DES simulation code and JDEM imaging simulation

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Introduction

The document provides a brief summary of the DES simulation software and data. See also the slides for the simulations talk at the June 2010 DES review. Huan Lin, Nikolay Kurpatkin, and Chris Stoughton provided most of the information in private conversations in the week of August 9, 2010.

Major elements of DES Simulation code

Cosmology simulation

The DES simulations start with a dark matter distribution generated using n-body simulations. The project currently uses the "Carmen" simulation from the LasDamas (McBride et al.) project.

Although this step will eventually become important for a full JDEM simulation, it is not relevant for the current study.

Initial galaxy catalog creation (addgals)

Addgals (Busha & Wechsler) generates a catalog of galaxies with realistic positions, redshifts, and magnitudes in each band is created according to the dark matter distribution. It appears to be possible to generate spectra as well as colors, although the DES simulations do not use this feature presently.

Although this step will eventually become important for a full JDEM simulation, it is not relevant for the current study.

Addition of morphological information to the galaxy catalog

This is done using code by Huan Lin, which matches each galaxy in the input catalog (generated by addgals) to its nearest neighbor (in color space) in the COSMOS catalog, and adds the morphological parameters (shapelet coefficients) to the catalog. Note that this means that each galaxy in the generated catalog is represented by the morphology of one galaxy in the COSMOS catalog. Also, the same morphology is assigned in all filters.

The input catalog was provided to DES by Richard Massey and Molly Peeples. Both the DES and SNAP catalogs were shaplet rank 15 catalogs based on ACS data from COSMOS, but it is currently unknown whether they both used the same catalog. The SNAPSim catalog was generated using Chris Stoughton's java code, itself a translation of Richard Massey's IDL code.

COSMOS only has ACS data in one filter: f814w. A spatially variable SED will require a different data set. Multi-filter data sets probably do not have the right resolution at the right redshift range; we need to prioritize/compromize, or use a different appreach.

Create images based on the catalog

This code, DESsim, was started by Chris Stoughton and eventually taken over by Nikolay Kuropatkin. The original code reused a lot of SNAPSim, and has evolved considerably since then. Most features of the instrument are configurable, and Nikolay tells me that configuring it for something like JDEM should be straitforward.