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Review Paper on Centroiding Algorithm for Lunar Navigation

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Abstract

This paper reviews on potential algorithms for navigation on the moon's surface, focusing on centroiding algorithms in star sensors or trackers. Accurate positioning is crucial for lunar missions since there's no Global Positioning System (GPS), and navigation depends on pre-installed maps and sensors like Light Detection and Ranging (LiDAR) and star trackers. Star sensors or trackers are ideal for these missions due to their high accuracy. However, the moon's environment adds challenges, like interference from bright reflections and noise from radiation. This paper reviews different star-sensing methods, comparing CMOS and CCD sensors, and assesses their algorithms for their effectiveness in lunar mission. The research gap which are the strengths and weaknesses of these methods were discussed and identify areas for improvement. By addressing these gaps, this study

aims to contribute to the development of more robust and accurate centroiding algorithms, advancing lunar navigation technologies for future exploration missions. © 2025 IEEE.

Author keywords

Centroiding Algorithm; CMOS; Image Extraction; Lunar navigation; Star Sensor

Indexed keywords

Engineering controlled terms

Lunar landing; Optical flows

Engineering uncontrolled terms

Centroiding; Centroiding algorithm; CMOS; Global positioning; Image extraction; Lunar navigation; Moon surface; On potentials; Review papers; Star sensors

Engineering main heading

Global positioning system

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Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

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