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

Author: Mr. JAHIR UDDIN
University of Nebraska-Lincoln, United States, jahiruddinkomol+iafastro@gmail.com

Mr. Md. Mahbub Ul Haque
BRAC University, Bangladesh, md.mahbub.ul.haque@g.bracu.ac.bd
Mr. Sihab Sahariar
BRAC University, Bangladesh, sihab.sahariar@g.bracu.ac.bd
Ms. Rehnuma Binta Shahriar
BRAC University, Bangladesh, rehnumashahriar2@gmail.com
Mr. Amanto Amin Chamon
BRAC University, Bangladesh, amanto.amin.chamon@g.bracu.ac.bd
Mr. Abdulla Hil Kafi
BRAC University, Bangladesh, abdulla.kafi@bracu.ac.bd
Mr. MD FIROZ WADUD
BRAC University, Bangladesh, md.firoz.wadud@g.bracu.ac.bd

OPTIMIZING AUTONOMOUS NAVIGATION OF UNMANNED GROUND VEHICLES IN CHALLENGING TERRAIN THROUGH SURFACE ANALYSIS AND AI

Abstract

Autonomous navigation of unmanned ground rovers on different surfaces faces challenges due to surface conditions. This paper proposes a novel approach for optimising the autonomous navigation of unmanned ground vehicles (UGVs) in challenging terrains through surface analysis and artificial intelligence (AI). The proposed method relies on surface analysis techniques to obtain high-resolution maps of the terrain, which are then processed using an optimised deep learning algorithm to determine the optimal path for the UGV. The approach also incorporates information obtained from vertical Light Detection and Ranging (LiDAR) to provide additional information about the environment, such as obstacles and elevation changes. The proposed method has been tested on various terrains, including those resembling the Martian environment. The results demonstrate its effectiveness in navigating UGVs through challenging terrain with minimal jerks and oscillations. Given the challenging nature of the Martian terrain, autonomous navigation of UGVs is crucial for mission success, and the proposed approach has significant potential for future Mars exploration missions. The paper concludes with a discussion of the possible applications of this approach in Martian operations, such as scouting, reconnaissance, and sample collection missions. This approach can potentially enhance the efficiency and safety of UGV operations in Martian environments and enable the successful achievement of mission objectives.