Voice controlled Turtlebot 2i

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Outline of the project

- Speech to Text (NLP)
- Response of the bot based on the command

Speech to Text (NLP)

- Libraries used: Speech Recognition, PyAudio, re

It doesn't have a single fixed API that it uses, but rather, it provides a common interface to work with multiple speech recognition engines and services. I used the **Google Web Speech API**. **It** will require internet connection for the lib to work.

- Grammar for commands recognised:

```
text_grammar = """
    # Command format: "Move <direction> by <distance> units"
    # e.g., "Move left by ten units", "Move right by five units", "Turn left", "Turn right", "Stop", "Move straight"
    direction = "left" | "right" | "straight"
    distance = /([1-9]|10|1[1-9]|20|30)/  # Matches numbers from 1 to 30
    units = "units"
    command = ("move" direction "by" distance units | "turn" direction | "stop" | "move" direction )
             """
```

Command types

- Simple direction

  - No numerals

  - Simple looking out for keywords ‘left’, ‘right’, ‘straight’, ‘stop’

  - Call the particular function based on keyword

- Numerals in command (left by x units)

  - Identify the digit (NLP could recognise the spoken command as spelled out or as digit - ‘one’ or 1)

  - JSON format of all possible speech-to-text, choose the one with digit

  - Convert to float and pass as linear variable

Publishes the final recognized text onto topic: /recognized_text

Response of the bot based on the command

- Libraries used: rospy, std_msgs, geometry_msgs

This section of the project focuses on how to move the robot based on the voice commands. The angular, linear speed is varied.

Publishes the required motion onto topic: /cmd_vel

Components of the code

Link to code on Github

- Publisher: text_publisher

Recognises voice command, converts to text and publishes onto /recognized_text topic

- Subscriber: text_subscriber

Reads the text messages, runs the relevant motion command

- Publisher: motion_publisher

Publishes the motion (linear, angular speeds and distance) onto /cmd_vel topic

Example: Spoken command “Left by 10 units”

```
Listening now:
Stopped Listening
{u'alternative': [{u'transcript': u'left by 10 units'}], u'final': True}
('Selected Text:', u'left by 10 units')
[INFO] [1696915613.031137]: Recognized digit: 10
[INFO] [1696915613.032825]: Command: Left
```

```
^Cturtlebot@turtlebot:~/riddhi_ws$ rostopic echo /recognized_text
data: "left by 10 units"
```

/recognized_text topic

```
^Cturtlebot@turtlebot:~/riddhi_ws$ rostopic echo /cmd_vel
linear:
  x: 1.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.2
```

/cmd_vel