

Vision-Based Autonomous Vehicle Navigation of a Robot: Week 3

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TurtleBot: TB-02

Procedure

- SSH into the turtlebot
- Copy the kobuki_button.py from the online GitHub repository
 - Modify the code, replacing “Button” with “Bumper” to subscribe to the bumper events.
 - Use the message format for BumperEvent and replace the constants related to ButtonEvent
 - See attached code: kobuki_bumper.py
- Modify the MoveForward.py code to include different states
 - 1) Move forward
 - 2) Stop when bumper hit
 - 3) Go back after stopping
 - 4) Turn 90 degrees to the left

Investigation

- What are the ROS topics that must be subscribed to in order to get these sensor measurements? To find out these things quickly, bringup the turtlebot, then use the rostopic command with the list option to query the different published topics. Using the type and echo options will let you know what the data type of the message is and what the different fields are of the message.

The ROS topics that must be subscribed to include the /mobile_base/eventsbumper, /mobile_base/events/cliff, and /mobile_base/wheel_drop.

- Bumper: /mobile_base/events/bumper

```
bumper: 2
state: 1
```

```
---
```

```
bumper: 2
state: 0
```

```
---
```

- Cliff: /mobile_base/events/cliff

```
sensor: 2
state: 1
```

bottom: 1486

sensor: 2

state: 0

bottom: 1393

sensor: 2

state: 1

bottom: 1535

- Wheel Drop: /mobile_base/events/wheel_drop

wheel: 0

state: 1

wheel: 1

state: 1

wheel: 0

state: 0

wheel: 1

state: 0

- Of course, the message will only pop up when the publisher publishes. Some messages publish all the time. Some only when triggered to. Which of the above publish all the time, which publish as needed?

Bumper, wheel drop, and cliff sensors are only published as needed, as they are events.

The odometry and laptop charge were published continuously. The laptop charge publishing only about once per second, while the odometry published every 20ms or so.

Adventure

1. Modify the `kobuki_buttons` code to also check for a bumper event. Call the file `kobuki_bumpers`. Display output whenever that is triggered. How many different bumpers does the kobuki have? Modify so that the message specifies which bumper was hit or "unhit." Once you have this working, you are ready to combine with actuation. The important thing here is to learn how to modify what gets imported at

the beginning of the code, and how to setup the subscriber. To learn what the messages are like, you can access the [kobuki message python code](#) that describes what the message structures are like.

- The turtlebot has three different bumper sensors: left, center, and right.
 - Please see attached *kobuki_bumperps.py*
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2. Copy the goforward code to another file. Modify it so that the robot moves with a constant slow velocity. Add a condition to stop when it bumps into something or senses a wheel drop condition. It should start again 2 seconds after the condition is removed. The best way to do this involves coding a finite state machine, so that specific commands will be sent when the state changes, as well as keeping track of the overall hit state of the bumpers.
- Please see attached *Move.py*