

# Student Satellite Project Indian Institute of Technology, Bombay Powai, Mumbai - 400076, INDIA



Website: www.aero.iitb.ac.in/satlab

# **README - q-Davenport Algorithm**

Guidance, Navigation and Controls Subsystem

# es\_main\_qdp.m

Code Type: MATLAB - Script Code author: Shashank Singh Created on: 29/04/2020 Last modified: 08/08/2020

**Reviwed by: NOT YET REVIEWED!** 

**Description:** 

This is the main script, which runs the q-Davenport Algorithm. It also runs the sequential rotation function, in case the q-Davenport fails in the given initial frame.

#### Formula & References:

Reference: **Chapter 5**, Fundamentals of Spacecraft Attitude Determination and Control Authors: Markley, F. Landis, Crassidis, John L.

#### **Input parameters:**

The input arguments to the function are read from the Input folder. Here N refers to the number of input stars.

- 1. es\_input.mat: The contents of which are-
  - op\_bi: ((N, 4) Matrix) The body-frame vectors (X, Y, Z), of the matched stars
  - op\_ri: ((N, 4) Matrix) The inertial-frame vectors (X,Y,Z), of the corresponding matched stars
  - N: (Integer) The number of stars matched by Star Matching

### **Output:**

Writes the final estimated quaternion using q-Davenport into **es\_q\_bi.csv** file in the **Output** folder as well as the **Output** folder(to be used for Sequential Rotation later).

### es\_qdp.m

Code Type: MATLAB - Function Code author: Shashank Singh Created on: 29/04/2020

**Last modified:** 08/08/2020

**Reviwed by: NOT YET REVIEWED!** 

**Description:** 

This is the main and the only function in the q-Davenport algorithm. This function calculates the **final estimated quaternion**. It also checks if **check\_value** is close to zero. If **check\_value** is smaller than the threshold value, then  $q_-bi = [-1; -1; -1]$  is returned, which indicates the main script that q-Davenport has failed in this frame and then sequential rotation is used.

## Formula & References:

Reference: **Chapter 5**, Fundamentals of Spacecraft Attitude Determination and Control Authors: Markley, F. Landis, Crassidis, John L.

**Input parameters:** Here **N** refers to the number of input stars.

- 1. **b\_m**: ((N, 3) Matrix) The body-frame vectors (X,Y,Z), of the matched stars
- 2.  $\mathbf{m}_{\cdot}\mathbf{r}$ : ( (N, 3) Matrix) The inertial-frame vectors (X,Y,Z), of the corresponding matched stars
- 3. **v**