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A Large Scale Structure Void Identifier for Galaxy Surveys Based on the β-Skeleton Graph Method

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ABSTRACT

We are living the golden age of cosmology. Since the three past decades we are able do precise measurements of cosmological parameters by observational methods. Besides, computational astrophysics has won its own place as the tool to probe theoretical models and compare them with observations.

The standard cosmological model (ΛCDM) explains the observed Large Scale Structure (LSS) of galaxies by introducing dark matter and dark energy as the Universe components along with baryonic matter. The LSS has been reproduced in Gravitational N-bodies simulations such as Millenium and Bolshoi.

One of the LSS elements are the voids; irregular huge volumes at h^{-1}Mpc scales, where the matter density is below the 20% of the Universe average density and sparse non-massive galaxies. Voids are key elements to study Dark Energy and give important hints about other cosmological parameters. Statistics about voids population such as mass, shape and orientation encloses that information.

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The β-Skeleton method has been widely used on image processing, recognition and machine learnig applications, has been introduced recently in LSS analysis. It is a fast tool identifiying LSS filaments, and promises to be a robust tool to make statistical analysis as the two point correlation function and the Alcock-Pazcynski test, booth methods are currently used in cosmology.

The objetive of this work is to develope a LSS void identifier based on the β-Skeleton method in order to improve the statistical analysis of voids in galaxy surveys and the constriction of cosmological parameters.

Keywords: Large Scale Structure, cosmology, voids, computational astrophysics

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