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A NOVEL APPROACH BASED ON SHADOW OF SOLAR ARRAY FOR AUTONOMOUS  
NAVIGATION OF SPACECRAFT FOR ASTEROID EXPLORATION**Abstract**

The landing accuracy of asteroid explorer in landing stage is closely related to the implementation of autonomous navigation algorithm. If the Detector Visual Navigation Algorithm based on traditional navigation landmarks such as feature point and meteorite crater does not obtain enough ground object information, the navigation results will be affected. This paper presents a new autonomous navigation algorithm for asteroid explorer, which makes use of the shape of the solar panel shadow and the relationship between its position and attitude in landing stage. Firstly, considering the influence of the thickness of the solar panel, the solar panel projection is fitted and extracted through the threshold segmentation, edge extraction and convex edge extraction algorithms. Then, according to the extracted shadow information, the change of pitch angle and roll angle is solved by using the projection transformation relationship, and the change of yaw angle and position is calculated by template matching method. Finally, through simulation, the effectiveness and reliability of the algorithm are verified on the premise of adding noise, which provides a new method for the estimation of the position and attitude of asteroid explorer in the landing stage.