

A Procedure to Improve Low-Quality Distance Measurements for Galaxy Group Identification

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In space, galaxies often exist in groups. For example, our own Milky Way galaxy exists in the Local Group, containing two giant galaxies and dozens of dwarf galaxies. Groups accelerate galaxy evolution as their members interact with each other and the gas and dark matter that fills the group environment. Galaxies occupy a three dimensional space yet we see them on a two dimensional sky, so we must measure their distance along the line of sight. We use the fact that as the universe expands, light is stretched on its way to us. The distance over which the light travels can be measured from this stretch, which is called a redshift. A redshift can be measured either via spectroscopy or via imaging (“photometry”), the latter being less accurate yet easier to obtain for distant galaxies. We see these galaxies in the cosmic past as their light has traveled through space for so long, giving us a glimpse into the early stages of galaxy evolution. Group finding for distant-universe galaxies has been difficult due to the high uncertainties often associated with photometric redshifts. By calibrating photometric redshifts using nearby-universe surveys that have high quality spectroscopic redshifts for comparison, we develop a procedure to apply to distant-universe surveys lacking high quality redshifts. Our procedure will be applied to group finding for the LADUMA survey, a next generation galaxy survey that is providing our first inventory of gas in galaxies when the universe was a third of its current age.