



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

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



README - Star Catalogue Pre-Processing

Guidance, Navigation and Controls Subsystem

cat_preprocessing.m

Code Type: MATLAB - Script

Code author: KT Prajwal Prathiksh

Created on: 25/04/2020

Last modified: -/-/-

Reviewed by: NOT YET REVIEWED!

Description:

This script converts the SKY2000 Catalogue, into the Master-Star Catalogue, and the SSP-Star Catalogue.

The following data fields of the SKY2000 Catalogue are used:

1. SKY2000 - Identifier based on J2000 position
2. RAJ2000 - Right ascension (J2000) hours - ("h:m:s")
3. DEJ2000 - Declination degrees (J2000) - ("d:m:s")
4. pmRA - Proper motion in RA (J2000) - second per year
5. pmDE - Proper motion in Dec (J2000) - second of arc per year
6. Vmag - Photometric magnitude - (Optical V band between 500 and 600 nm)
7. B-V - Color index or magnitude difference - (Optical V band between 500 and 600 nm; Optical B band between 400 and 500 nm)

The catalogues, which are classified as follows, is created by this script.

1. **SKY2000.csv** : Comprises of all the aforementioned data fields (unaltered), downloaded from Vizier.
2. **Master_Star_Catalogue.csv** : Same as *SKY2000.csv* except for the following changes:
 - (a) **RAJ2000** is split into **RA_h**, **RA_m**, and **RA_s**
 - (b) **DEJ2000** is split into **DE_d**, **DE_m** and **DE_s**
3. **SSP_Star_Catalogue.csv** : Same as *Master_Star_Catalogue.csv*, which has been sorted based on 'Vmag' field, in addition to the following changes:

- (a) **RA_h**, **RA_m**, and **RA_s** is merged to create **RA** field - degrees
- (b) **DE_d**, **DE_m**, and **DE_s** is merged to create **DE** field - degrees
- (c) **SSP_ID** - Fictitious identifier created for stars, which is essentially the position of the stars after being sorted according to '*Vmag*'

Formula & References:

References:

1. SKY2000 Catalogue - <http://tdc-www.harvard.edu/software/catalogs/sky2k.html>
2. SKY2000.csv, obtained from - <http://vizier.u-strasbg.fr/viz-bin/VizieR-3?-source=V/145>
3. Detailed README of SKY200 - <http://data.bao.ac.cn/ftp/cats/5/109/sky2kv4.pdf>

Input parameters:

1. **skip**: (Integer) Skips the first n rows of SKY2000 Catalogue, to avoid header rows.

Output:

Writes Master_Star_Catalogue.csv, and SSP_Star_Catalogue.csv in `./Catalogue/SKY2000/Catalogues` directory

DMS2degrees.m

Code Type: MATLAB - Function **Code author:** KT Prajwal Prathiksh

Created on: 25/04/2020

Last modified: -/-/—

Reviewed by: NOT YET REVIEWED!

Description:

This function converts the angle from D:M:S to degrees format

Formula & References:

Conversion Formula - <https://in.mathworks.com/help/map/ref/dms2degrees.html>

Formula: For input $[DMS]$, output is:

$$deg = SGN \times \left(|D| + \frac{|M|}{60} + \frac{|S|}{3600} \right),$$

where SGN is 1 if $D \geq 0$, and -1 if $D < 0$

Input parameters:

1. **D** : (Float) - Degree component
2. **M** : (Float) - Minute component
3. **S** : (Float) - Second component

Output:

1. **deg**: (Float) - Angle in degrees

HMS2degrees.m

Code Type: MATLAB - Function **Code author:** KT Prajwal Prathiksh

Created on: 25/04/2020

Last modified: -/-/—

Reviewed by: NOT YET REVIEWED!

Description:

This function converts the angle from H:M:S to degrees format

Formula & References:

Formula: For input $[HMS]$, output is:

$$T = H \times 3600 + M \times 60 + S$$

$$360^\circ = 24hr = 24 \times 3600s$$

$$deg = \frac{T \times 360^\circ}{24 \times 3600s}$$

Input parameters:

1. **H** : (Float) - Hour component
2. **M** : (Float) - Minute component
3. **S** : (Float) - Second component

Output:

1. **deg**: (Float) - Angle in degrees