

NDnano Undergraduate Research Fellowship (NURF) 2011 Project Summary

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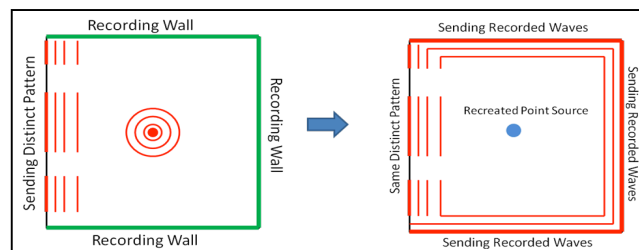
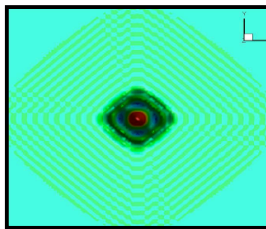
Faculty mentor name: Gyorgy Csaba & Wolfgang Porod

Project title: Pattern Recognition using On-Chip Waves

Project Summary:

Cellular Non-Linear Networks (CNNs) are chips which contain arrays of cells that are able to communicate with each of their neighboring cells and pass information quickly across the array. Because of how the cells communicate, when one cell is stimulated with an electric signal, it creates a wave-like reaction throughout the rest of the array as this signal is passed to all the neighboring cells. The simulation module I used in this research was created to emulate this effect. By treating the waves produced in these simulations with the laws of physics for waves, it can be shown that these waves can be manipulated on-chip and furthermore, that distinct patterns being sent on the chips can be recognized.

Over the summer, I spent my time running simulations to prove that pattern recognition could be accomplished using waves in an array on a chip. I worked with C++ and MATLAB code to adjust the simulations as I needed, and worked through a series of goals to build up to a simulation that successfully recognized distinct patterns on chips. With these simulations showing that these things were possible, hopefully more work can be done to make this a reality.



The picture on the left is a simple simulation just showing how the waves looked, the picture on the right shows the overall goal of the project, recognizing a pattern, by recreating a point source in the center.