On the Theory of Lures with Dynamical Action on Compact Topological Manifolds and Ordinary Hyperreal Fractal Strings

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In this project, we provide a new notion of a topological homeomorphism by defining such in terms of a dynamical system. That is, we want to construct a time-dependent quasi-attractor and a time-dependent basin of attraction that respects the homotopy equivalence class of some compact topological manifold by acting on some portion of the manifolds boundary, whilst altering the Minkowski Content. We were able to properly provide a new notion of a topological homeomorphism in terms of a dynamical system, namely a "lure". This definition is constructed for general n-dimensions. We are able to show that, with respect to the monoid of positive time under addition, a set M denoting the homotopy equivalence class of a manifold, and the "lure", this system satisfies the axioms of a dynamical system. However, we are able to generalize this notion beyond that of compact topological manifolds, to ordinary hyperreal fractal strings. That is, the natural hyperreal extension of an ordinary fractal string, the first appearance of such an object. In future work, we would like to apply the general idea of a "lure" to practical applications in economic systems, biological systems, and certain machine learning algorithms.

Awards Won:

European Organization for Nuclear Research-CERN: All expense paid trip to tour CERN