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README - Tracking Mode Algorithm : Preprocessing
Guidance, Navigation and Controls Subsystem

sm_constants_TM.m

Code Type: MATLAB - Script
Code author: Pranjal Gupta
Created on: 10/08/2020
Last modified: 27/09/2020
Reviewed by: NOT YET REVIEWED!
Description: This script generated all the constants required for the Tracking Mode Algorithm and the Star Neighbourhood Table. It saves the Star Neighbourhood Table, the guide star and preprocessed star catalogues and the values of the constants. The constants are as follows:

1. **sm_TM_SNT_R**: (Float) The radius used for generating the Star Neighbourhood Table. Units in *deg*.

Formula & References:
Input parameters:
The input arguments to the function must be written here. The format would

1. **write_csv** : (Boolean) - If true, saves the Star Neighbourhood Table as a CSV file.

Output:

1. Writes constants in './Star_Matching/Tracking_Mode/Preprocessing/Output/sm_constants_TM.mat' directory.

2. Writes the Star Neighbourhood Table in './Star_Matching/Tracking_Mode/Preprocessing/Output/sm_Star_Neigh directory.

sm_TM_SNT_main.m

Code Type: MATLAB - Script
Code author: Pranjal Gupta
Created on: 10/08/2020
Last modified: 27/09/2020
Reviewed by: NOT YET REVIEWED!
Description: This script generates and saves the Star Neighbourhood Table required by the Tracking Mode Algorithm. The first column of the table stores the SSP_IDs from the Guide Star Catalogue, and the remaining columns store the SSP_IDs of the stars in the neighbourhood of the star in the first column.

NOTE : This script should only be run through **sm_constants_TM.m** ! The script will throw an error if run independently.

Formula & References:

Input parameters:

Output:

1. Writes the Star Neighbourhood Table in './Star_Matching/Tracking_Mode/Preprocessing/Output/sm_Star_Neigh directory.

sm_TM_gnrt_SNT.m

Code Type: MATLAB - Function
Code author: Pranjal Gupta
Created on: 10/08/2020
Last modified: 27/09/2020
Reviewed by: NOT YET REVIEWED!
Description: This function generates the Star Neighbourhood Matrix given a Radius value (in either degrees or unit less).
Formula & References: Reference : Recursive Mode Star Identification Algorithms - M.A Samaan, D.Mortari, J.L Junkins (2005). *Star Neighbourhood Table*.

Input parameters:

1. **sm_TM_SNT_R** : (Float) - The radius value used to construct the Star Neighbourhood Table.

2. **is_degree** : (Boolean) - If true, implies that the unit of Radius value is degree.

3. **sm_GD_SC** : ((5060, 4) - Matrix) - The Guide Star Catalogue

4. **sm_PP_SC** : ((381131,4) - Matrix) - The Preprocessed Star Catalogue

Output:

1. **sm_TM_SNT** : ((5060, N) - Matrix) - The Star Neighbourhood Matrix.

sm_TM_SNT_neighbours.m

Code Type: MATLAB - Function
Code author: Pranjal Gupta
Created on: 10/08/2020
Last modified: 27/09/2020
Reviewed by: NOT YET REVIEWED!
Description: This function finds the neighbour stars (and their SSP_IDs) around a given star (with SSP_ID) in a radius of a given radius value (sm_TM_SNT_R).
Formula & References:

Input parameters:

1. **sm_star_ID** : (Integer) - The SSP_ID of the star around which neighbours are found.

2. **sm_PP_SC** : ((381131,4) - Matrix) - The Preprocessed Star Catalogue

3. **sm_TM_SNT_R** : (Float) - The radius value used to find neighbours stars around a given star.

4. **is_degree** : (Boolean) - If true, implies that the unit of Radius value is degree.

Output:

1. **sm_TM_SNT_star_ID** : ((1, N) - Vector) - The Star Neighbourhood Row vector corresponding to the given star sm_star_ID.

sm_TM_SNT_padding.m

Code Type: MATLAB - Function
Code author: Pranjal Gupta
Created on: 10/08/2020
Last modified: 27/09/2020
Reviewed by: NOT YET REVIEWED!
Description: This function concatenates a given Star Neighbourhood Row vector with the (incomplete) Star Neighbourhood Matrix and adds zero padding to either the Star Neighbourhood Row vector or the Star Neighbourhood Matrix if required, to generate the (complete) Star Neighbourhood Matrix.
Formula & References:
Input parameters:

1. **sm_TM_SNT_star_ID** : ((1,N) - Vector) - The Star Neighbourhood Row vector corresponding to a single star and a given radius.

2. **sm_TM_SNT** : ((M,N) - Matrix) - The (incomplete) Star Neighbourhood Matrix

Output:

1. **sm_TM_SNT** : ((5060, N) - Matrix) - The (complete) Star Neighbourhood Matrix