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Author: Mr. Diego Martin Arroyo Villanueva
Universidad Nacional de Ingeniería (Lima, Perù), Peru

Mr. Paulo Cesar Romero Aguilar
Universidad Nacional de Ingeniería (Lima, Perù), Peru
Mr. Belyeud Prado
Universidad Nacional de Ingeniería (Lima, Perù), Peru
Mr. Brando Burgos Guerrero
Universidad Nacional de Ingeniería (Lima, Perù), Peru
Mr. Darwin Junnior Sabino Diego
Universidad Nacional de Ingeniería (Lima, Perù), Peru

ALTERNATIVES FOR OPTIMIZATION IN MAPPING AND LOCALIZATION OF AN AUTONOMOUS ROVER ON THE SURFACE OF MARS USING SENSOR FUSION

Abstract

The exploration of the Martian surface poses a significant challenge regarding the precise localization of rovers in an unknown and variable environment. One of the most crucial tasks that an exploration vehicle must perform is estimating its movement and being aware of its surroundings. In this study, an advanced localization architecture is proposed based on the Robot Operating System (ROS) ecosystem, where adaptive and robust SLAM algorithms based on EKF, FastSLAM, and Visual SLAM will be applied. The approach also incorporates the use of sensor fusion such as IMU to obtain the rover's relative coordinates, Lidar sensors to gather information about obstacles or changes in elevation in its environment, and stereoscopic cameras to capture meaningful imagery. The performance results of each algorithm will be evaluated through simulated testing in the Gazebo environment, demonstrating high precision that will be influential in the future development of autonomous exploration systems on Mars.