Name(s)	Project Number
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Project Title

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

Abstract

Objectives/Goals
In this project, we attempt to 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.

Methods/Materials
There is no distinct set of steps one must follow in order to do research in mathematics. The "lure" was constructed through trial and error; various possible definitions were tested. For example, we originally constructed a one-dimensional definition that was not easily generalized to higher dimensions, so we had to revise said definition. As far as materials are concerned, the only materials used were textbooks and scholarly articles on related subjects.

Results
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.

Conclusions/Discussion
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. Additionally, we would like to extend the notion of a lure to more general manifolds, as well as Iterated Function Systems

Summary Statement

We construct a new notion of a topological homemorphism in terms of a dynamical system.

Help Received