Computational H-Calculus with Remarks on Topology

It does not require a degree in mathematics to know that the idea of limits is the foundation of calculus. Mathematics, calculus in particular, is used all over the world, everyday to solve problems in physics and engineering. However, the theory of the Planck length could overturn the idea of the existence of limits in physical reality. As theory states, a Planck length is the smallest measurable unit of length. If there truly is no smaller measurable unit, then it is impossible to have an infinitely small distance. In an attempt to reconcile calculus with the possibility of a reality governed by the Planck length, mathematicians developed a "new" calculus called h-calculus.

Under the supervision of my a graduate student of my faculty mentor, I will investigate the computational properties and topology (that is, the inherent mathematical shape) of h-calculus. Using "Quantum Calculus" by Victor Kac and Pokman Cheung as a reference, I will elaborate on computational methods involved in differential and integral h-calculus. The goal is to acquire computational competence with respect to h-calculus and discuss the geometric or topological aspects of h-calculus. I hope to attain a working knowledge of h-calculus computations by mid-October and to begin a discussion of h-calculus geometry and topology immediately after.

In sum, the overarching purpose of the proposed project is to explore the computation properties of h-calculus. In the process, I will study the topology of h-calculus in order to begin a discussion about the obstacles facing the study of the topological aspects of h-calculus. My work will add to the knowledge of h-calculus. In particular, I want to begin a discussion of the topology of h-calculus because it may one day, if the Planck length is proven to exist, describe the shape of the universe we live in.