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VISION-BASED SPACECRAFT AUTONOMOUS NAVIGATION ALGORITHM FOR MARS
PINPOINT LANDING**Abstract**

In this paper, autonomous navigation algorithms based on optimal fusion of visual feature information and inertial measurement for the descent phase of Mars soft landing application are proposed; observability analysis of the navigation algorithms is also studied in detail. In the process of designing the navigation algorithm, the camera measurement model and state equation considering the planet rotation effects are provided in the first step. Subsequently state vector augmentation algorithm during the time delay is presented to deal with the measurement latency, and then the state and error covariance measurement update equations are derived. Then the observability of the nonlinear system describing the landing navigation process is investigated by observability matrix rank condition based on Lie derivatives. Finally the feasibility and validity of the proposed navigation algorithm are demonstrated by mathematical simulation.