Voice Control AprilTag ID Sorting

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

Voice commands are issued to sort AprilTag IDs. The robotic arm will grasp the AprilTag block with the corresponding ID according to the command.

2. Startup and Operation

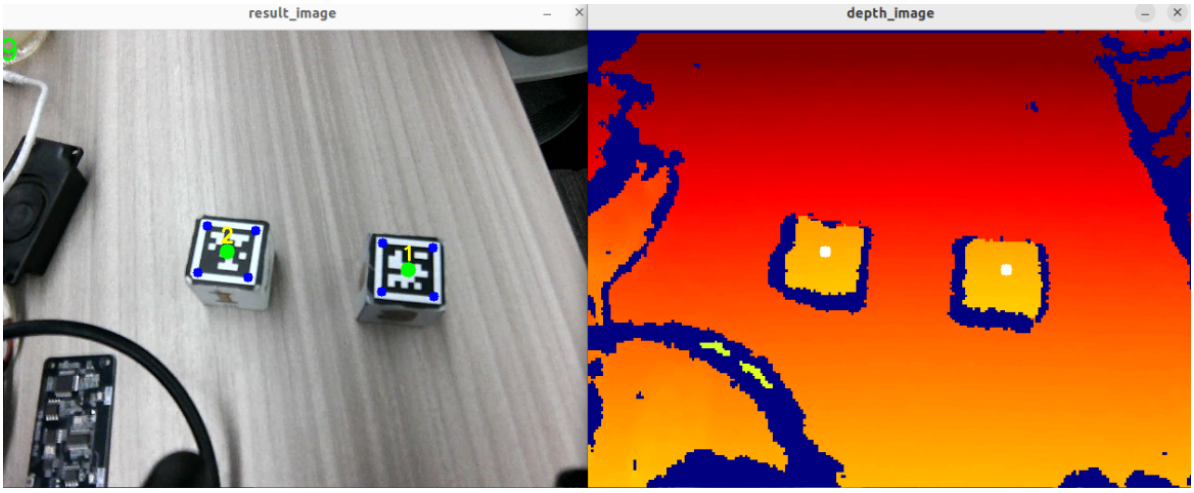
2.1. Startup

Users with Jetson-Nano board version need to enter the docker container and input the following commands. Orin board users can directly open the terminal and input the following commands:

```
#Start camera and inverse kinematics
ros2 launch dofbot_pro_info camera_arm_kin.launch.py
#Start speech recognition and broadcast
ros2 launch yahboom_speech speech.launch.py
#Start AprilTag recognition
ros2 run dofbot_pro_voice_ctrl apriltag_detect
#Start AprilTag grasping
ros2 run dofbot_pro_voice_ctrl apriltag_grasp_VC
```

2.2. Operation Steps

After all programs are running, place four AprilTags with different IDs in the image. Say "Hello, yahboom" to the speech recognition module, and the speaker will broadcast "here". Then say "Sorting machine code number one"/"Sorting machine code number two"/"Sorting machine code number three"/"Sorting machine code number four" to the speech module. The robotic arm will lower its gripper to grasp the target ID AprilTag block, and the speech module will broadcast "OK". After grasping the AprilTag block, it will place it at the designated position. Finally, the robotic arm returns to its initial posture, and the speech broadcast module will announce "Placement complete".



3. Core Code Analysis

3.1. Speech Recognition Node speech_recognize_node

`Source code path:`
`~/dofbot_pro_ws/src/yahboom_speech/yahboom_speech/speech_recognize.py`

Mainly explains how to create a publisher for speech recognition results and how to call the function library to get recognition results, and finally publish the speech recognition results.

```
#Import speech recognition and broadcast library
from Speech_Lib import Speech
#Create speech recognition and broadcast object
mySpeech = Speech()
#Create publisher for speech recognition results
self.pub_res = self.create_publisher(Int8,'voice_result',1)
#Call function in the library to get recognition result
result = mySpeech.speech_read()
#Publish speech recognition result topic
self.voice_command.data = result
self.pub_res.publish(self.voice_command)
```

3.2. Voice Broadcast Node voice_player_node

`Source code path: ~/dofbot_pro_ws/src/yahboom_speech/yahboom_speech/voice_player.py`

Mainly explains how to create a subscriber for voice broadcast and how to call the function library to broadcast voice.

```
#Import speech recognition and broadcast library
from Speech_Lib import Speech
#Create speech recognition and broadcast object
mySpeech = Speech()

#Create subscriber for voice broadcast results
self.sub_playID =
self.create_subscription(Int8,'player_id',self.playercallback,1000)

#Callback function
def playercallback(self,msg):
    #Extract voice broadcast topic data
    ID_value = msg.data
    print("ID_value: ",ID_value)
    if ID_value!=0:
        play_id = ID_value
        print("play_id = ",play_id)
        #Call void_write in the library to play audio file
        mySpeech.void_write(int(play_id))
```

3.3. AprilTag Recognition Node apriltag_detect.py

`Source code path:`
`~/dofbot_pro_voice_ctrl/dofbot_pro_voice_ctrl/AprilTag/apriltag_detect.py`

Mainly explains how to subscribe to and process speech recognition result topics and publish voice broadcast topics.

```
#Create subscriber for speech recognition result topic
self.sub_voice =
self.create_subscription(Int8,"voice_result",self.getVoiceResultCallBack,1)
#Create publisher for voice broadcast topic
self.pub_playID = self.create_publisher(Int8,"player_id", 1)

#Callback function
def getVoiceResultCallBack(self,msg):
    #When the data of speech recognition result topic is 95, 96, 97, 98, it
respectively represents the command to sort AprilTag one/two/three/four
    if msg.data == 95 or msg.data == 96 or msg.data == 97 or msg.data == 98:
        #Change self.pubPos_flag, indicating that AprilTag position information
topic can be published
        self.pubPos_flag = True
        play_id = Int8()
        #Voice broadcast result 45, plays audio "OK", publish this topic
information to voice broadcast node
        play_id.data = 45
        self.pub_playID.publish(play_id)
```

3.4. Robotic Arm AprilTag Grasping Node apriltag_grasp_VC.py

`Source code path:`
`~/dofbot_pro_voice_ctrl/dofbot_pro_voice_ctrl/AprilTag/apriltag_grasp_VC.py`

Mainly explains how to subscribe to and process speech recognition result topics and publish voice broadcast topics.

```
#Create subscriber for speech recognition result topic
self.sub_voice =
self.create_subscription(Int8,"voice_result",self.getVoiceResultCallBack,1)
#Create publisher for voice broadcast topic
self.pub_playID = self.create_publisher(Int8,"player_id", 1)

#Callback function, processes received speech recognition result topic data, 95
to 98 correspond to AprilTags 1 to 4, self.set_id represents the id of the
AprilTag to be sorted
def getVoiceResultCallBack(self,msg):
    if msg.data == 95:
        self.set_id = 1
    elif msg.data == 96:
        self.set_id = 2
    elif msg.data == 97:
        self.set_id = 3
    elif msg.data == 98:
        self.set_id = 4
    print("id:",self.set_id)
    self.grasp_flag = True

#Publish voice broadcast topic, broadcast "Placement completed" audio
play_id = Int8()
play_id.data = 81
self.pub_playID.publish(play_id)
```