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CONCEPTUAL APPROACH FOR EFFICIENT LUNAR DESCENT AND LANDING USING A CONVOLUTIONAL NEURAL NETWORKS

Abstract

Robotic systems are required for the spacecraft's descent and landing system. After numerical predictions of astrodynamic events, engineers design robotic systems precisely enough to overcome the various constraints and ensure the given mission's success. After several attempts so far, there are still unsuccessful lunar missions caused by loss of communication or mission module crashes - which can be avoided by designing more efficient space robotics systems for the main spacecraft. Deep learning methods are expected to play a critical role in autonomous and intelligent spatial guidance problems. The method exploits the ability of CNNs to extract characteristics and correlate them with optimal fuel thrust autonomously. The spacecraft's position and speed are directly correlated by ray-tracing simulation on the onboard camera's associated optical image. This paper aims to design a set of Convolutional Neural Networks (CNNs) capable of predicting the optimal fuel control actions for performing a moon landing, using only raw images taken by optimal onboard cameras. Based on deep learning that integrates guidance and navigation functions, this article proposes to provide an end-to-end solution to a lunar landing. We propose a neural network model implemented in the robotic system for an efficient descent and landing on the Moon. We propose approaches for efficient entry and landing using appropriate space robotics systems and the spacecraft's trajectory optimization constraints from descent to after-landing.