

Yolov11 Garbage Sorting with Voice Broadcast (Jetson Orin)

This course is exclusive to Orin board users. Jetson-Nano board users please refer to the course content in [12.1 Garbage Sorting with Voice Broadcast (Jetson Nano)].

Before running the function, you need to close the App and large programs. For the closing method, refer to [4.Preparation] - [1. Manage APP control services].

1. Function Description

Control garbage sorting through voice commands and broadcast the name and type of the currently sorted garbage through voice.

2. Startup and Operation

2.1. Startup

First, you need to start the ROS node service. Open the terminal and enter the following:

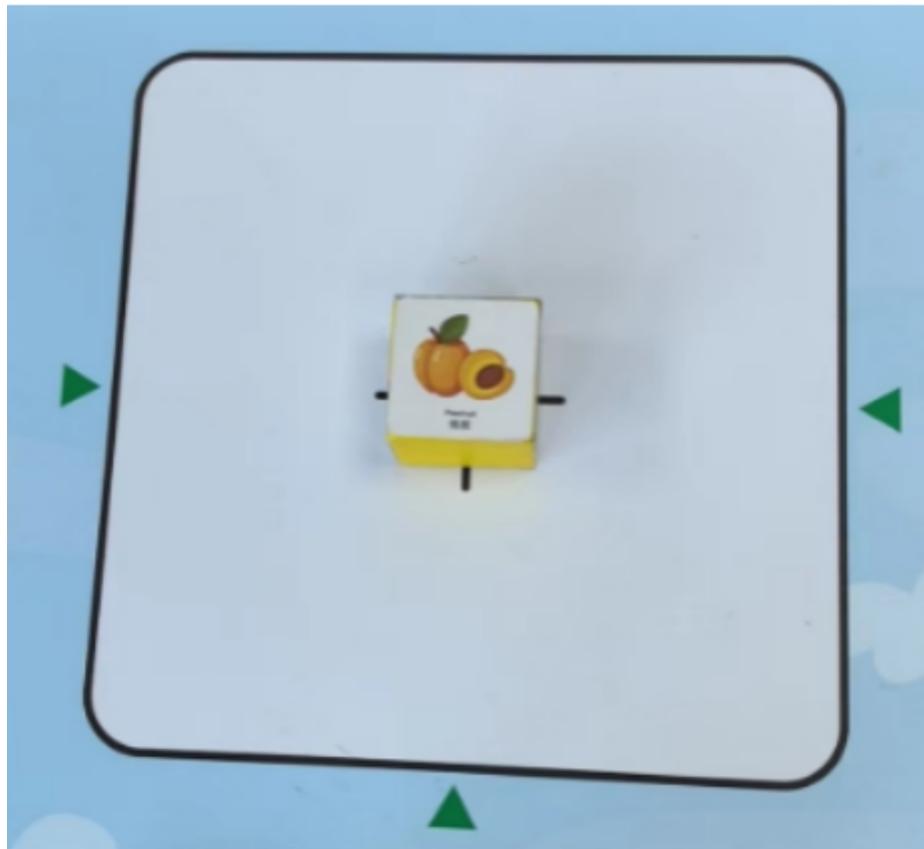
```
ros2 run dofbot_pro_info kinematics_dofbot
```

Then open another terminal and enter the following:

```
python3 ~/dofbot_voice/scripts/garbage_sorting_broadcast.py
```

2.2. Operation Steps

Place the garbage label code block in the center of the image, then say "Hello, yahboom" to the voice module. The voice module will reply "here" to indicate successful wake-up. Then say "What garbage is this?" to the voice module. After the program recognizes it, the voice module will reply and broadcast what this garbage is and its type, and the robotic arm will grab this block and place it in the designated position according to its garbage type. Taking the figure below as an example, according to the recognition result, it will reply "This is a peach pit, which belongs to dry garbage". Then the robotic arm will lower its gripper to grab it and place it in the "dry garbage" area marked on the map.



3. Core Code Analysis

Source code path: ~/dofbot_voice/scripts/garbage_sorting_broadcast.py

```
# Import voice broadcast garbage type library, this library is located at
#/home/jetson/dofbot_pro/dofbot_garbage_yolov11/speech_garbage_identify.py
from speech_garbage_identify import speech_garbage_identify

# Mainly look at the content of this library
# Import garbage recognition library, this library is located at
#/home/jetson/dofbot_pro/dofbot_garbage_yolov11/garbage_identify.py
from garbage_identify import garbage_identify

# Call the garbage recognition function, the input parameter is the current
# image, then return the recognized processed image and recognition results
self.frame, msg = self.garbage_identify.garbage_run(self.frame)

# Traverse the recognition results msg, determine the number self.garbage_num and
# type self.garbage_class represented by the garbage name according to the value of
# name
for key, pos in msg.items():
    name = key
    if name == "zip_top_can":           (self.garbage_num,
self.garbage_class) = ('00', '01')
    if name == "old_school_bag":        (self.garbage_num,
self.garbage_class) = ('01', '01')
    if name == "Newspaper":             (self.garbage_num,
self.garbage_class) = ('02', '01')
    if name == "Book":                 (self.garbage_num,
self.garbage_class) = ('03', '01')
    if name == "Toilet_paper":          (self.garbage_num,
self.garbage_class) = ('04', '02')
```

```

    if name == "Peach_pit":           (self.garbage_num,
self.garbage_class) = ('05', '02')
    if name == "Cigarette_butts":     (self.garbage_num,
self.garbage_class) = ('06', '02')
    if name == "Disposable_chopsticks": (self.garbage_num,
self.garbage_class) = ('07', '02')
    if name == "Egg_shell":           (self.garbage_num,
self.garbage_class) = ('08', '03')
    if name == "Apple_core":          (self.garbage_num,
self.garbage_class) = ('09', '03')
    if name == "Watermelon_rind":     (self.garbage_num,
self.garbage_class) = ('10', '03')
    if name == "Fish_bone":           (self.garbage_num,
self.garbage_class) = ('11', '03')
    if name == "Expired_tablets":     (self.garbage_num,
self.garbage_class) = ('12', '04')
    if name == "Expired_cosmetics":   (self.garbage_num,
self.garbage_class) = ('13', '04')
    if name == "Used_batteries":      (self.garbage_num,
self.garbage_class) = ('14', '04')
    if name == "Syringe":             (self.garbage_num,
self.garbage_class) = ('15', '04')
    if name == "None":                (self.garbage_num,
self.garbage_class) = ('None', 'None')
# Get voice recognition results
result = mySpeech.speech_read()
#If the current voice recognition result is 94, it means asking what the current
garbage is
if result == 94:
    if self.garbage_num == '00':
        mySpeech void_write(94)

    elif self.garbage_num == '01':
        mySpeech void_write(95)

    elif self.garbage_num == '02':
        mySpeech void_write(96)

    elif self.garbage_num == '03':
        mySpeech void_write(97)

    elif self.garbage_num == '04':
        mySpeech void_write(109)

    elif self.garbage_num == '05':
        mySpeech void_write(108)

    elif self.garbage_num == '06':
        mySpeech void_write(107)

    elif self.garbage_num == '07':
        mySpeech void_write(106)

    elif self.garbage_num == '08':
        mySpeech void_write(105)

    elif self.garbage_num == '09':
        mySpeech void_write(104)

```

```

        elif self.garbage_num == '10':
            mySpeech.void_write(103)

        elif self.garbage_num == '11':
            mySpeech.void_write(102)

        elif self.garbage_num == '12':
            mySpeech.void_write(101)

        elif self.garbage_num == '13':
            mySpeech.void_write(100)

        elif self.garbage_num == '14':
            mySpeech.void_write(99)

        elif self.garbage_num == '15':
            mySpeech.void_write(98)

#Start thread to grab garbage label code block
threading.Thread(target=self.single_garbage_grap, args=(self.garbage_class,)).start()

#Grab function
def single_garbage_grap(self, name):
    """
    Robotic arm grab function
    :param name: recognized garbage category
    """

    self.arm.Arm_Buzzer_On(1)
    sleep(0.5)

    # Hazardous waste -- red 04
    if name == "04":
        # print("Hazardous waste")
        # Move to trash can position and drop corresponding pose
        joints_down = self.robot.P_HAZARDOUS_WASTE
        self.move(joints_down)
        # Movement complete
        self.status = 'waiting'

    # Recyclable waste -- blue 01
    if name == "01":
        # print("Recyclable waste")
        joints_down = self.robot.P_RECYCLABLE_WASTE
        self.move(joints_down)
        self.status = 'waiting'

    # Kitchen waste -- green 03
    if name == "03":
        # print("Kitchen waste")

        joints_down = self.robot.P_KITCHEN_WASTE
        self.move(joints_down)
        self.status = 'waiting'

    # Other waste -- gray 02
    if name == "02":
        # print("Other waste")
        joints_down = self.robot.P_OTHER_WASTE
        self.move(joints_down)
        self.status = 'waiting'

#Movement function

```

```
def move(self, joints_down):
    joints_uu = self.robot.P_TOP
    # Move over the object's position
    self.arm.Arm_serial_servo_write6_array(joints_uu, 1000)
    sleep(1)
    # Release the jaws
    self.arm.Arm_serial_servo_write(6, self.release_joint, 500)
    sleep(0.5)
    # Move to object position
    joints_center = self.robot.P_CENTER
    joints_center[5] = self.release_joint
    self.arm.Arm_serial_servo_write6_array(joints_center, 1000)
    sleep(1.5)
    # Gripping, clamping jaws
    self.arm.Arm_serial_servo_write(6, self.grap_joint, 500)
    sleep(0.5)
    # Set up
    self.arm.Arm_serial_servo_write6_array(joints_uu, 1000)
    sleep(1)
    # Lift to the top of the corresponding position
    self.arm.Arm_serial_servo_write(1, joints_down[0], 1000)
    sleep(1)
    # Lift to the corresponding position
    self.arm.Arm_serial_servo_write6_array(joints_down, 1000)
    sleep(1.5)
    # Release the object, release the gripper
    self.arm.Arm_serial_servo_write(6, self.release_joint, 500)
    sleep(0.5)
    # Put up
    self.arm.Arm_serial_servo_write(2, 90, 1000)
    sleep(1)
    # Move to initial position
    self.arm.Arm_serial_servo_write6_array(self.robot.P_LOOK_MAP, 1000)
    sleep(1.5)
```