Determining the Properties of Star Clusters

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We hypothesized that the Hertzsprung-Russell (H-R) diagrams for various star clusters would be different and that we could use them to determine properties of star clusters such as age, composition, and distance from Earth. To test this hypothesis, we took images of four distinct star clusters using the astrograph at the Drake Municipal Observatory. By analyzing these images with the Image Reduction and Analysis Facility (IRAF) software, we recorded the apparent magnitudes of several stars in each cluster, then graphed the visual magnitude against the difference in the blue and visual magnitudes to produce an H-R diagram. Using the H-R diagram, we were able to determine the composition of each cluster based the locations of the stars on the diagram. This, in turn, allowed us to determine the age qualitatively. Then, utilizing an equation relating distances to magnitudes, we were able to use the shifts in the visual magnitude and a known distance to a reference star cluster to determine the distances to the other star clusters quantitatively. With only our star cluster images, we were able to determine several important properties of the star clusters, and the techniques that we employed could be extended to the analysis of other astronomical objects, including galaxies.