```
/gx5/gps/fix
lat:37.7505695
long-122.4044006
/gx5/imu/data
orientation:
x:0.0137228192762
y:0.0250551644713
z:-0.949354171753
w:0.312906682491
_____
/tenacity/battery/info
capacity:12.604638211
voltage:11.5126266479
percentage:0.697951972485
battery_health:1
```

Heads-Up Display(HUD) Hack:

How to output your IMU/GPS data onto your robot's POV video stream.

Here's a quick HUD tool I wrote up recently for "Tenacity" , the testbed rover I've been building at Circuit Launch for a while. It's mostly 3D-printed and based on plans by Roger Cheng at www.sawppy.com. The rover not only looks cool it's also a low-cost rugged little testbed for some of the robotics consulting I do. Much of my work is onsite with a client's robot or cloud resources, but occasionally I get asked to help shake out the ROS package for a new depth camera or LIDAR or other sensor. I don't really have the budget for something like a Clearpath Husky or Robotnik platform, but I do have time, robot parts and a 3D-printer.

The camera on the front is an Orbbec Astra Pro that has a structured-light sensor and RGB camera. For this project, I'm just using the RGB camera. The text comes from live ROS topic data generated by an onboard IMU/GPS and an Arduino-based battery monitor.

The IMU is a LORD-Microstrain 3DM-GX5-45 IMU/GNSS, courtesy of John Bergstrom, Staff Engineer at Parker/LORD. It's been a really nice piece of kit to have onboard the rover over the past 6 months or so while I've worked on the navigation software stack and has good ROS

support through their MSCL SDK. I want to thank John and the Parker/LORD team for the unit and for answering my questions when I've had them.

To create the "Heads Up Display" effect, we subscribe to the ROS `/camera/rgb/image_raw` camera topic, the `ros_mscl node` to read the Imu messages and `ros_battery_monitor` to read the battery monitor. Images from the `/camera/rgb/image_raw` topic are run through the cv_bridge Python module to convert them from ROS Image format to OpenCV.

There's a bit of string processing to do on the data coming from the subscribed topics and then it's sent to a series of OpenCV `cv2.putText()` commands which write the topic data right overtop of the image. From there the image can be pushed out to another video stream for real-time heads-up POV monitoring of the rover's activity or saved to an MP4 movie file.

The results from the "HUD"-processing script, taken while driving the rover around a local park in the Mission District in San Francisco. There's a good number of hills and a paved path that make for a nice rover testing ground.

I've got a few other posts brewing about some other tools I've written using the GX5(like a tilt/tipover monitor) I'll be posting over the next month or two.

If you have any questions or comments, you can contact me on LinkedIn or email me at espressobot@gmail.com

A 3DM-GX5-45 GNSS/IMU nestles away in the electronics bay of the "Tenacity" rover, with the GPS/GNSS antenna visible on the rover below.

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