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STRUCTURE OF BRIGHT 2MASS GALAXIES: 2D FITS TO THE K_S-BAND SURFACE BRIGHTNESS PROFILES

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The unprecedented sky coverage and photometric uniformity of 2MASS provides a rich resource for obtaining a detailed understanding of the galaxies populating our local ($z<$ 0.1) Universe. A full characterization of the physical structure of nearby galaxies is essential for theoretical and observational studies of galaxy evolution and structure formation. We have begun a quantified description of the internal structure and morphology of 10,000 bright ($10 \leq K_s \leq 11$) 2MASS galaxies through multi-component model fits to the 2D surface brightness profiles.

The current understanding of galaxy properties has been strongly biased by the small fraction of hot, young stars that dominate observations in optical wavelength surveys. Our goal is a comprehensive survey of local galaxy structure at near-infrared (NIR) wavelengths where the light best reflects the total stellar mass and the effects of dust are minimized. The 2MASS Extended Source Catalog contains over 3×10^5 galaxies at $K_s = 13.1$ (10σ), with 98% reliability and 90% completeness (Jarrett et al. 2000, AJ, 119, 2498). Outside the Galactic plane there are $\sim 10^4$ 2MASS galaxies of sufficient brightness ($10 \leq K_s \leq 11$) and size ($\sim 1'$ isophotal diameters) to be readily fit using GIM2D (Simard et al. 2002, astro-ph/0205025).

We have selected GIM2D because it is well-tested, it accounts for seeing through PSF convolution, and it provides a variety of model profiles including an $r^{1/n}$ bulge plus exponential disk. For each galaxy, GIM2D produces model and residual images (Fig. 1), plus quantitative measures of internal structure (sizes, ellipticities, surface brightnesses) and morphology (residual structure asymmetries, light concentration, relative bulge and disk light contribution, bar strength).

We have tested the reliability of our fitting method through a Monte Carlo procedure using a preliminary subset of 77 galaxies (39 E's and 38 S's) drawn randomly from RC3 in the range $7 < K_S <$ 12.5. The background sky uncertainty is the largest

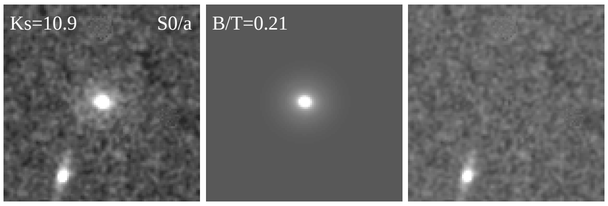

Fig. 1. Example 2MASS K_s-band galaxy image (left), best-fit GIM2D $r^{1/4}$ bulge plus exponential disk model (middle), and residual (model-subtracted) image (right).

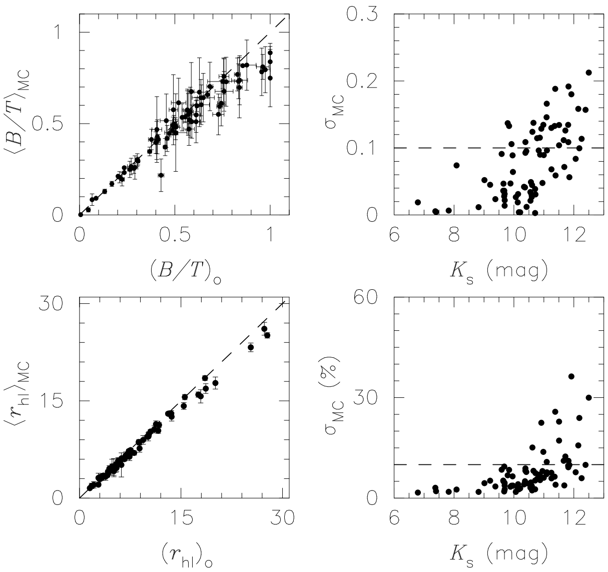

Fig. 2. Bulge-to-total ratio B/T and half-light radius $r_{\rm hl}$ (asecs) error analysis for 77 galaxies. Left: parameter value from GIM2D fits to 2MASS galaxy image plotted against mean from 25 Monte Carlo realizations with different random backgrounds. Right: standard deviation of recovered distribution as a function of magnitude.

source of error in parameters derived from profile fitting. From the best-fit model of each galaxy, we constructed 25 realizations, artificially placed them in different regions of blank 2MASS sky, and fit these to obtain the distribution of GIM2D derived parameter values. For galaxies brighter than $K_s = 11$, the typical parameter errors due to sky are $\leq 10\%$ (Fig. 2). We will apply this procedure to *all* profile fits in our study, providing the community a reliable catalog of structural parameters with formal errors.

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