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OBSERVATION, NAVIGATION, OBSTACLE DETECTION INTEGRATED PROGRAM FOR DEEP SPACE LANDER BASE ON SUPERPOSITIONAL COMPOUND EYE IMAGING TECHNOLOGY

Abstract

Deep space lander can get more physical information of the celestial bodies, is an important form of exploration of deep space. The key to soft landing on the chosen celestial body successfully is monitoring the Lander's own speed and hazard in the landing area. Traditional single-aperture optical camera though has been successfully applied Curiosity, Hayabusa probe, but its data rate, speed detection accuracy is poor, need to be combined with a laser radar and other equipment. Superpositional compound eye imaging technology simulates the structure of insect compound eye. It is small size, light, large field of view (horizontal field of view up to 240 degrees, the vertical field of view up to 360 degrees), data rates up to 240Hz. This technique is more sensitive for detecting moving target and higher resolution for wavelength, intensity and color of light. According to the integration requirements for small deep space Lander, we provide a new idea for micro and small deep space probe designed. We design the observation, navigation, obstacle detection integrated program for deep space Lander base on superpositional compound eye imaging technology. In the program, a superpositional compound eye camera is adopted to imaging the asteroid's surface, providing the accuracy velocity of the Lander related to the asteroid and 3D information of the landing zone, for hazard detection and landing control. This paper describes the superpositional compound eye imaging system design, superpositional compound eye structure processing design, observation / navigation / obstacle detection algorithm design, as well as the progress in the development of micro superpositional compound eye camera.