Paper ID: 61794
student

Lunar Exploration (2)
Lunar Exploration (4) (4)

Author: Dr. Anran WANG
Beijing Insitude of Control Engineering, China

RESEARCH ON THE LANDMARK NAVIGATION METHOD OF THE LUNAR LANDER IN THE POWER DESCENT PHASE

Abstract

Abstract

Activities such as polar survey and manned lunar landing in the process of lunar exploration put forward higher requirements on the navigation accuracy and pinpoint landing capability of the aircraft. In this paper, a navigation method based on landmarks is studied to achieve high-precision pinpoint landing of the lander during the process of lunar exploration. First, a navigation landmarks database is prepared in advance based on the existing topographic map of the moon. During the power descent phrase, the images taken by the vision sensor of the aircraft are matched with the navigation landmarks database stored on the aircraft in real time. According to the flight characteristics of the power descent stage, the initial locations of the landmarks in the landing images can be figured out between adjacent frames, and the accurate coordinates of the landmarks are obtained by sub-pixel matching between the landing images and the landmarks database, then the poses of the craft can be solved. However, due to the impact of the lunar topographic map accuracy, the landmarks database has a certain system error, and bundle adjustment method is used to optimize the solved poses information. Finally, the images taken by the Chang'e-4 landing camera and the topographic maps with resolutions of 5m and 1.5m of the Chang'e-4 landing area are used to verify the method in this paper. The experimental results show that the method can achieve a precision of 10m.