For Favour of Posting

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Room 220, Lady Shaw Building, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

Colloquium

Locally Complicated Spaces

Professor Gregory R. CONNER
Brigham Young University

Abstract

In many settings we encounter complicated spaces which encode information about objects we study and care about. Examples include attractors of dynamical systems, boundaries of manifolds and other spaces, compactifications of moduli spaces, boundaries of groups, asymptotic cones of groups, self-similar tiles and other attractors or 'fractals' to name a few. These spaces tend to be *locally complicated* because they have interesting topology in arbitrarily small neighborhoods of points.

A humorous, and somewhat accurate, aphorism states that a topologist is a person whose job is to tell topological spaces apart. One of the main tools we use to distinguish between topological spaces is the notion of a homotopy invariant. These include the fundamental group and higher homotopy groups as well as homology and cohomology groups. We have simple tools such as the Siefert-van Kampen theorem and exact sequences in homology and homotopy as well as covering space and fibration theory which allow us to iteratively compute homotopy invariants for locally simple spaces such as CW-complexes.

Historically it has been very difficult to understand anything useful at all about the homotopy invariants of locally complicated spaces, let alone be able to tell them apart or compute them, because standard tools seem to yield very little information. For instance, locally complicated spaces do not have universal covering spaces and, indeed, may not have any covering spaces.

All are Welcome

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Over the last three decades a number of authors have been working towards understanding the homotopy invariants of some of the most well-behaved locally complicated spaces. In this talk I will discuss the both some of the history and recent progress in this area while offering numerous examples and open conjectures.

Here are some examples of the types of things I will speak about:

Did you know that locally complicated compact one dimensional spaces (e.g. the Menger sponge or the Hawaiian earring) can be 'reconstructed' from their fundamental group but that their first homologies are all the same?

Did you know that there are two, very easy to describe, compact locally connected 2-dimensional spaces but that no one knows if they have isomorphic fundamental groups?

Did you know that it's still an open question if fundamental groups of subsets of Euclidean 3-space can contain elements of finite order?

Date:	March 31, 2017 (Friday)
Time:	4:00pm ~ 5:00pm
Venue:	Room 219, Lady Shaw Building, The Chinese University of Hong Kong, Shatin

All are Welcome