Optimizing Future Surveys on Galaxy Evolution

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We present new results on the optimization of broad-band photometry observations designed to analyze the galaxy physical properties at different redshits. We have computed the uncertainties expected in the derivation of the star formation history, age, metallicity, and reddening of galaxies when comparing broad-band photometry with the predictions of evolutionary synthesis models.

The synthetic colors for a large sample (10000) of artificial galaxies have been obtained assuming different star formation histories, ages, metallicities, reddening values, and redshifts. The colors derived have been perturbed adopting different observing errors and compared back with the evolutionary synthesis models grouped in different sets. The comparison has been performed using a combination of Monte Carlo simulations, a Maximum Likelihood Estimator and Principal Component Analysis.

After comparing the input and derived output values we have been able to compute the uncertainties and degeneracies between the galaxy physical properties as function of (1) the set of observables available, (2) the observing errors, and (3) the galaxy properties themselves. In this work we have considered different set of observables, some of them including the standard Johnson/Cousins (UBVRI) and Sloan Digital Sky Survey (SDSS) bands in the optical, the 2 Micron All Sky Survey (2MASS) bands in the near-infrared, and the Galaxy Evolution Explorer (GALEX) bands in the UV, and three different redshifts, z=0.0, 0.7, and 1.4. This study is intended to represent a fundamental tool for the design of future projects on galaxy evolution, allowing to estimate the optimal band-pass combinations and signal-to-noise ratios required for a given scientific objective.

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