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

Author: Mr. NamSuk Cho
Unmanned Exploration Laboratory (UEL), Korea, Republic of, whitewh0519@uel.co.kr

Mr. TaeYoung Lee
Hanyang University, Korea, Republic of, dlxodud200@hanyang.ac.kr
Mr. YeongSeop Kim
Unmanned Exploration Laboratory (UEL), Korea, Republic of, yeongseop.kim@uel.co.kr

# LUNAR ROVER LOCALIZATION IN NON-GPS ENVIRONMENTS: A PROPOSAL UTILIZING XBEE COMMUNICATION MODULES AND RSSI MEASUREMENTS

**Abstract**

Accurately localizing a lunar rover is crucial for effective exploration of the Moon's surface, yet the absence of GPS signals presents a significant challenge. In this paper, we propose a novel localization system that leverages Xbee communication modules and Received Signal Strength Indication (RSSI) measurements. Our system aims to precisely determine the rover's position and orientation without relying on GPS. The proposed system consists of external anchor nodes positioned with the lander serving as the origin coordinates. By measuring the signal strength between these anchor nodes and the lander, we can infer the distance between them. This distance information is then utilized in triangulation to ascertain the rover's position relative to the anchor nodes. Furthermore, installing Xbee modules on both sides of the rover allows for the calculation of the rover's heading by analyzing the inclination of sensors. To address the noise inherent in the measurement process, we employ an extended Kalman filter. This filtering technique helps in estimating the rover's position and orientation more accurately by incorporating sensor measurements and system dynamics. Additionally, we utilize Monte Carlo estimation to further enhance the localization accuracy. Simulation results demonstrate the efficacy of our proposed system in achieving precise localization of the lunar rover in the absence of GPS signals. By effectively utilizing Xbee communication modules and RSSI measurements, our method offers a viable solution for lunar rover localization, thereby facilitating exploration and scientific endeavors on the Moon's surface.