IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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AN OPTIMIZED RECONFIGURABLE ON-BOARD THERMAL IMAGES CLASSIFICATION USING AI FOR MOON SOUTH POLE ROVER MISSION

Abstract

The poles are the newest uncharted territories for lunar exploration missions, with the South Pole being one potential location for a human base in the future. Furthermore, the presence of iced water in the dark areas surrounding the south pole has always attracted the interest of scientists. However, moon rovers that can study these areas face many challenges due to the harsh environment of the Moon. One of the major challenges that moon rovers face is the power limitation in a long eclipse duration. Moreover, Artificial Intelligence (AI) algorithms and automatic processes require high power consumption, and this result in limiting the rover's operation. Thus, this research proposes an optimized AI-based thermal images classifier implemented on the FPGA board to be on-board a lunar rover. The proposed system will aid in classifying the water occurrence and mapping its area using thermal images with an accuracy of around 97%. The proposed system showed promising results as the optimized system required less time and power to run the AI algorithm. Hence, the developed system can be implemented on a real moon rover project.