

Task2

step1:

```
yahboom@VM: ~/roscourse_ws/src
yahboom@VM: ~/roscourse_ws/src 74x28
yahboom@VM:~$ mkdir -p ~/roscourse_ws/src
yahboom@VM:~$ cd ~/roscourse_ws/src
yahboom@VM:~/roscourse_ws/src$ ros2 pkg create --build-type ament_python webcam
going to create a new package
package name: webcam
destination directory: /home/yahboom/roscourse_ws/src
package format: 3
version: 0.0.0
description: TODO: Package description
maintainer: ['yahboom <harryhuang1.razx@outlook.com>']
licenses: ['TODO: License declaration']
build type: ament_python
dependencies: []
creating folder ./webcam
creating ./webcam/package.xml
creating source folder
creating folder ./webcam/webcam
creating ./webcam/setup.py
creating ./webcam/setup.cfg
creating folder ./webcam/resource
creating ./webcam/resource/webcam
creating ./webcam/webcam/__init__.py
creating folder ./webcam/test
creating ./webcam/test/test_copyright.py
creating ./webcam/test/test_flake8.py
creating ./webcam/test/test_pep257.py
yahboom@VM:~/roscourse_ws/src$
```

step8:

```
yahboom@VM: ~/roscourse_ws
yahboom@VM: ~/roscourse_ws 74x28
creating ./webcam/package.xml
creating source folder
creating folder ./webcam/webcam
creating ./webcam/setup.py
creating ./webcam/setup.cfg
creating folder ./webcam/resource
creating ./webcam/resource/webcam
creating ./webcam/webcam/__init__.py
creating folder ./webcam/test
creating ./webcam/test/test_copyright.py
creating ./webcam/test/test_flake8.py
creating ./webcam/test/test_pep257.py
yahboom@VM:~/roscourse_ws/src$ cd ~/roscourse_ws/src/webcam/webcam
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ touch cam_pub.py
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ touch cam_sub.py
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ nano cam_pub.py
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ nano cam_sub.py
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ nano ~/roscourse_ws/src/webcam/package.xml
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ nano ~/roscourse_ws/src/webcam/setup.py
yahboom@VM:~/roscourse_ws/src/webcam/webcam$ cd ~/roscourse_ws
yahboom@VM:~/roscourse_ws$ colcon build --symlink-install
starting >>> webcam
finished <<< webcam [0.66s]

summary: 1 package finished [0.84s]
yahboom@VM:~/roscourse_ws$
```

step11:

```
yahboom@VM: ~/roscourse_ws
yahboom@VM: ~/roscourse_ws 74x28
~/roscourse_ws/src/webcam/webcam/cam_pub.py
chmod: cannot access '/home/yahboom/roscourse_ws/src/webcam/webcam/cam_pub.py': No such file or directory
yahboom@VM:~/roscourse_ws/src/webcam$ ls ~/roscourse_ws/src/webcam/
package.xml resource setup.cfg setup.py test webcam
yahboom@VM:~/roscourse_ws/src/webcam$ ls ~/roscourse_ws/src/webcam/webcam
cam_pub.py cam_sub.py __init__.py
yahboom@VM:~/roscourse_ws/src/webcam$ chmod +x ~/roscourse_ws/src/webcam/webcam/cam_pub.py
yahboom@VM:~/roscourse_ws/src/webcam$ chmod +x ~/roscourse_ws/src/webcam/webcam/cam_sub.py
yahboom@VM:~/roscourse_ws/src/webcam$ cd ~/roscourse_ws
yahboom@VM:~/roscourse_ws$ colcon build --symlink-install
Starting >>> webcam
Finished <<< webcam [0.59s]

Summary: 1 package finished [0.68s]
yahboom@VM:~/roscourse_ws$ source ~/roscourse_ws/install/setup.bash
yahboom@VM:~/roscourse_ws$ ros2 pkg executable webcam
Usage: ros2 pkg [-h]
    Call 'ros2 pkg <command> -h' for more detailed usage.
...
ros2 pkg: error: argument Call 'ros2 pkg <command> -h' for more detailed usage.: invalid choice: 'executable' (choose from 'create', 'executables', 'list', 'prefix', 'xml')
yahboom@VM:~/roscourse_ws$ ros2 pkg executables webcam
webcam webcam_pub = webcam.cam_pub:mainwebcam_sub
yahboom@VM:~/roscourse_ws$
```

step13:

```
yahboom@VM: ~/roscourse_ws
yahboom@VM: ~/roscourse_ws 74x28
51, in resolve
  module = _import_(self.module_name, fromlist=['_name_'], level=0)
  File "/home/yahboom/roscourse_ws/build/webcam/webcam/cam_pub.py", line 5
    from rclpy._____ import Node
ModuleNotFoundError: No module named 'rclpy._____'
yahboom@VM:~/roscourse_ws$ nano ~/roscourse_ws/src/webcam/webcam/cam_pub.py
yahboom@VM:~/roscourse_ws$ nano ~/roscourse_ws/src/webcam/webcam/cam_sub.py
yahboom@VM:~/roscourse_ws$ cd ~/roscourse_ws
yahboom@VM:~/roscourse_ws$ colcon build --symlink-install
Starting >>> webcam
Finished <<< webcam [0.57s]

Summary: 1 package finished [0.67s]
yahboom@VM:~/roscourse_ws$ source ~/roscourse_ws/install/setup.bash
yahboom@VM:~/roscourse_ws$ ros2 pkg
webcam webcam_pub
webcam webcam_sub
yahboom@VM:~/roscourse_ws$ ros2 run webcam webcam_sub
[ WARN:0] global ../modules/videoio/src/cap.cpp:175: GStreamer warning: Cannot query version=-1
[INFO] [1739398835.593337759] [webcam]
source ~/roscourse_ws/install/setup.bash
ros2 run webcam webcam_sub

Image
[Image window showing a blurry camera feed of a room interior]
```

Task3

step1:

```
yahboom@VM: ~/roscourse_ws/src
yahboom@VM: ~/roscourse_ws/src 74x28
    await await_or_execute(tmr.callback)
File "/opt/ros/foxy/lib/python3.8/site-packages/rclpy/executors.py", line
118, in await_or_execute
    return callback(*args)
File "/home/yahboom/roscourse_ws/build/webcam/webcam/cam_pub.py", line 6
, in capture_frame
    rval,img_data = self.camera.read()
KeyboardInterrupt
yahboom@VM:~/roscourse_ws$ cd ~/roscourse_ws/src
yahboom@VM:~/roscourse_ws/src$ ros2 pkg create --build-type ament_cmake tu
tle_interfaces
going to create a new package
package name: turtle_interfaces
destination directory: /home/yahboom/roscourse_ws/src
package format: 3
version: 0.0.0
description: TODO: Package description
maintainer: ['yahboom <harryhuang1.razx@outlook.com>']
licenses: ['TODO: License declaration']
build type: ament_cmake
dependencies: []
creating folder ./turtle_interfaces
creating ./turtle_interfaces/package.xml
creating source and include folder
creating folder ./turtle_interfaces/src
creating folder ./turtle_interfaces/include/turtle_interfaces
creating ./turtle_interfaces/CMakeLists.txt
yahboom@VM:~/roscourse_ws/src$
```

step4:

```
yahboom@VM: ~/roscourse_ws/src/turtle_interfaces
yahboom@VM: ~/roscourse_ws/src/turtle_interfaces 74x28
2, in capture_frame
    rval,img_data = self.camera.read()
Files bardInterrupt
yahboom@VM:~/roscourse_ws$ cd ~/roscourse_ws/src
yahboom@VM:~/roscourse_ws/src$ ros2 pkg create --build-type ament_cmake tu
rtle_interfaces
going to create a new package
package name: turtle_interfaces
destination directory: /home/yahboom/roscourse_ws/src
package format: 3
version: 0.0.0
description: TODO: Package description
maintainer: ['yahboom <harryhuang1.razx@outlook.com>']
licenses: ['TODO: License declaration']
build type: ament_cmake
dependencies: []
creating folder ./turtle_interfaces
creating ./turtle_interfaces/package.xml
creating source and include folder
creating folder ./turtle_interfaces/src
creating folder ./turtle_interfaces/include/turtle_interfaces
creating ./turtle_interfaces/CMakeLists.txt
yahboom@VM:~/roscourse_ws/src$ cd ~/roscourse_ws/src/trutle_interfaces
bash: cd: /home/yahboom/roscourse_ws/src/trutle_interfaces: No such file o
r directory
yahboom@VM:~/roscourse_ws/src$ cd ~/roscourse_ws/src/turtle_interfaces
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ mkdir msg
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$
```

step20:

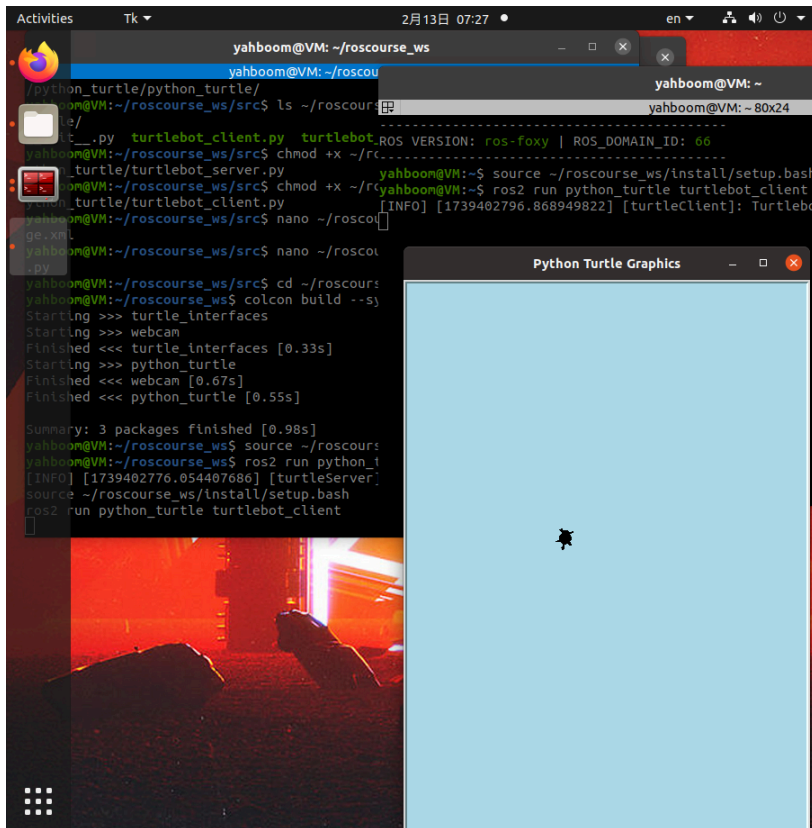
```
yahboom@VM: ~/roscourse_ws
yahboom@VM: ~/roscourse_ws 74x28
creating ./turtle_interfaces/CMakeLists.txt
yahboom@VM:~/roscourse_ws/src$ cd ~/roscourse_ws/src/turtle_interfaces
bash: cd: /home/yahboom/roscourse_ws/src/turtle_interfaces: No such file or
directory
yahboom@VM:~/roscourse_ws/src$ cd ~/roscourse_ws/src/turtle_interfaces
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ mkdir msg
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ nano msg/TurtleMsg.msg
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ nano CMakeLists.txt
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ nano package.xml
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ cd ~/roscourse_ws
yahboom@VM:~/roscourse_ws$ cd ~/roscourse_ws/src/turtle_interfaces
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ mkdir srv
yahboom@VM:~/roscourse_ws/src/turtle_interfaces$ cd srv
yahboom@VM:~/roscourse_ws/src/turtle_interfaces/srv$ nano SetPose.srv
yahboom@VM:~/roscourse_ws/src/turtle_interfaces/srv$ nano SetColor.srv
yahboom@VM:~/roscourse_ws/src/turtle_interfaces/srv$ nano ~/roscourse_ws/s
rc/turtle_interfaces/CMakeLists.txt
yahboom@VM:~/roscourse_ws/src/turtle_interfaces/srv$ cd ~/roscourse_ws
yahboom@VM:~/roscourse_ws$ colon build --symlink_install
colon: command not found
yahboom@VM:~/roscourse_ws$ colcon build --symlink_install
starting >>> turtle_interfaces
starting >>> webcam
finished <<< webcam [0.55s]
finished <<< turtle_interfaces [4.15s]
summary: 2 packages finished [4.25s]
yahboom@VM:~/roscourse_ws$
```

step22:

```
yahboom@VM:~/roscourse_ws$ ros2 interface show turtle_interfaces/msg/Turtl
eMsg
string name
geometry_msgs/Pose turtle_pose
string color
yahboom@VM:~/roscourse_ws$ ros2 interface show turtle_interfaces/srv/SetPo
se
geometry_msgs/PoseStamped turtle_pose
---
int8 ret
yahboom@VM:~/roscourse_ws$ ros2 interface show turtle_interfaces/srv/SetCo
lor
string color
---
int8 ret
yahboom@VM:~/roscourse_ws$
```

Task4

step7:



step16:

