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3-D Voronoi's Tessellation as a Tool for Identifying Galaxy Groups

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Abstract. 3-D Voronoi's tessellation method has been applied for identifying groups of galaxies in the structure of the Local Supercluster and evaluation of its properties.

Keywords. Local Supercluster, Voronoi tessellation, galaxy groups

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The studied catalogue of the Local Supercluster (LS) compiling from LEDA consists of more then 7000 galaxies with radial velocities up to 3100 km/s was compiled on the base of Database (Makarov & Karachentsev 2000). The catalogue is essentially non-homogeneous due to selection effect as concerns with a weak end of the luminosity function. To avoid this selection effect, we proposed to over scale up distances in such an "artificial" way that the concentration of galaxies with increase of the distance was varying as a power-behaved function with the same exponent β as for the full homogeneous catalogue.

After this procedure we applied 3-D Voronoi's tessellation for identifying galaxy groups with different population (from two to more then 200 components in each group). Voronoi's tessellation is a geometrical method based only on galaxy positions, which allows detaching over regions of galaxies in comparison with the background (Vavilova & Melnik 2005). Various parameters of clustering were taking into account: α (0.01 %, 0.1 %, 1 %) as the percent of galaxies, which have the relative volume of a Voronoi's cell smaller then a critical one x_{lim} for the random distribution (Kiang 1966); $\beta = 0$, which fits to the random galaxy distribution; $\beta = 0.7$, which fitting is close to the pancake galaxy distribution.

Note that for the selected parameters α (0.01 %, 0.1 %, 1 %) in case of a real LS galaxy distribution a part of clustered galaxies is 36 %, 47 %, 58 %, respectively. It was revealed that Voronoi's tessellation method depends weakly on α-parameter, and the number of galaxies in the rich structures is growing rather then in the poor structures with increase of β-parameter (Melnyk, Elyiv & Vavilova 2006).

We conclude that 3-D Voronoi's tessellation is a useful tool for identifying galaxy groups and evaluation of its properties. It could be modified by gravitational parameter introducing.

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