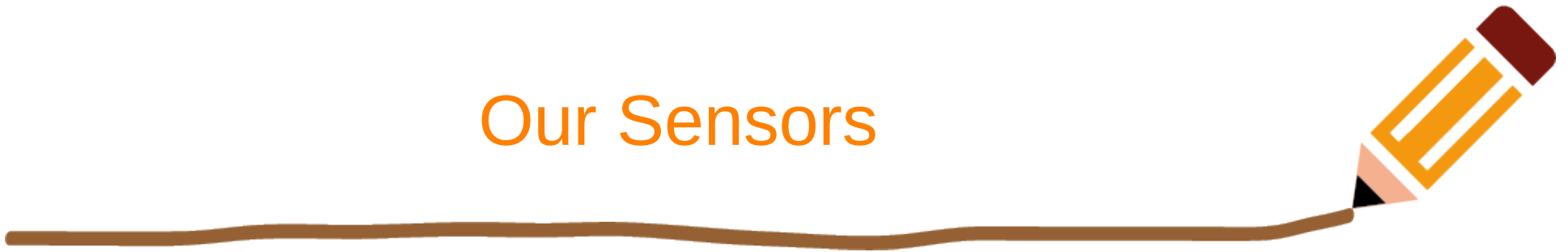
Our Sensors



Admin

- Questions?
- Comments?
- Concerns?

Docs

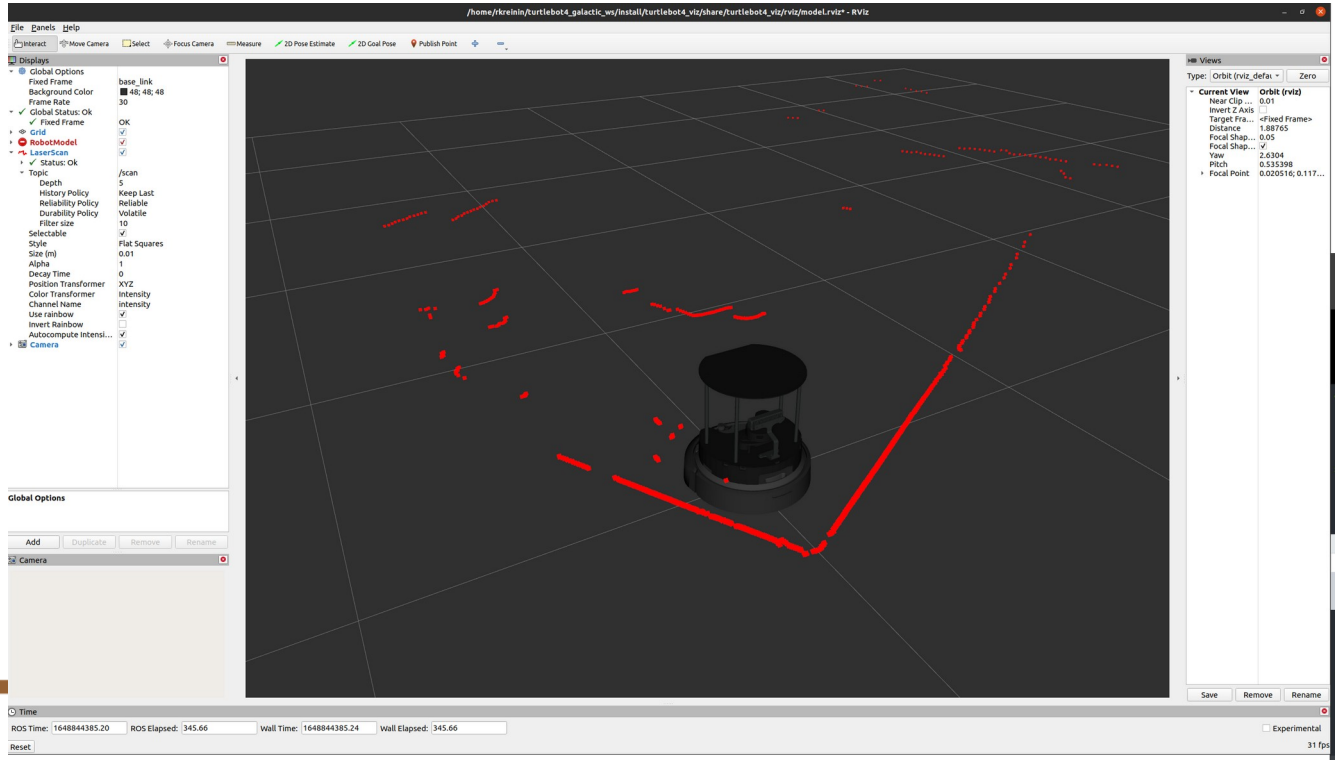
- Check out the official docs where I pulled some of this from
- https://github.com/turtlebot/turtlebot4-hardware
- https://turtlebot.github.io/turtlebot4-user-manual/software/sensors.html

Laser Range Finder

- RPLIDAR A1M8
  - Spinning more or less all the time,
  - Sends laser light out,
    - Receives reflection back
    - *usually* one of the more accurate sensors.
  - Because of the spin, can get a pretty good 360 degree range find

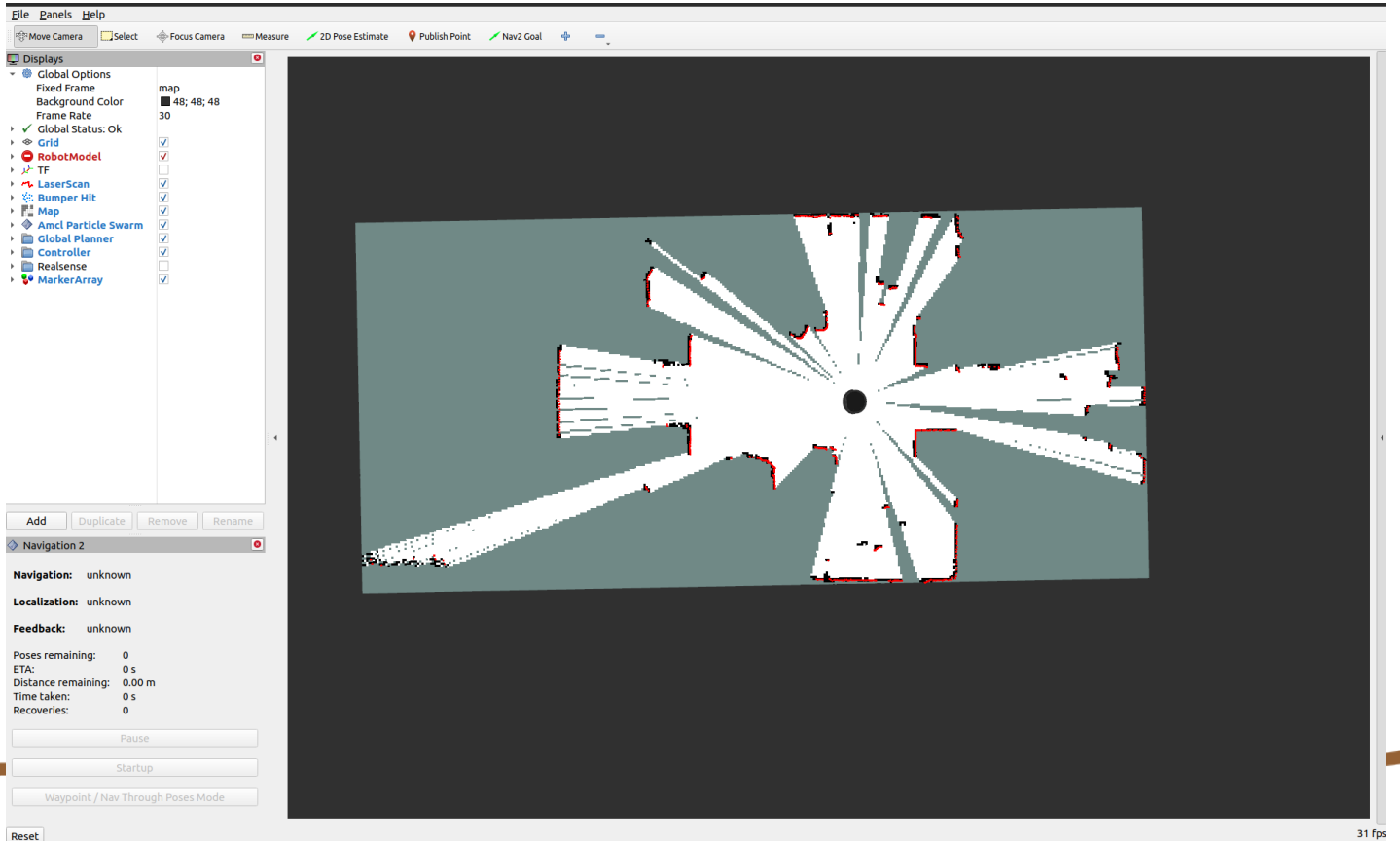
Lidar II

- Lidar usually provides a depth map that might be interpreted like this
- (the view we will use for project 1)



Lidar III

- Or sometimes like this



Cliff Sensors

- The bottom of the Turtlebot4 is an iRobot Create
- There are four downward facing IR sensors that they call ‘cliff sensors’
- IR sensors *kinda* detect distance
  - But really proximity
  - Same principle as lidar, but with infrared
- Mostly tied into the system at a lower level than we will work

Bump Sensor

- The Create 3 has a bump sensor
  - on/off toggle button with a great big cover
  - Mostly used at a lower level than we work
    - But state can be queried

Button (sensors)

- The Create 3 has two buttons
- oo and o
  - Use for basic on/off input for programs
    - State can be queried
    - And change in state can be watched
  - Often in projects 2-?? will want to begin autonomous program with a press

WheelDrop

- **Wheeldrop**
  - The wheeldrop is the spring on which the Create® 3 wheels sit. When the robot is lifted off of the ground, the spring is decompressed and the wheeldrop hazard is activated.
  - Mostly used at a lower level than we work
    - But state can be queried

Front Facing IR Sensors

- IR Proximity
  - The IR proxmity sensors are located on the front of the bumper and are used for the wall follow action. The sensor data can be viewed on the /ir_intensity topic.
    - # This message provides the ir intensity readings
    -
    - std_msgs/Header header
    - irobot_create_msgs/IrIntensity[] readings

Slip and Stall

- Slip and Stall are fusion of wheel and optical odometer sensors
- **Slip and Stall**
  - Wheel slip and stall is also detected by the Create® 3. The status can be viewed on the /slip_status and /stall_status topics.
  - What is slip?
    - Lucky students?
  - What is stall?
    - Another lucky student?

Kidnap Sensor

- Kidnap
  - The robot uses a fusion of sensor data to detect when it has been picked up and "kidnapped". Motors will be disabled in this state, and will re-enable when placed on the ground again. The /kidnap_status topic shows the current kidnap state.
  - Again, usually works lower level than we work.
    - Will usually stop all running behaviors
  - But can be watching for it.

Camera

- Camera
  - OAK-D Camera
    - 4K camera
    - Pair of additional sensors for depth information
    - On board processing for some on board object tracking.
  - One of the more expensive sensors on the robot.
- We’ll begin by using rviz to see what the camera sees.

Additional Sensors

- There are several free USB ports to potentially support additional sensors.
  - We shall see if we get far enough to use more sensors.
- Grad students and first time use of robots.
  - It will be an exciting adventure.

Lets Try it

- Project 1 now or after talking about teleoperation
  - Depending on what time it is when we get here.
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