Theoretical summary

# Variables:

|  |  |
| --- | --- |
|  | Aircraft fixed body angular velocity respect to inertial frame |
|  | Quaternion del body frame respect to the Inertial frame |
|  | Status vector for Runge-Kutta |
|  | Torque, Aircraft fixed coordinates, [Nm] |
|  | Inertial tensor of the satellite |
|  | Total angular momentum in the fixed coordinates of the aircraft |
|  |  |

**Procedure using RungeOneStep (Inertial Mode: easy to control the attitude respect to an inertial frame in scenarios as such as stellar or planetary observation):**

Fourth-order Runge-Kutta method. Given the following differential equation:

At this time, the state quantity at the () th step is given as follows.

Where is a time step and satisfies the following equation

are vectors with the same number of components as the state quantities and are given by the following calculations.

In the case of the attitude propagation in this case, the state quantity x is composed of seven components, which are the combination of the following Quaternion\_i2b and the aircraft fixed angular velocity ω\_b.

With

**Procedure using RungeOneStep (Relative to LVLH frame: easy to control the attitude respect to a vector pointing to the center of the Earth used in scenarios as such as earth observation):**