*]
- * /rosbridge_websocket/port: 9090
- * /rosbridge_websocket/retry_startup_delay: 5
- * /rosbridge_websocket/services_glob: [*]
- * /rosbridge_websocket/topics_glob: [*]
- * /rosbridge_websocket/unregister_timeout: 10
- * /rosbridge_websocket/use_compression: False
- * /rosbridge_websocket/websocket_external_port:
- * /rosbridge_websocket/websocket_ping_interval:
- * /rosbridge_websocket/websocket_ping_timeout:
- * /rosdistro: noetic

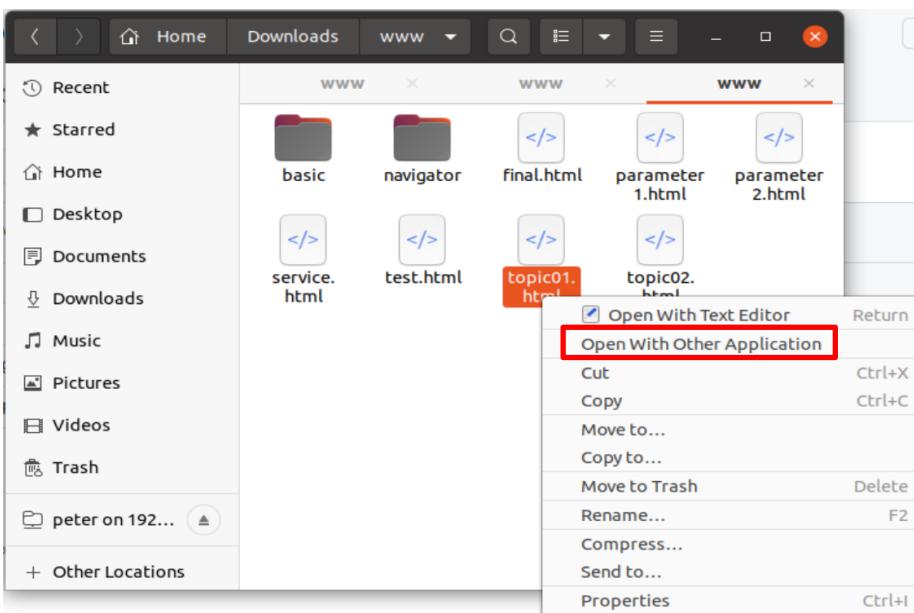
ros roslibjs – topic 04

https://github.com/Waywrong/ros_course/tree/main/ros_libjs

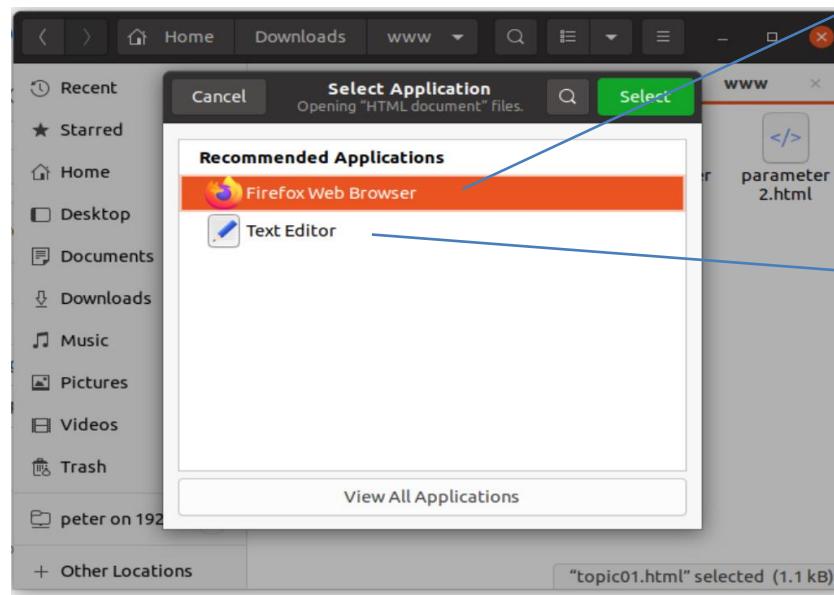
下載 www.zip 並解壓縮



ros roslibjs – topic 05



用瀏覽器執行網頁



編輯網頁內容

ros roslibjs – topic 06 編輯網頁內容

The screenshot shows a browser window with two tabs open:

- parameter1.html**: This tab is inactive.
- topic01.html**: This tab is active, showing the following code:

```
1 <!DOCTYPE html>
2 <html>
3 <head>
4 <meta charset="utf-8" />
5 <script type="text/javascript" src="basic/eventemitter2.js"></script>
6 <script type="text/javascript" src="basic/roslib.js"></script>
7 <script type="text/javascript">
8 // Connecting to ROS
9 // -----
10
11 var ros = new ROSLIB.Ros({
12   url : 'ws://localhost:9090'
13 });
14
15 ros.on('connection', function() {
16   console.log('Connected to websocket server.');
17 });
18
19 ros.on('error', function(error) {
20   console.log('Error connecting to websocket server: ', error);
21 });
22
23 ros.on('close', function() {
24   console.log('Connection to websocket server closed.');
25 });
26
27 // Publishing a Topic
28 // -----
29
30 var cmdVel = new ROSLIB.Topic({
31   ros : ros,
32   name : '/turtle1/cmd_vel',
33   messageType : 'geometry_msgs/Twist'
34 });
35 var twist = new ROSLIB.Message({
36   linear : {
37     x : 0.5,
38     y : 0,
39     z : 0
40   },
41   angular : {
42     x : 0,
43     y : 0,
44     z : 0
45   }
46 });
47 cmdVel.publish(twist);
48
49 </script>
50 </head>
51
52 <body>
53   <h1>Simple roslib Example</h1>
54   <p>Check your Web Console for output.</p>
55 </body>
56 </html>
```

The browser interface includes standard controls like Open, Save, and tabs, along with status bars at the bottom indicating "HTML Tab Width: 8" and "Ln 56, Col 8".

ros roslibjs – topic 07 激覽器執行網頁



Simple roslib Example

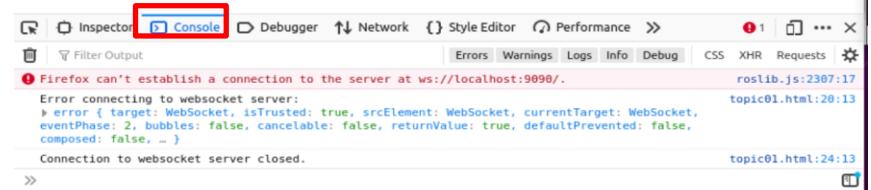
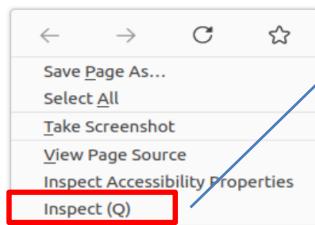
Check your Web Console for output.



Simple roslib Example

Check your Web Console for output.

激覽器除錯模式

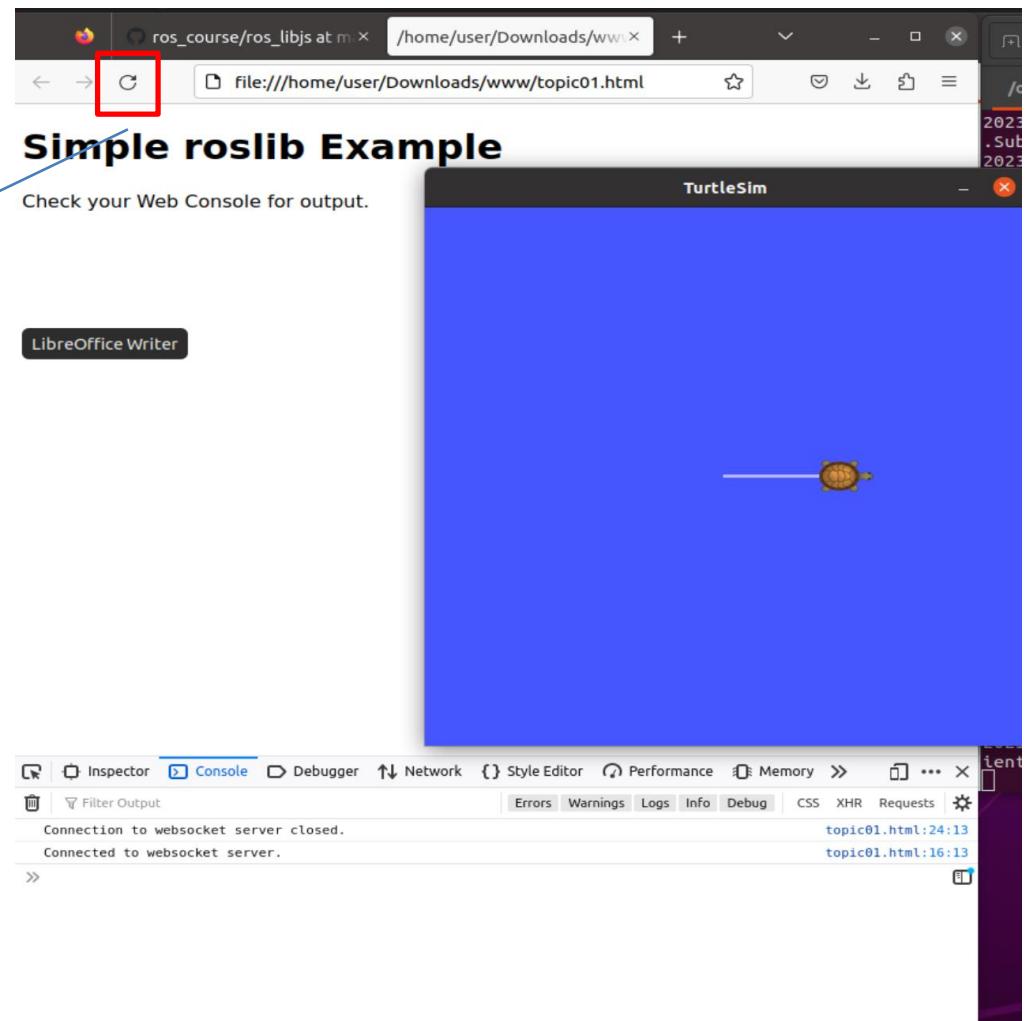


ros roslibjs – topic 08瀏覽器執行網頁

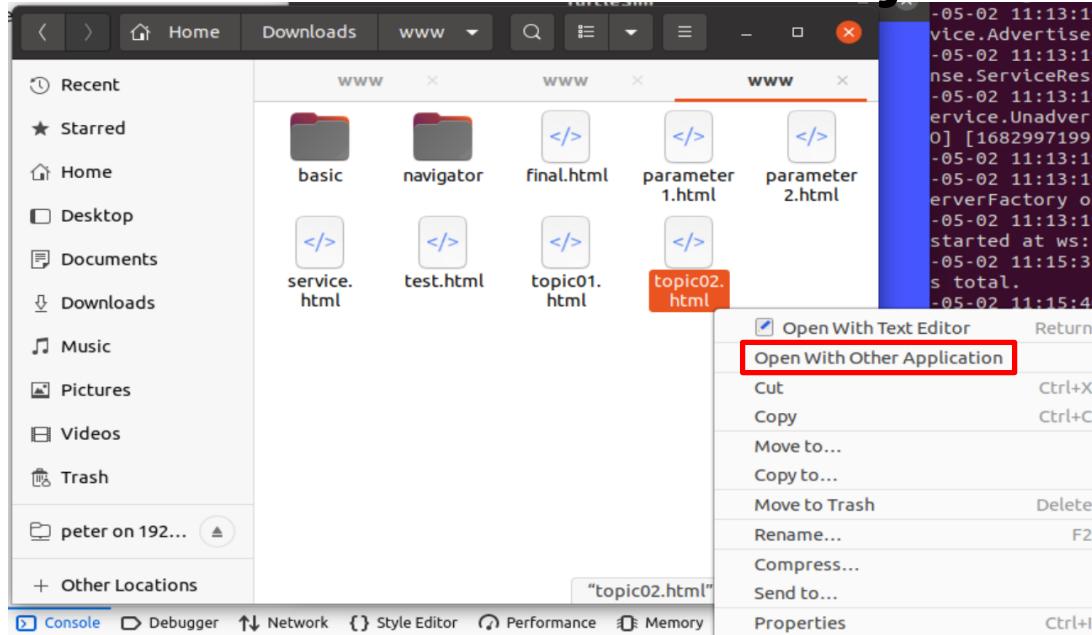
roslaunch rosbridge_server rosbridge_websocket.launch

rosrun turtlesim turtlesim_node

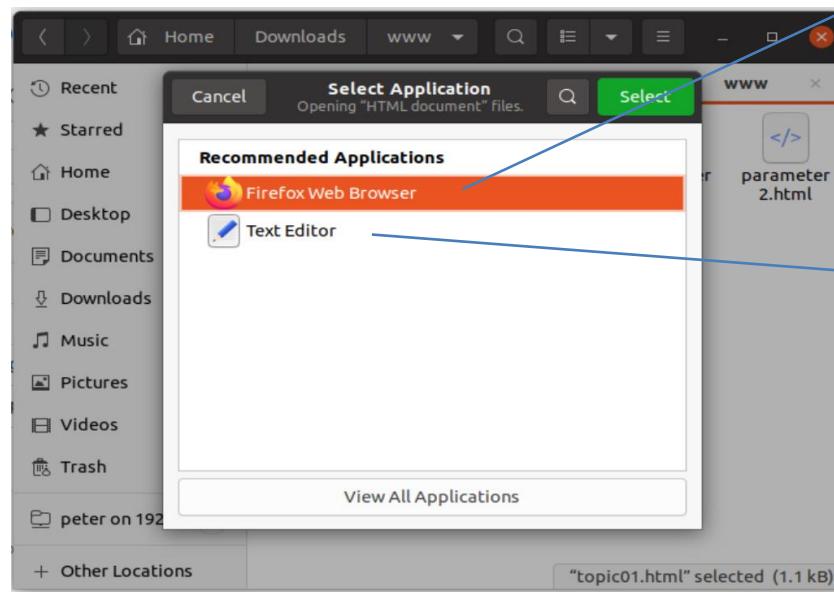
rosbridge與小烏龜啟動後
刷新瀏覽器畫面數次F5
可看到小烏龜前進



ros roslibjs – topic 05



用瀏覽器執行網頁



編輯網頁內容

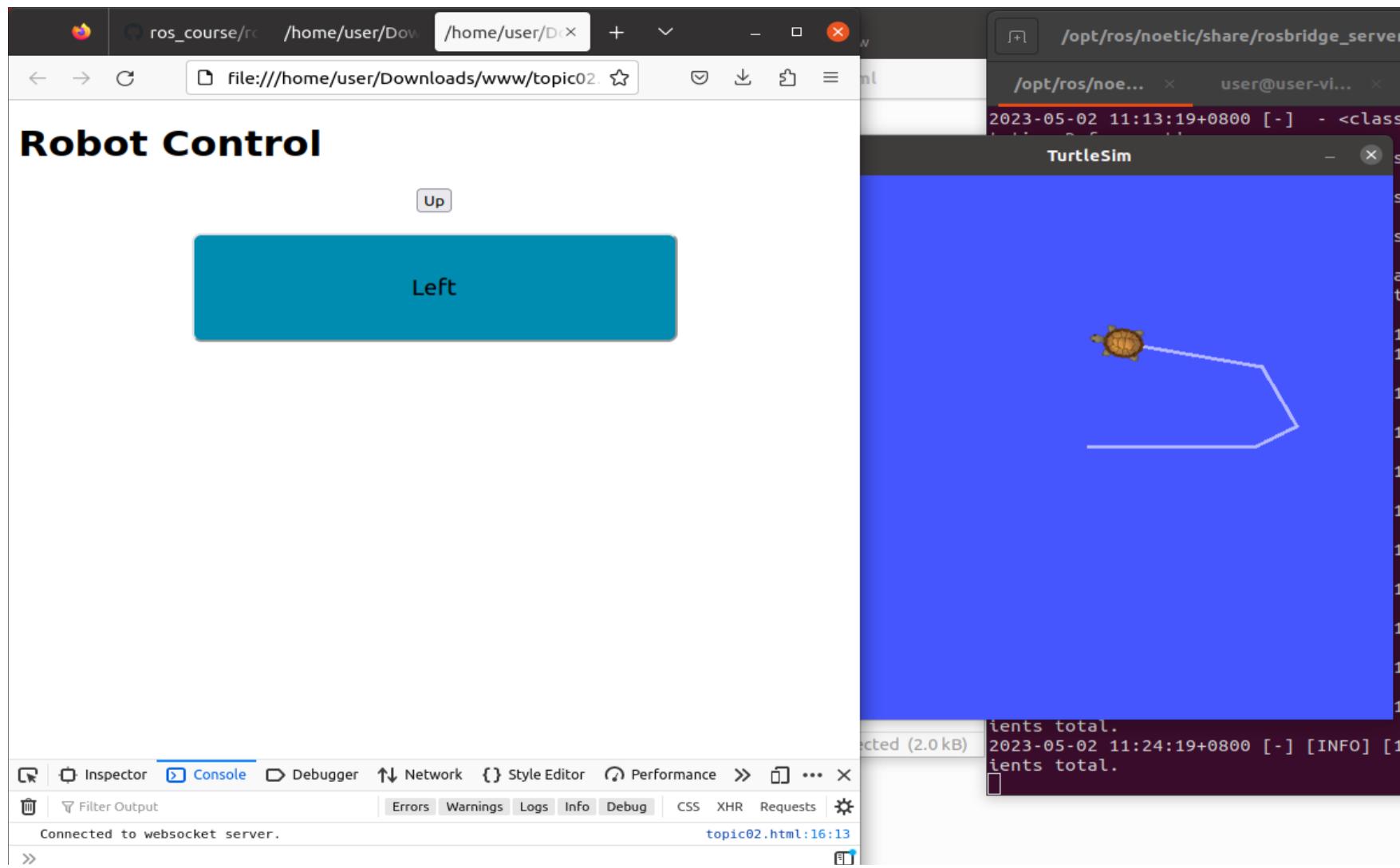
```
unction cmd_vel_linear(idx_posminus){  
var cmdVel = new ROSLIB.Topic({  
ros : ros,  
name : '/turtle1/cmd_vel',  
messageType : 'geometry_msgs/Twist'  
});  
var twist = new ROSLIB.Message({  
linear : {  
x : 0.8*idx_posminus,  
y : 0,  
z : 0,  
},  
angular : {  
x : 0,  
y : 0,  
z : 0,  
}  
});  
cmdVel.publish(twist);  
}
```

```
function cmd_vel_angular(idx_posminus){  
var cmdVel = new ROSLIB.Topic({  
ros : ros,  
name : '/turtle1/cmd_vel',  
messageType : 'geometry_msgs/Twist'  
});  
var twist = new ROSLIB.Message({  
linear : {  
x : 0,  
y : 0,  
z : 0,  
},  
angular : {  
x : 0,  
y : 0,  
z : 0.5*idx_posminus,  
}  
});  
cmdVel.publish(twist);  
}
```

```
function cmd_up(){  
cmd_vel_linear(1);  
}  
function cmd_left(){  
cmd_vel_angular(1);  
}
```

```
</script>  
</head>  
  
<body>  
<h1>Robot Control</h1>  
<center>  
<input type="submit"  
value="Up"  
onclick="cmd_up()" />  
<br>  
<hr>  
<input type="submit"  
value="Left"  
onclick="cmd_left()"  
style="font-size : 20px; width: 400px; height: 100px; background-color:  
#008CB1; border-radius: 8px;" />  
</center>  
</body>  
</html>
```

ros roslibjs – topic 09



Service

ROS ROSLIBJS

ros roslibjs – service 01

複習rosservice

rosservice list

rosservice type /spawn

rosservice type /spawn | rossrv show

rosservice call /spawn 1 2 0 kk

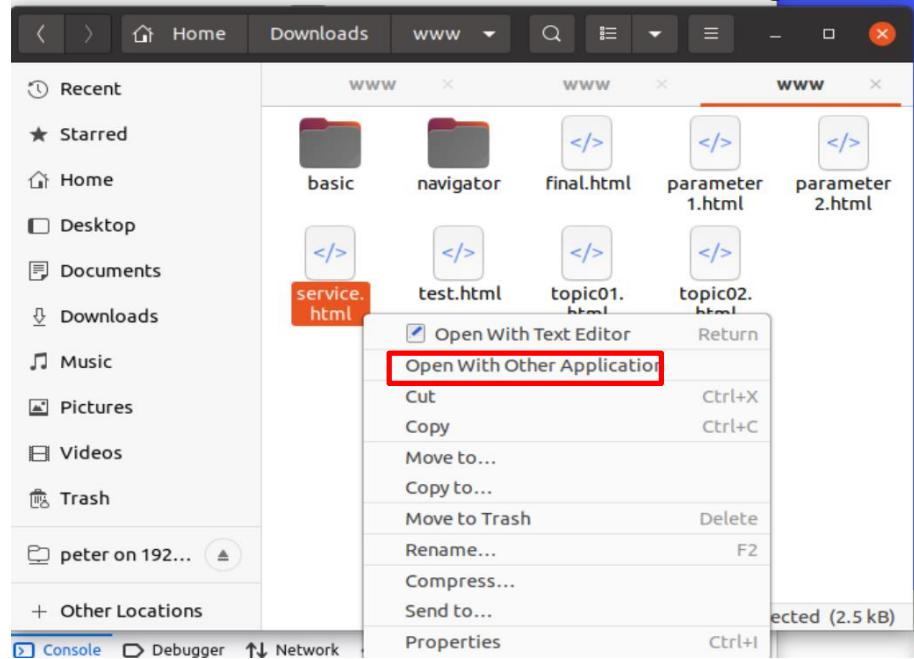
rosservice call /kill kk

```
user@user-virtual-machine:~$ rosservice type /spawn
turtlesim/Spawn
user@user-virtual-machine:~$ rosservice type /spawn | rossrv show
float32 x
float32 y
float32 theta
string name
---
string name

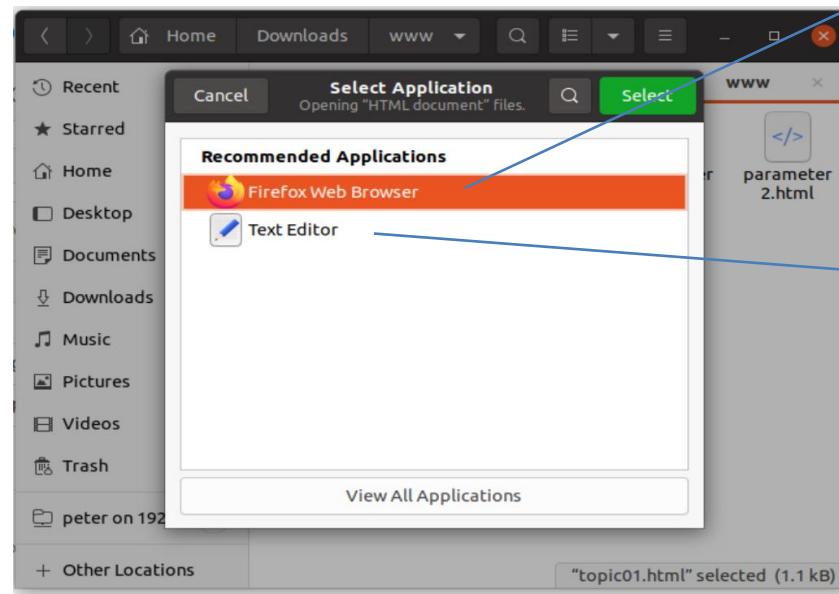
user@user-virtual-machine:~$ rosservice call /spawn "x: 1.0
y: 2.0
theta: 0.0
name: 'jj'"
name: "jj"
user@user-virtual-machine:~$
```



ros roslibjs – service 02



用瀏覽器執行網頁



編輯網頁內容

ros roslibjs – service 03

```
function callService_spawn(strName){  
    var turtleSimClient = new ROSLIB.Service({  
        ros : ros,  
        name : '/spawn',  
        serviceType : 'turtlesim/Spawn'  
    });  
    var request = new ROSLIB.ServiceRequest({  
        x : 1,  
        y : 2,  
        theta : 0,  
        name : strName  
    });  
    turtleSimClient.callService(request, function(result) {  
        console.log('Result for service call /spawn on '  
            + turtleSimClient.name  
            + ':'  
            + result.name);  
    });  
}
```

```
function callService_kill(strName){  
    var turtleSimClient = new ROSLIB.Service({  
        ros : ros,  
        name : '/kill',  
        serviceType : 'turtlesim/Kill'  
    });  
    var request = new ROSLIB.ServiceRequest({  
        name : strName  
    });  
  
    turtleSimClient.callService(request, function(result) {  
        console.log('Result for service /kill call on '  
            + turtleSimClient.name  
            + ':'  
            + result.name);  
    });  
}
```

ros roslibjs – service 04

```
function btn_spawn(){
    var itemString;
    itemString = document.getElementById('itemString');
    console.log('itemString: ' + itemString.value);
    //callService_spawn('kk');
    callService_spawn(itemString.value);
}

function btn_kill(){
    var itemString;
    itemString = document.getElementById('itemString');
    console.log('itemString: ' + itemString.value);
    callService_kill(itemString.value);
}

</script>
</head>

<body>
<h1>Robot Control</h1>
<center>
    <h1>請輸入小烏龜的名字</h1>
    <input type="submit"
        value="spawn"
        onclick="btn_spawn()" />

    <input type="submit"
        value="kill"
        onclick="btn_kill()" />
    <input type="text" name="enter" class="enter" value="1" id="itemString"
        style= "font-size : 20px; height: 100px; width:100px;" />
</center>
</body>
</html>
```

ros roslibjs – service 05

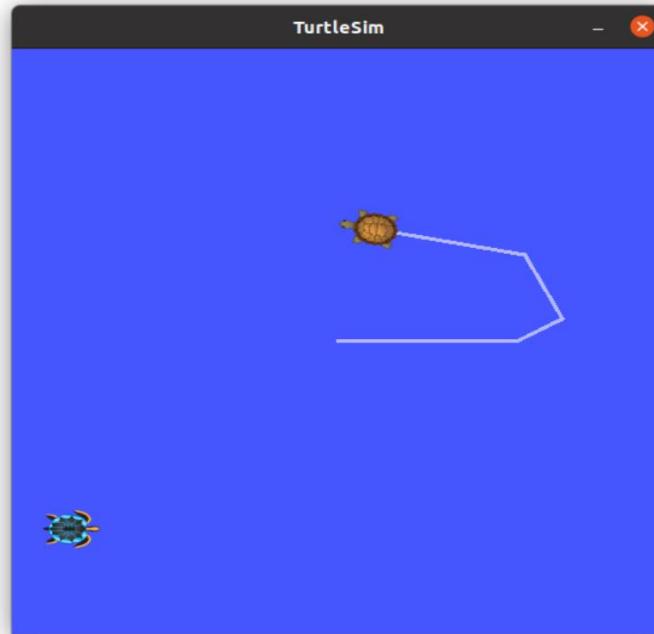


Robot Control

請輸入小烏龜的名字



名字不要用數字開頭
spawn 產生新的小烏龜
kill 殺掉指定的小烏龜



ros parameter

ROS ROSLIBJS

ros roslibjs – parameter 01

```
rosrun my_work04 myNode04  
rosparam get /para_Period
```

```
rosparam set /para_Period 1  
rosparam set /para_Period 6
```

```
^Cuser@user-virtual-machine:~$ rosrun my_work04 myNode04  
[ INFO] [1681788043.366761167]: myNode04: hi :0 @3.00 sec  
[ INFO] [1681788046.368424021]: myNode04: hi :1 @3.00 sec  
[ INFO] [1681788049.369232883]: myNode04: hi :2 @1.00 sec  
[ INFO] [1681788050.370616101]: myNode04: hi :3 @1.00 sec  
[ INFO] [1681788051.371905189]: myNode04: hi :4 @1.00 sec  
[ INFO] [1681788052.372819544]: myNode04: hi :5 @1.00 sec  
[ INFO] [1681788053.374045307]: myNode04: hi :6 @1.00 sec  
[ INFO] [1681788054.375574361]: myNode04: hi :7 @1.00 sec  
[ INFO] [1681788055.376492474]: myNode04: hi :8 @1.00 sec  
[ INFO] [1681788056.377711122]: myNode04: hi :9 @1.00 sec  
[ INFO] [1681788057.378865065]: myNode04: hi :10 @6.00 sec  
[ INFO] [1681788063.379732979]: myNode04: hi :11 @6.00 sec
```

ros roslibjs – parameter 02

The screenshot shows a code editor window with a red box highlighting the title bar and several sections of the code. The title bar says "parameter1.html ~/Downloads/www". The code is a combination of JavaScript and HTML.

```
// parameter
// -----
function paraALL(){
  ros.getParams(function(params) {
    console.log(params);
  });
}

function paraSet(period){
  var iPeriod = new ROSLIB.Param({
    ros : ros,
    name : '/para_Period'
  });
  iPeriod.set(period);
  iPeriod.get(function(value) {
    console.log('period: ' + value);
  });
}

function btn_set_para(){
  var results = document.getElementById("itemInt01").value;
  var intResults = parseInt(results, 10);
  paraSet(intResults);
}

</script>
</head>
<body>
<h1>Robot Status</h1>
<center>
  <h2>Robot Parameter</h2>
  <input type="submit"
    value="show_all"
    onclick="paraALL()" />
  <br><br><br>
  <input type="submit"
    value="Set Timer"
    onclick="btn_set_para()" />
  <input type="number" name="enter" class="enter" value=5 id="itemInt01"
    style= "font-size : 20px; height: 50px; width:50px;" />
</center>
</body>
</html>
```

The code defines two functions: `paraALL()` and `paraSet()`. It also contains a `btn_set_para()` function which reads a value from an input field and calls `paraSet()`. The HTML part includes a `<center>` block containing a button to call `paraALL()` and another button to call `btn_set_para()`, along with a numeric input field with ID `itemInt01`.

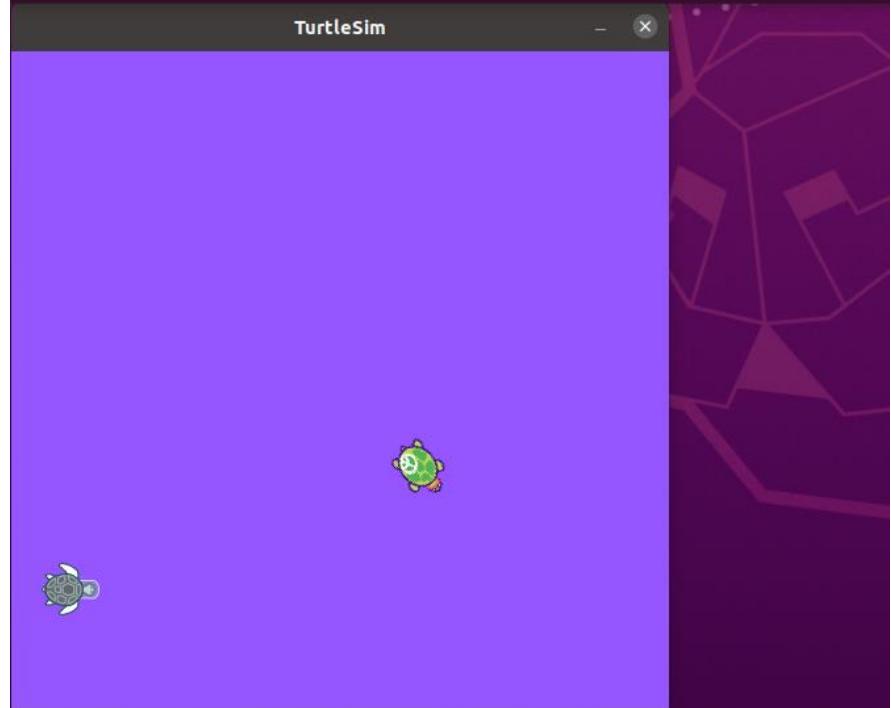
ros roslibjs – parameter 03

The screenshot shows a web browser window titled "Robot Status" with a sub-section "Robot Parameter". It features a "show_all" button and a "Set Timer" input field containing the value "2". Below the browser is a terminal window titled "Ubuntu Software" showing a ROS log output. The log output displays 11 INFO messages from a node named "myNode04". The last message, which includes a timestamp of 1682998693.839308204, is highlighted with a red rectangle.

```
user@user-virtual-machine:~$ rosrun my_work04 myNode04
[ INFO] [1682998666.828441961]: myNode04: hi :0 , 3.00 sec
[ INFO] [1682998669.830104012]: myNode04: hi :1 , 3.00 sec
[ INFO] [1682998672.831117959]: myNode04: hi :2 , 3.00 sec
[ INFO] [1682998675.832378859]: myNode04: hi :3 , 3.00 sec
[ INFO] [1682998678.833449842]: myNode04: hi :4 , 3.00 sec
[ INFO] [1682998681.834276628]: myNode04: hi :5 , 3.00 sec
[ INFO] [1682998684.835078803]: myNode04: hi :6 , 3.00 sec
[ INFO] [1682998687.835935425]: myNode04: hi :7 , 2.00 sec
[ INFO] [1682998689.837079000]: myNode04: hi :8 , 2.00 sec
[ INFO] [1682998691.838099191]: myNode04: hi :9 , 2.00 sec
[ INFO] [1682998693.839308204]: myNode04: hi :10 , 2.00 sec
```

ros roslibjs – parameter 04

```
roscore http://127.0.0.1:11311/ user@user-virtual-machine user@user-virtual-machine user@user-virtual-machine
user@user-virtual-machine:~$ rosparam list
/rostdistro
/roslaunch/uris/host_user_virtual_machine_36723
/rosversion
/run_id
/turtlesim/background_b
/turtlesim/background_g
/turtlesim/background_r
user@user-virtual-machine:~$ rosparam get /turtlesim/background_r
69
user@user-virtual-machine:~$ rosparam set /turtlesim/background_r 150
user@user-virtual-machine:~$ rosparam get /turtlesim/background_r
150
user@user-virtual-machine:~$ rosservice call /clear
user@user-virtual-machine:~$ 
```



rosparam list

rosparam get /turtlesim/background_r

rosparam set /turtlesim/background_r 150

rosparam get /turtlesim/background_r

rosservice call /clear

清潔背景(強制程式讀取取ros param改變才會生效)

rosparam set /turtlesim/background_r 50

rosservice call /clear

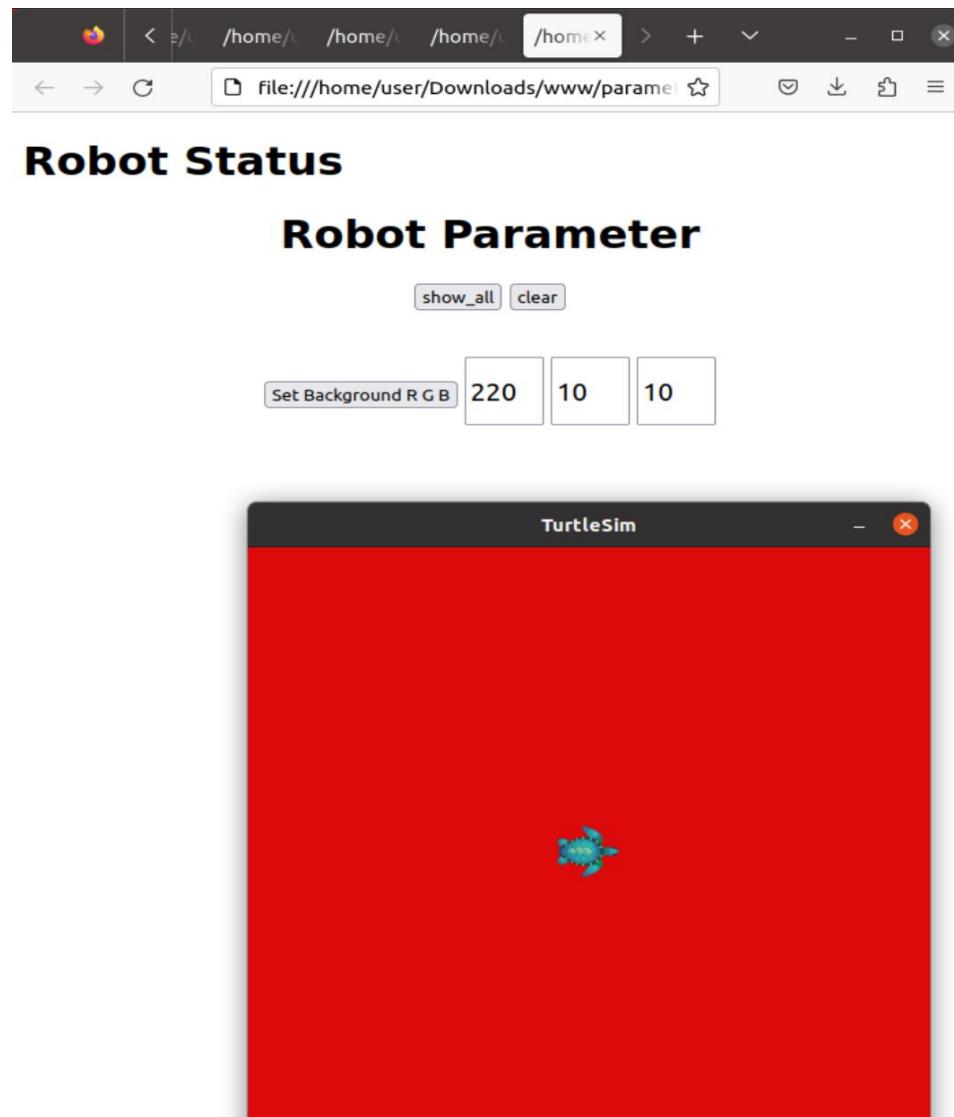
ros roslibjs – parameter 05

```
parameter2.html
~/Downloads/www

59 }
60
61 function callService_clear(){
62     var turtleSimClient = new ROSLIB.Service({
63         ros : ros,
64         name : '/clear',
65         serviceType : 'std_srvs/Empty'
66     });
67     var request = new ROSLIB.ServiceRequest({
68         //name : ''
69     });
70     turtleSimClient.callService(request, function(result) {
71         console.log('Result for service /clear call');
72     });
73 }
74
75 function btn_set_bg(){
76     var itemInt01 = document.getElementById('itemInt01').value;
77     var intResults01 = parseInt(itemInt01, 10);
78     var itemInt01 = document.getElementById('itemInt02').value;
79     var intResults02 = parseInt(itemInt02, 10);
80     var itemInt03 = document.getElementById('itemInt03').value;
81     var intResults03 = parseInt(itemInt03, 10);
82     paraSet(intResults01,intResults02,intResults03);
83     callService clear();
84 }
85
86 </script>
87 </head>
88
89 <body>
90 <h1>Robot Status</h1>
91 <center>
92     <h1>Robot Parameter</h1>
93     <input type="submit"
94         value="show_all"
95         onclick="paraALL()" />
96     <input type="submit"
97         value="clear"
98         onclick="callService_clear()" />
99     <br><br><br>
100    <input type="submit"
101        value="Set Background R G B"
102        onclick="btn_set_bg()" />
103    <input type="text" name="enter" class="enter" value="127" id="itemInt01"
104        style= "font-size : 20px; height: 50px; width:50px;"/>
105    <input type="text" name="enter" class="enter" value="127" id="itemInt02"
106        style= "font-size : 20px; height: 50px; width:50px;"/>
107    <input type="text" name="enter" class="enter" value="127" id="itemInt03"
108        style= "font-size : 20px; height: 50px; width:50px;"/>
109 </center>
110 </body>
111 </html>
```

HTML ▾ Tab Width: 8 ▾ Ln 108, Col 66 ▾ INS

ros roslibjs – parameter 06



HW5 全部組合在一起

1. 上下左右都要有

作業5

- 將本週課程與有烏龜有關的網頁程式整合，目的為在turtlesim中用網頁控制小烏龜，並上傳相關檔案
- 參考5/02上課內容，“ROS-Class-9.pdf”
- https://github.com/Waywrong/ros_course/tree/main/ros_libjs/www
- 計分部分包含
 - 1. 完整性(topic + service +parameter)
 - 2. 紀錄實驗過程於word檔，紀錄所下的命令與回應，可多利用截圖(圖文並茂加分)
 - rosnodes list
 - rostopic list
- 上傳作業包含 (期末前上傳):
 - 1. html檔
 - 2. 實驗紀錄word檔