

An Intuitive Tool to Design Relative Orbits for Formation Flying

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Relative astrodynamics is often an opaque subject for most spacecraft engineers who do not deal directly in the guidance and control of formation flying or distributed satellite systems. Designing relative orbits itself is often a daunting task, even in the two-body-only sense, as the mission designer needs to select the correct set of Keplerian (or other suitable) orbit elements for the deputy and chief spacecraft. In this open-source project, QLUSTER allows for the layman to design the formation geometry directly, by specifying the radial, in-track, and cross-track design baselines, as well as two angular parameters. QLUSTER then takes these parameters, and works backwards to solve for the desired initial osculating orbit elements of the deputy instead, using the eccentricity-inclination vector separation framework proposed by D'Amico et al (2010). This is a lot more efficient than beginning with the traditional orbit elements, and also gives the user a lot more visual feedback in how the selected formation geometry parameters influences the orbital elements.

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