
On the Initial Condition for Satellite Formation Flying

Hyung-Chul Lim¹, Hyo-Choong Bang², Pil-Ho Park¹,
Kwan-Dong Park¹, Jeong-Ho Jo¹

¹GPS Research Group, Korea Astronomy Observatory

²Aerospace Department, KAIST

Satellite formation flying is the placing of multiple satellites into nearby orbits to form cluster of satellites. Clohessy-Wiltshire equations are used to describe the relative motions between satellites within a cluster, which are known as Hill's equations. Hill's equations assume that the Earth is spherically symmetric, the reference satellite orbit is circular and the equations can be linearized in the relative motion variables. However, Hill's equations can not accurately describe the relative motion under J2 perturbation. Currently, there are many different ways of describing satellite motion within a cluster in the presence of the J2 perturbation. This study gives a method of determining initial conditions for satellite formation flying using mean elements. For this research mean elements are transformed to osculating elements using Brouwer's theory and the orbit propagation is performed with the consideration of J2, J3, J4 and J5. The results show that the method is effective on a fuel saving for satellite formation flying.