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How to disentangle the Cosmic Web?[1] SERGEI SHANDARIN, MIKHAIL MEDVEDEV, Univ of Kansas — The Cosmic Web is a complicated highly-entangled geometrical object formed from remarkably simple – Gaussian – initial conditions. The full complexity of the Web can be fully appreciated in the six-dimensional phase space only, which study is, however, impractical due to numerous reasons. Instead, we suggest to use Lagrangian submanifold, i.e., the mapping $x = x(q)$, where x and q are three dimensional vectors representing Eulerian and Lagrangian coordinates. Being fully equivalent in dynamical sense to the phase space, it has the advantage of being a single valued and also metric space. In addition, we propose a new computational paradigm for the analysis of substructure of the Cosmic Web in cosmological cold dark matter (CDM) simulations. We introduce a new data-field – the flip-flop field – which carries wealth of information about the history and dynamics of the structure formation in the universe. The flip-flop (FF) field is an ordered data set in Lagrangian space representing the number of sign reversals of an elementary volume of each collisionless fluid element represented by a computational particle in a N-body simulation. This FF-field is effectively a multi-stream counter of each substructure element of the Cosmic Web. We demonstrate that the very rich subst

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