

WEEKLY REPORT DE BENEDETTI MATTEO

WEEK 7: 14/10/2019 – 18/10/2019

TESTS:

After talking with Martin Azkarate it was decided to accept, for now, the results obtained so far in terms of investigation of the VO performances with respect to the various parameters and to choose a set that gives acceptable performances and start working on the tests.

It was also decided to investigate if the IMU measurements might contribute in the error drift.

PARAMETERS INVESTIGATION:

The objective was to study different combinations of parameters to find the best in terms of xy error norm and heading error.

A few sets of parameters, that were investigated in the previous weeks and gave acceptable results, were tested:

VO PARAMETERS
VO_set_1
VO_set_2
VO_set_3
CAMERA PARAMETERS
Camera_set_1
Camera_set_2
BODY->CAMERA TRANSFORM
Transform_1
Transform_2
IMU
IMU not used
IMU used

VIRTUAL SCRIPT FOR VISUAL ODOMETRY TESTING:

Since combining the parameters sets led to 24 different tests, it was decided to improve the testing script, in order to be able to run the tests completely offline.

In the new script only the VO tasks are running live, while the IMU, Vicon, control and camera feed are provided by a log file instead of being acquired in real time while the rover moves.

This approach improved consistency across all the tests (now the trajectory and the camera frames are exactly the same across all the tests), strongly reduced the time needed for the each test and removed the need to have access to the rover itself.

After running all the tests, the set that performed the better is: IMU used, Camera_set_2, Transform_1, VO_set_2.

It achieved:

- XY error norm = 0.1084 m after a traveled distance = 3.1458 m (meaning a 3.45% error)
- Heading error = 4.7398 deg

FUTURE OBJECTIVES

In the next weeks the tests objectives will be better defined and the tests will be carried out.

A preliminary idea for the tests is to change the following conditions:

- Velocity (both translational and rotational)
- Trajectory (straight path, point turn, Ackermann turn, complex trajectory)
- Light conditions
- Camera position and orientation
- Terrain type (sand, sand with small rocks, small rocks, big rocks)

EXTRA ACTIVITIES:

During this week I also took part in extra two activities.

CDF STUDY FOR A LUNAR MISSION:

I am part of the robotics team for the CDF (Concurrent Design Facility) Study for a Lunar Mission to investigate Regolith Sintering.

The Robotics Team is responsible of designing the robotic arm that will be mounted on the lunar lander, while compromising and discussing different architectures with the other teams, mostly the Power, Optics and Instruments Teams.

This week the sessions were on Tuesday and Friday morning and there are 2 remaining Sessions on Friday morning of the next 2 weeks.

We also worked on a test setup to investigate the behavior of a sintered regolith sample that is either on the surface or buried under lunar soil when pressure is applied with an indenter and measured with a Force/Torque sensor (the samples were provided by colleagues from the Materials Section).

FIELD TEST:

On Thursday I helped carrying out and setting up the equipment for a field test for a Motion Planning algorithm (with Hazard Detection and Waypoints navigation) on the HDPR rover [1].

BIBLIOGRAPHY:

[1]: HDPR: A MOBILE TESTBED FOR CURRENT AND FUTURE ROVER TECHNOLOGIES, E. Boukas, R. A. Hewitt, M. Pagnamenta, R. Nelen, M. Azkarate, J. A. Marshall, A. Gasteratos, G. Visentin, 2016