CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S1516

Project Title

Dynamics on the Rado Graph

Abstract

Objectives/Goals

In this project, we prove certain properties about the Rado Graph. In order to do that, we first consider a simpler case of the graph, a modified version, and prove that it's connected.

Methods/Materials

No materials other than pencils, paper and a computer were needed to conduct this project. That is because this project is a mathematics project.

Results

First, I proved that the Rado graph is connected through the usage of prime gaps and a theorem from Baker, Harman, Pintz. I showed that the graph can keep on growing to infinity, but is only increasing (took the derivative). Then, using results and techniques from other papers, I proved using induction that the Frog Model is recurrent on the Rado graph. Recurrence means that the process will eventually return back to the root as we go to infinity.

Conclusions/Discussion

In this project, we proved that the modified version of the Rado graph is locally connected through the use of many techniques. We used the main theorem from a paper by Benjamini and Peres to conclude that there is a prime in every gap that we jump to. Additionally, we used the idea of polynomial versus exponential growth from a Telcs and Wormald paper. We used this and a theorem from Benjamini and Peres to conclude the frog model is recurrent on the modified graph because it is polynomially growing.

Summary Statement

It is shown in this project that the Frog Model is recurrent on the Rado Graph, a random graph, through the usage of many techniques such as the theory of prime gaps.

Help Received

I did my work in collaboration with Dr. Simon Rubinstein-Salzedo who lives in the Bay Area. He provided tremendous support for me during this project.