U06b Quantification of the Large-scale Structure in the Local Universe Using Minimal Spanning Tree

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Minimal Spanning Tree (MST) is a uniquely defined measure of the filamentary connectedness of a point pattern. This is the path of straightline connections (edges) between points which has minimum total length, visits each point only once, and creates no closed circuits. This construction was first applied to galaxy clustering problems by Barrow et al. (1985), and turned out to have a fundamental significance in the construction of particular generalized measures of dimensionality which describe the information of various clustered sets (Martínez et al. 1990). Recently in particular, the dependence of statistical quantities defined with MST on various cosmological parameter sets has been extensively investigated (Ueda & Itoh 1997). However, the samples used in previous attempts were not adequately controlled in order to compare with the numerical results.

We tried to quantify the global topology of the Large-scale structure in the nearby universe and derived the basic statistical quantities using MST, by constructing the volume-limited sample from *Center for Astrophysics Redshift Catalog (ZCAT)*. Our sample is complete to $\log L_B[L_\odot] = 9.12$, corresponding to $M_B = -17.32 + 5\log h$ (slightly brighter than typical dwarfs). We properly corrected the extinction of Our Galaxy which is considerably large in the low-Galactic latitude region in B-band, and perfomed K-correction. The resultant data depth is $< 5000\ \mathrm{km\,s^{-1}}$ ($50h^{-1}$ Mpc), deep enough to explore the present properties of the Large-scale Structures. Using this database, we derived the edge-length distribution and other MST-related statistics, and estimated the typical scale of the filamentary structures with various techniques developed by previous studies. Added to this, we show the MST representation of the global shape of the distribution of galaxies.