Photometric and Kinematic Studies of Open Star Clusters

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The shape of the initial mass function (IMF) is an important parameter to understand the fragmentation of molecular clouds and therefore the formation and development of stellar systems. Work on star clusters plays an important role in this field, as age, metalicity, and distance of all cluster stars can be assumed to be equal. Most of the previous studies indicate that the IMF of a star cluster can be described by power laws with different exponents within different mass intervals.

Knowledge of membership is essential to derive the IMF especially of open star clusters, as the contamination of the data with field stars is a major problem. Two methods for membership determination are in use nowadays:

Proper motions: All cluster stars can be expected to move in the same way, whereas the field stars show a more widely spread and differently centred proper motion distribution. For each star a membership probability can be specified. To obtain a sufficient epoch difference, old as well as recent photographic plates are needed to measure proper motions, so that this method is limited by the comparably poor sensitivity of the old plates.

Statistical subtraction: Assuming (almost) identical field star distributions in the cluster region itself and the surrounding area, the distribution of the field stars can be subtracted from the one of the (contaminated) cluster area. This makes sense for fainter stars but with the bright stars one deals with statistics of small numbers.

We obtained CCD photometry and proper motions for several open star clusters. We will discuss the IMF of these objects determined on the basis of a combination of the two methods for membership determination.