Project Reading

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Contents

This file contains the important and relevant things from the reading resources for the project. It also contains doubts which are unresolved. Last edited: *[2025-05-10 Sat]*

1 Converging point method

The method is beautifully explained in this website: `https://physics.weber.edu/palen/clearinghouse/labs/hyades/disthyad.html`.

2 Reading Paper:

2.1 4. Membership determination:

Using Gaia DR2, data proper-motion is plotted as Vector Point Diagram (VPD). And the cluster members are assigned by chosing stars which form a dense cluster of points in VPD.

> The centre of the circular region confining the probable cluster members was determined by maximum density method in the proper motion plane which is found to lie at (x , y) (cos,) (0.13, 3.37) mas yr1 . The radius of the circle was derived by plotting the stellar density as a function of radial distance in the proper motion plane as illustrated in Fig. 2. We fit the

stellar density profile with a function similar to the one used to characterize the radial profiles of star clusters in the galaxies.

2.1.1 Membership probability

$$P_\mu(i) = \frac{n_c \cdot \phi_c^v(i)}{n_c \cdot \phi_c^v(i) + n_f \cdot \phi_f^v(i)}$$

$$\phi_c^v(i) = \frac{1}{2\pi\sqrt{(\sigma_{xc}^2 + \epsilon_{xi}^2)(\sigma_{yc}^2 + \epsilon_{yi}^2)}} \exp\left\{-\frac{1}{2}\left[\frac{(\mu_{xi} - \mu_{xc})^2}{\sigma_{xc}^2 + \epsilon_{xi}^2} + \frac{(\mu_{yi} - \mu_{yc})^2}{\sigma_{yc}^2 + \epsilon_{yi}^2}\right]\right\}$$

$$\phi_f^v(i) = \frac{1}{2\pi\sqrt{1-\gamma^2}\sqrt{(\sigma_{xf}^2 + \epsilon_{xi}^2)(\sigma_{yf}^2 + \epsilon_{yi}^2)}} \exp\left\{-\frac{1}{2(1-\gamma^2)}\left[\frac{(\mu_{xi} - \mu_{xf})^2}{\sigma_{xf}^2 + \epsilon_{xi}^2} - \frac{2\gamma(\mu_{xi} - \mu_{xf})(\mu_{y}}{\sqrt{(\sigma_{xf}^2 + \epsilon_{xi}^2)(\sigma_{y}^2}}\right.\right.$$

$$\gamma = \frac{(\mu_{xi} - \mu_{xf})(\mu_{yi} - \mu_{yf})}{\sigma_{xf}\sigma_{yf}}$$