To Create H-R Diagram and Initial Mass Function of Open Cluster in Milky Way Galaxy

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Abstract

This research studies about the scatter of different mass star in each open cluster. In our Milky Way Galaxy have many open clusters but in this research we study in 15 clusters. There are M7,M18,M21,M25,M36,M37,M41,M67,M103,NGC188,NGC225,NGC869,NGC114,NGC5460 and NGC6633. Study by create H-R Diagram of each open cluster and choose only main sequence star of Diagram to analyze to Find Initial Mass Function. Create histogram graph by using Mass star to separate amount star in each open cluster and fit the tendency line of star scatter in term of linear equation line. And then change linear equation in to form of Power law to observe the relation between Mass star and amount star in each open cluster by using database of cluster from DS9 Program.

Keywords: Initial Mass Function, Power Law, Open Cluster

Introduction

Universe create sphere together. Each star lives together by their gravity as well as cluster. One type of cluster is open cluster, it will be found in Spiral Galaxy and Irregular Galaxy. Each star in open cluster has different mass in Milky Way Galaxy. Researcher creates H-R Diagram of open Cluster in Milky Way Galaxy to find relation of different mass and amount of star in format of Initial Mass Function. Benefit from this studied will let us to know H-R Diagram of open cluster in Milky Way Galaxy and analyze Initial Mass Function ,how different mass in each cluster scatter in term of Power law.

Methods

1. **To create H-R Diagram**

   1.1 Lit name of Open clusters in Milky Way Galaxy that interesting 15 clusters.

   1.2 Download Images of cluster from Image server (SAO DSS) in DS9 program and take Flux B and Flux V of every star in each cluster and Find Flux B-V by loading Flux star from Catalog star in Database Simbad.

   1.3 Create H-R Diagram by create scatter graph. The X core is Flux B-V and The Y core is Flux V.

2. **To analyze Initial Mass Function**

   2.1 Choose only main sequence star from H-R Diagram.

   2.2 Use Stellar Classification table to change Flux B-V of each star in cluster to M_{star}/M_{sun}.

   2.3 Divide period of M_{star}/M_{su} of all clusters.

   2.4 Count amount star in each period of M_{star}/M_{su}

   2.5 Plot log Histogram graph between mass star and amount star.

   2.6 Fit the tendency line from Histogram graph and

   change the equation to be term of Power Law.
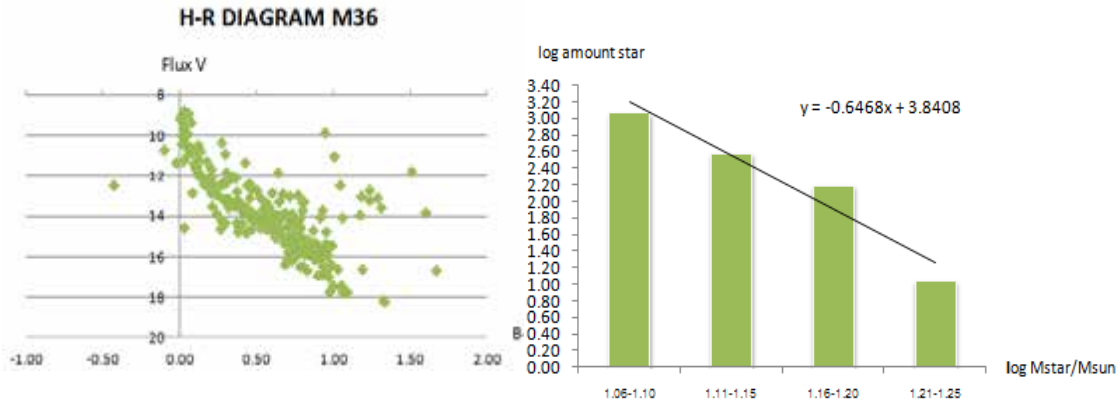
H-R DIAGRAM M36

Result and Discussion

From the study H-R Diagram of open cluster, almost star live in main sequence. But the shape of scatter will different by different Flux star value of each star in cluster.

From the study about Initial Mass Function in term of power law. We have got Function to explain the scatter of different mass star in each open cluster in the following table.

Open cluster	IMF
M7	$y = 67.6x^{-0.24}$
M8	$y = 1.54 \times 10^2 x^{-0.5}$
M21	$y = 4.57 \times 10^2 x^{-0.55}$
M25	$y = 1.44 \times 10^2 x^{-0.34}$
M36	$y = 1.2 \times 10^2 x^{-0.91}$
M37	$y = 1.04 \times 10^2 x^{-0.1}$
M41	$y = 25x^{-0.1}$
M67	$y = 100x^{-0.21}$

Open cluster	IMF
M103	$y = 2.51 \times 10^2 x^{-0.72}$
NGC188	$y = 1.86 \times 10^2 x^{-0.11}$
NGC225	$y = 1.94 \times 10^2 x^{-0.54}$
NGC869	$y = 2.57 \times 10^2 x^{-0.54}$
NGC3114	$y = 51x^{-0.16}$
NGC5460	$y = 3.63 \times 10^2 x^{-0.57}$
NGC6633	$y = 1.99 \times 10^2 x^{-0.53}$

Function to explain the scatter of star that have different mass star conclude all 15 open clusters

is $y = 6.93 \times 10^3 x^{-0.6468}$.

From the study we found that, when we create histogram graph, the amount of less massive star not according to the theory. The less massive star have amount less than the massive star that because of the little bit flux of less massive star. When the lass massive star have little bit flux it effect to when we get the picture that not all of less massive star will attach in the picture. So in this study we delete the less period of mass star out for the precision of the result.

Conclusion

From the study, H-R Diagram of open clusters have almost star in main sequence. But the shape of diagram will varies according to the value of Flux of each star in clusters. The Initial Mass Function in term of power law has function to describe the scatter of different mass star in all of 15 open clusters that is $y = 6.93 \times 10^3 x^{-0.6468}$. The number to show the relationship between the amount star and mass star in 15 open clusters is 0.6468.

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