

# Trajectory reconstruction of CE-3 soft landing by landing camera images

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**Abstract**--Precision trajectory of Chang'E-3 (CE-3) is important for the orbital control strategy analysis, orbital optimization and orbital control strategy adjustment of lunar exploration. Limited to short landing period, far Earth-Moon distance, uncertainty of probe kinetic model and some other influence, it is difficult to obtain precision trajectory of CE-3 during its soft landing process until now. However, the trajectory reconstruction based on landing camera images does not affected by these factors, and has many other technical advantages such as high resolution, high frame rate, continuous lunar surface coverage, simultaneous calculation of lunar probe position and attitude, and so on, so that precision soft landing trajectory can be calculated. On the other hand, more subtle change process of lunar probe during soft landing can be emerged by landing camera images compared with the results based on radio observations because of their high frame rate. In this paper, a method of trajectory reconstruction by space resection of landing camera is proposed. The process of avoidance obstacle at orbital altitude of about 100 meters is carefully studied. The results show that the trajectory of CE-3 restructured by this paper can reflect the position change of power decline process in detailed and the results are favorable to the application of orbital analysis, gravity field inversion and so on.

**Key words:** Chang'E-3; landing camera; trajectory reconstruction; space resection

