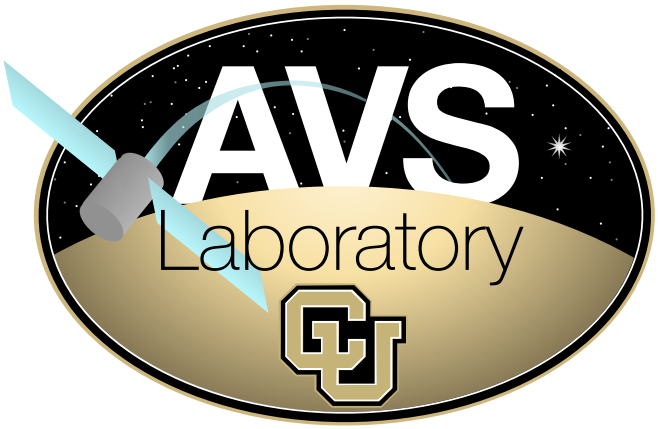

Autonomous Vehicle Simulation (AVS) Laboratory

AVS-Sim Technical Memorandum

Document ID: AVS-SIM-inertial3D

GUIDANCE MODULE TO PERFORM AN INERTIALLY FIXED POINTING

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Status: Initial Version
Scope/Contents
Generate the reference attitude trajectory for a general 3D inertial pointing. A corrected body frame will align with the desired reference frame.

Rev:	**Change Description**	**By**
Draft	initial copy	M. Cols

Contents

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1 Module Input and Output

Table 2 shows the input Configuration Data of the module Inertial 3D Point.

Table 2: Input Configuration Data

Name	Type	Length	Description
$\sigma_{R_0/N}$	double []	3	MRP attitude set of the desired reference frame with respect to the inertial frame .

Table 3 shows the Attitude Reference output message of the module Inertial 3D Point.

Table 3: Output Attitude Reference Message

Name	Type	Length	Description
$\sigma_{R/N}$	double []	3	MRP attitude set of the reference frame with respect to the inertial frame.
${}^{\mathcal{N}}\omega_{R/N}$	double []	3	Angular rate vector of the reference frame with respect to the inertial expressed in inertial frame components.
${}^{\mathcal{N}}\dot{\omega}_{R/N}$	double []	3	Angular acceleration vector of the reference frame with respect to the inertial expressed in inertial frame components.

2 Introduction

This technical note discusses the guidance mathematics to compute a reference frame $\mathcal{R}$ that is aligned the with an inertially fixed frame $\mathcal{R}_0$, as shown in Figure 1.

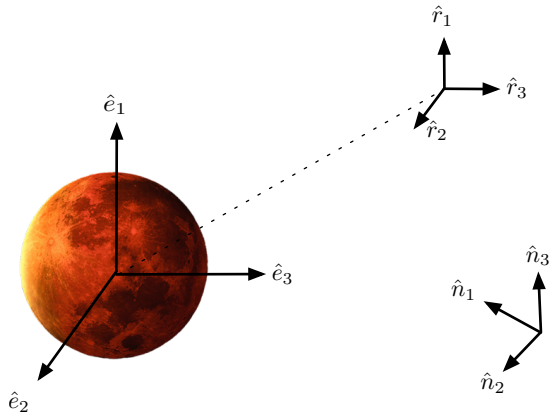

Fig. 1: Illustration of the input inertially fixed frame $\mathcal{R}_0$: $\{\hat{e}_1, \hat{e}_2, \hat{e}_3\}$, the generated reference frame $\mathcal{R}$: $\{\hat{r}_1, \hat{r}_2, \hat{r}_3\}$ and the inertial frame $\mathcal{N}$: $\{\hat{\boldsymbol{n}}_1, \hat{\boldsymbol{n}}_2, \hat{\boldsymbol{n}}_3\}$

3 Reference Frame Generation

The modules requires the desired reference orientation in terms of the MRP set $\boldsymbol{\sigma}_{R_0N}$. This input is only set once and does not have to be changed. Let us designate $\mathcal{R}$ as the output generated reference frame. Since the fixed-pointing is inertial:

$$\boldsymbol{\sigma}_{RN} = \boldsymbol{\sigma}_{R_0N} \tag{1}$$

$$\boldsymbol{\omega}_{RN} = \dot{\boldsymbol{\omega}}_{RN} = 0 \tag{2}$$

REFERENCES