The principal differences of this paper from previous related studies can be stated as follows:

* The Adaptive Reaction Null Space (ARNS) motion control scheme is expanded from a single-arm space robot to a dual-arm space robot, in which both arms execute ARNS motion.
* This adaptive scheme is able to stabilize a non-cooperative target that carries unknown momentum without the use of reaction wheels or jet thrust;
* The improved recursive least square with variable forgetting factor algorithm can improve the system stability and accelerate the convergence rate of the tracking errors;
* The unknown inertial parameters of a tumbling target are identified based on momentum conversation.