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A highly efficient measure of mass segregation in star clusters

C. Olczak, R. Spurzem, Th. Henning

(Submitted on 10 Jul 2011)

Investigations of mass segregation are of vital interest for the understanding of the formation and dynamical evolution of stellar systems on a wide range of spatial scales. Our method is based on the minimum spanning tree (MST) that serves as a geometry-independent measure of concentration. Compared to previous such approaches we obtain a significant refinement by using the geometrical mean as an intermediate-pass. It allows the detection of mass segregation with much higher confidence and for much lower degrees of mass segregation than other approaches. The method shows in particular very clear signatures even when applied to small subsets of the entire population. We confirm with high significance strong mass segregation of the five most massive stars in the Orion Nebula Cluster (ONC). Our method is the most sensitive general measure of mass segregation so far and provides robust results for both data from simulations and observations. As such it is ideally suited for tracking mass segregation in young star clusters and to investigate the long standing paradigm of primordial mass segregation by comparison of simulations and observations.

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