Evolution of Open Clusters

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December 3, 2019

1   Introduction

An **open cluster** is a group of up to a few thousand stars that were formed from the same giant molecular cloud and have roughly the same age. The most important characteristic of the open clusters is that they are loosely bound by mutual gravitational attraction and will gradually lose their stellar content. Generally, their evolution can be split into three phases: (i) the first lasts for $\sim$ 3 Myr, during which the cluster in embedded in its progenitor molecular cloud and stars are still forming; (ii) then the clusters experience the expulsion of the residual star-forming gas; and finally, (iii) the long term evolutionary phase dominated by both internal and external dynamical processes. Such physcial properties and evolutionary characteristics make the open cluster widely used to trace the histroy of the Galactic disk and stellar evolution.

Our project aims to explore the evolution of the open cluster through statistics and analysis of the cluster samples based on the data of Gaia DR2. So far, more than 3,000 open clusters have been discovered within the Milky Way Galaxy and many more are thought to exist. Since their population may cover a wide range of age and some physcical properties, we can investigate the relation between the mass, radius or velocity dispersion and age to trace the evolution of these properties and find out how the clusters dissipate and lose stellar mass and maybe some other interesting things.

2   Methods and Data

We are going to use the astrometric and photometric data from Gaia DR2 and 2MASS catalogue respectively and the open cluster catalogue by Kharchenko et al(2013). We plan to establish the list of members and relative parameters of about 3,000 open clusters and to achieve that, we may use the Topcat program and some simple pipelines to download the data and indentify the members with certain criterions. We will examine our indentifying process by reproducing some previous results(Tadross et al. 2018, Cantat-Gaudin et al. 2018). After obtaining the stellar data of all clusters, we will perform statistical count and analysis of the physical properties like age, mass, radius and velocity dispersion to investigate the evolution of open clusters.

3   References

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