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README - sm_N_star_4_star.c

Guidance, Navigation and Controls Subsystem

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main()

Code author: Ankur Verma
Created on: DD/MM/YYYY
Last modified: 29/01/2022
Reviwed by: Name of the person who has reviewed the code
Description:
This is the driver function which calls other functions in the code such as function for circulating the unidentified star table etc
Formula & References:

- Values of k_vector catalogue hyperparameters taken from here

Input parameters: TO BE WRITTEN
The input arguments to the function must be written here. The format would

1. **variable name** : (Datatype) - Definition. *Units*
2. **focal_length** : (Float) - Input focal length of the optic system. *Meters*

Output:
The main function prints the matched star table.

sm_gnrt_3D_vec()

Code author: Ankur Verma
Created on: DD/MM/YYYY
Last modified: 29/01/2022
Reviwed by: Name of the person who has reviewed the code
Description:
This function generates the 3D vectors from the input centroids which are stored in a sorted manner according to Euclidean distance in the UIS array
Formula & References:
The formula for calculating the 3D vectors was used from the **Erlank** document (Appendix B, Page 108)

Input parameters:

1. **sm_3D_vecs** : (double) - This will store the 3D vectors generated. *Unitless*
2. **UIS** : (double) - contains the input centroids in sorted order from which the 3D vectors will be generated. *Meters*
3. **foc** : (double) - Input focal length of the optic system. *Meters*
4. **N_i** : (int) - Number of input stars *Unitless*

Output:
The function modifies the sm_3D_vecs array which was passed by address into the function

sm_4_star()

Code author: Ankur Verma
Created on: DD/MM/YYYY
Last modified: 29/01/2022
Reviwed by: Name of the person who has reviewed the code
Description:
This is the soul of the algorithm; it does the whole task of matching the stars with appropriate star IDs and stores the matched stars in the sm_IS array
Formula & References:
This function was implemented with the help of the **Dong, Xing, You - 2006** document
Input parameters:

1. **four_stars** : (double) - It stores the 3D vectors of the four stars extracted from the sm_3D_vecs table *Meters*
2. **sm_3D_vecs** : (double) - contains 3D vectors of the unidentified stars *Meters*
3. **sm_IS** : (int) - Array for storing the matched stars *Unitless*
4. **sm_K_vec_arr** : (double) - This is the reference K_vector catalogue *Unitless*
5. **N_match** : (int) - This variable, which is passed y address, is used to count the number of stars matched in one iteration of the 4 star matching *Unitless*
6. **N_i** : (int) - Number of input stars *Unitless*
7. **N_gc** : (int) - Total number of stars in Guide Star catalogue *Unitless*
8. **delta** : (double) - Hyperparameter used in the K vector calculations *radians*
9. **q** : (double) - Hyperparameter used in the K vector calculations *Unitless*
10. **m** : (double) - Hyperparameter used in the K vector calculations *Unitless*

Output:
The above function modifies the sm_3D_vecs array which was passed by address into the function

sm_4_star_circulate()

Code author: Ankur Verma
Created on: DD/MM/YYYY
Last modified: 29/01/2022
Reviwed by: Name of the person who has reviewed the code
Description:
It circulates the unidentified star table if none of the stars were matched in the last 4 star matching iteration.
Formula & References:
None.
Input parameters:

1. **sm_3D_vecs** : (double) - contains 3D vectors of the unidentified stars *Meters*
2. **N_circ** : (int) - This variable stores the number of times the sm_3D_vecs array has been circulated *Unitless*
3. **N_i** : (int) - Number of input stars *Unitless*

Output:
The output is the sm_3D_vecs array circulated by 1 position.