Paper ID: 78706
interactive

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. TaeYoung Lee
Unmanned Exploration Laboratory (UEL), Korea, Republic of, taeyoung.lee@uel.co.kr

Mr. NamSuk Cho
Unmanned Exploration Laboratory (UEL), Korea, Republic of, whitewh0519@uel.co.kr
Mr. YeongSeop Kim
Unmanned Exploration Laboratory (UEL), Korea, Republic of, yeongseop.kim@uel.co.kr

NON GPS POSITIONING SYSTEM FOR LUNAR EXPLORATION ROVER.

Abstract

Non-GPS positioning systems are vital for the navigation and localization of lunar rovers due to the challenges presented by the lunar environment. GPS is designed to function in Earth's atmosphere, and its signals become very weak in the vacuum of space. Moreover, the Moon has no magnetic field, so GPS signals may be subject to interference from solar wind. And GPS operates around the Earth, and the distance between Earth and Moon is approximately 384,400 km, which weakens GPS signals significantly and makes it difficult for GPS receivers to obtain a sufficient signal on the lunar surface. Therefore, alternative positioning methods are required to ensure that the rover can navigate and carry out scientific missions safely and effectively.

One method of non-GPS positioning that has been used in lunar missions is optical navigation. This technique uses cameras and sensors to capture images of the Moon's surface, which are then used to determine the rover's position and orientation. This method works by matching features in the images with known landmarks or maps of the Moon's surface. By comparing the rover's current view with the map, the system can calculate the rover's position and direction of travel.

Another non-GPS positioning technique is laser ranging, which uses lasers to measure the distance between the rover and a known landmark or reflector on the Moon's surface. This method works by sending a laser pulse to the reflector and measuring the time it takes for the pulse to return to the rover. By calculating the time delay, the system can determine the distance between the rover and the reflector, which can be used to determine the rover's position.

Inertial navigation systems (INS) are another method of non-GPS positioning that have been used in lunar missions. INS uses accelerometers and gyroscopes to measure the rover's acceleration and rotation. This information is used to calculate the rover's velocity and position. INS is particularly useful in situations where such as when the rover is exploring the interior of a crater or a dark side of the Moon.

Overall, non-GPS positioning systems are crucial for ensuring the accurate and reliable navigation of lunar rovers. While each technique has its advantages and limitations, a combination of these methods can provide a robust and reliable non-GPS positioning system for lunar rovers.