SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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REIPOS - RELATIVE INTERFEROMETRIC POSITION SENSOR

Abstract

The ZARM is involved in the german RIMRES (Reconfigurable Integrated Multi-Robot Exploration System) project. Its purpose is the development of several technologies for autonomous robotic surface exploration missions. The key idea is the modularity of the robots. So several instruments shall be exchangeable on the rover or placed on perifer locations around the landing site. This can enable long term investigations on interesting spots with deployed instrument packages, that does not need a rover waiting for the conclusion of the measurement.

As the involvement of multiple mobile systems and seperated surface instruments requires a certain degree of navigation abilities, the ZARM is developing a relative positioning system. Although it is only able to determine the direction and the distance to other units, it can setup a network of sensors to enlarge the surveyed area. So it shall be possible to leave the video surveyed area of the lander with the rover, delpoy navigation beacons and investigate sites in greater distances and find safely back to the lander base.

The basic working principle is an interferometric high frequency approach. An array of antennas on the sensor PCB are determining the direction of the incoming transmission from the cooperative partner sensor by a phase shift measurement. The distance to the other sensor or rover is determined by the signal round trip time. Although these types of technologies are already used in ground based applications (aerospace direction finding, automotive sensors) it will be a good navigation complement for the multi robot scenario.

The adventages of the system is a GPS independant navigation of multiple mobile units in a certain range (several hundred meters to kilometers). By using an antenna array, also any moving parts can be avoided and the final sensor can be sealed in a plastic housing. Additionally some communication services between the mobile units can be provided.