The increasingly cluttered environment in space is placing a premium on techniques capable of tracking and estimating the trajectory of space debris. Unlike the debris smaller than 1 cm or larger than 10 cm, it is always a challenge for spacecraft or satellite mission designers to consider explicitly the ones ranged from 1 cm to 10 cm a priori. To tackle this challenge, in this paper a vision based debris’ trajectory tracking method in close proximity is presented using two cameras on-board of satellites in a formation. Also to differentiate the target debris from other clutters, a data association technique is investigated. A two-stage nonlinear robust controller is developed to adjust the attitude of the satellites such that the desired field of view can be achieved for the target debris. Capabilities of the proposed integrated estimation and control methods are validated in the simulations.