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China, jyuan@nwpu.edu.cnDUAL EKF-BASED COLLABORATIVE OBSERVATION AND ATTITUDE DETERMINATION FOR  
A TUMBLING NON-COOPERATIVE SPACE TARGET**Abstract**

The precise attitude determination of a tumbling non-cooperative target in space is challenging. During the observation, the observing spacecraft has to fly around the tumbling target in space, maintain or adjust the trajectory and attitude in real-time. However, the orbit and attitude determination error of the observing spacecraft caused by orbit and attitude control error will negatively affect the attitude determination of the target. Aim at the problem, this paper proposes a scheme for multi-spacecraft collaborative observation and attitude determination of the tumbling target based on dual Extended Kalman Filtering. Based on multi-spacecraft collaborative observation, the tumbling target can be observed from different viewpoints at the same moment. Based on feature matching between the multi-view image set, the relative position and attitude between the collaborative observing spacecrafts is estimated via EKF. According to the relative state determination between the collaborative observers, the point cloud data of the target is reconstructed in terms of the collaborative observation data, the attitude change of the target is derived through point cloud matching, and the attitude information of the tumbling target is estimated via EKF. Finally, the simulation results show that the proposed method is effective for the attitude determination of the non-cooperative tumbling target, and it can avoid the influence of the orbit and attitude control error of the observers in process of observation. The approach presented can be applied for space non-cooperative target on-orbit servicing in future.