**The Formation of Binary Star Cluster in Our Galaxy from Fractal Distribution**

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MiStIX survey showed that most of embedded young star clusters (a few Myr) have clumpy structures. Observations and statistical studies also concluded that there are binary star clusters and multiple systems in our Galaxy and Magellanic Clouds. Their typical ages are less than 25 Myr. Some mechanisms are proposed to explain the formation of binary star cluster. One of those is simultaneous formation which yields the primordial binary cluster. In this work, we made N-body simulations to investigate the formation of primordial binary cluster in our Galaxy from fractal distribution. The identifications of binary star clusters at time 20 Myr and 50 Myr were statistically done using K-Means clustering and calculation of total energy.

The results showed that there are merger processes at time less than 6 Myr which describe the highly mass segregation at the early time of star cluster formation. After that process, many binary star clusters and multiple systems are formed at time less than 20 Myr for the clumpier star clusters. At 20 Myr, we get binary fraction in range of 40% - 60% for clumpier star clusters. This fraction becomes less than 40% at time 50 Myr due to the merger processes during 20 Myr to 50 Myr. We conclude that the fractal distribution of stars in a cluster is significant in describing the formation of binary star cluster at early time of formation.

Keywords: Star cluster: binary star cluster, fractal distribution, N-body simulation.