Attitude Dynamics and Control of a Nano-Satellite Orbiting Mars

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Abstract should be around 200–300 words. Explain briefly what the problem is, how does the presented work contribute. Summarize the paper results

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I. Introduction

A. Testing of a Subsection

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II. Problem Statement

Let us begin with defining the orbit with the following figure

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Figure 1: Illustration of the Inertial, Hill, and perifocal geometrical constructions.

Task 1: Orbit Simulation

Our Hill frame is defined by the basis: $\{\hat{\boldsymbol{i}}_r, \hat{\boldsymbol{i}}_\theta, \hat{\boldsymbol{i}}_h\}$ with the inertial defined as $\{\hat{\boldsymbol{n}}_1, \hat{\boldsymbol{n}}_2, \hat{\boldsymbol{n}}_3\}$. Given the inertial and Hill frame definitions, we know that the position vector of the LMO satellite is $r\hat{\boldsymbol{i}}_r$. Additionally we know that since it is a circular orbit, it has a time invariant angular rate $\boldsymbol{\omega}_{H/N} = \dot{\theta}\hat{\mathbf{i}}_h$. Calculating the vectorial inertial derivative:

$$\dot{\boldsymbol{r}} = \frac{^N d}{dt}\boldsymbol{r} = \frac{^H d}{dt}\boldsymbol{r} + \boldsymbol{\omega}_{H/N} \times \boldsymbol{r} \tag{1}$$

$$= \dot{\theta}\hat{\boldsymbol{i}}_h \times r\hat{\boldsymbol{i}}_r \tag{2}$$

$$= r\dot{\theta}\hat{\boldsymbol{i}}_\theta \tag{3}$$

Additionally, we can use this information to find the inertial position and velocity vectors by performing transformations using the perifocal frame information. We know that the perifocal frame can be defined by an Euler 3-1-3 rotation.

III. Numerical Simulations

IV. Conclusion

Acknowledgment

References