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**README - Star Matching - Star Catalogue: Preprocessing**
Guidance, Navigation and Controls Subsystem

## st_guide_star_catalogue.m

**Code Type:** MATLAB - Script
**Code author:** KT Prajwal Prathiksh
**Created on:** 25/04/2020
**Last modified:** 28/05/2020
**Reviewed by: NOT YET REVIEWED!**
**Description:**
This script converts the SSP Star Catalogue, into the Guide Catalogue.
**st_Guide_Star_Catalogue.csv :** This Catalogue has been generated specifically for the purpose of Star Matching. It contains the following data fields:

1. **SSP_ID** - The fictitious identifier of all those stars which satisfy the condition, that their **Vmag** is $\leq$ the Limiting Magnitude $(= 6)$
2. **[X, Y, Z]** - The Cartesian unit vector representation of each star generated from its Right-Ascension and Declination coordinate. The (X, Y, Z) coordinate system definition corresponds to the projection of the Earth' North Pole onto the celestial sphere as the Z-axis, and the vernal equinox as the X-axis,at epoch ICRS2000, with the Y-axis completing the right-handed orthonormal coordinate system: $Z = X \times Y$

**Formula & References:**
References:

1. Guide Star Catalogue, Section 1.1 - Dong, Ying Xing, Fei You, Zheng. (2006). *Brightness Independent 4-Star Matching Algorithm for Lost-in-Space 3-Axis Attitude Acquisition.* Tsinghua Science Technology. 11. 543-548. 10.1016/S1007-0214(06)70232-2.

**Input parameters:**

1. **Magnitude_Limit** : (Double) A system parameter, that ascertains the magnitude of the dimmest star we are capable of detecting by our system

**Output:**
Writes st_Guide_Star_Catalogue.csv in `./Star_Matching/Star_Matching_Catalogues/Catalogues` directory

## st_preprocessed_star_catalogue.m

**Code Type:** MATLAB - Script
**Code author:** KT Prajwal Prathiksh
**Created on:** 25/04/2020
**Last modified:** 28/05/2020
**Reviewed by: NOT YET REVIEWED!**
**Description:**
This script uses the Guide Star Catalogue, to generate the Preprocessed Star Catalogue.
**st_Preprocessed_Star_Catalogue.csv :** This Catalogue has been generated specifically for the purpose of Star Matching. It contains the following data fields:

1. **SSP_ID_1** - The SSP-ID of $i^{th}$ star
2. **SSP_ID_2** - The SSP-ID of $j^{th}$ star
3. **AngDst_cos** - The dot product of the Cartesian unit vector corresponding to the $i^{th}$ and $j^{th}$ star $(i \neq j, \forall\, i, j)$
4. **AngDst_deg** - The cos inverse of the corresponding dot product value in degrees

This catalogue has only those pairs of stars whose **AngDst_deg** is $\leq$ ($2\times$ circular Field-of-View) $(= 2 \times 17.89°)$
**Formula & References:**
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**Input parameters:**

1. **FOV_Circular** : (Double) A system parameter, that ascertains the circular Field-of-View of the optic system

**Output:**
Writes st_Preprocessed_Star_Catalogue.csv in `./Star_Matching/Star_Matching_Catalogues/Catalogues` directory