Constellation Plotter

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Create a program to generate an image of a given constellation using accurate data which can be found in the ‘Yale Bright Star Catalog’ (http://tdc-www.harvard.edu/catalogs/bsc5.html).

1. Firstly, the program should prompt the user to enter a constellation, this can either be the full name of the constellation or its three-letter abbreviated equivalent. It is recommended validate the input to ensure the entered constellation exists.

2. Then using a constellations three-letter abbreviation read the star catalogue file and locate all the stars belonging to it, extracting the stars name, position, and magnitude. Ideally, a star object would work best for this.

3. Once all stars belonging to the input constellation have been collected from the catalogue, and with them all their specifics, convert the stars Equatorial Coordinates (right ascension α, and declination δ) to Cartesian Coordinates (x, y) - using the Orthographic Projection about a central point provided below – which can be noted as (α_0 , δ_0):

$$x = \cos(\delta)\sin(\Delta\alpha)$$
$$y = \sin(\delta)\cos(\delta_0) - \cos(\delta)\cos(\Delta\alpha)\sin(\delta_0)$$

where, $\Delta\alpha = \alpha - \alpha_0$, taking α_0 and δ_0 to be the mean of all (α, δ) values for the stars in the specified constellation.

4. Last of all, plot each individual star on a black background with their brightness varying according to their magnitude (V), building the constellation.

Bonus: While plotting the stars, very each one’s colour by its colour index which can be found within the catalogue and can be extracted at the same moment the stars other specifics are collected.