Name(s)	Project Number
Tarang Luthra	**S1217**

Project Title

Adaptive Interference Rejection in Wireless Networking

Abstract

Objectives/Goals

Wireless networking is fast becoming ubiquitous. With the crowding of airwaves, the interference from unwanted sources is increasingly impacting how fast and far one can communicate. The focus of this project was on developing and simulating an adaptive algorithm in which an antennae array in a receiver can automatically adjust itself to provide the optimum rejection of interference without knowing which direction it is coming from. A new scheme was developed which further helped in rejecting the interference that comes from a direction closer to the source. A computer simulation using Java programming language was then completed.

Methods/Materials

In my project, I used the mathematical models of antennae array, electromagnetic waves captured by the array, radiation from an unwanted source and the signal processing to be done by the array in wireless home networking environment.

In my simulated experiment, I applied programmable weights to the signals received at each element. I studied how different amount of weighting allowed me to change the antennae gain and interference rejection. I then wrote the program that picked the weighting that provided me the best signal reception.

Results

Graph 1 shows the plot of three different weighting schemes # Raised Cosine, Equal and new one called Tarang # which I used in my adaptive processing algorithm. Graph 2 shows beam patterns of the array when these weightings are applied. It can be seen that the gain obtained at each angle location is different for various antennae weighting schemes. Graph 3 shows for which interference directions my adaptive processing algorithm picked different weightings as the optimum ones for a 5-element array. We see that if the interference is near the source, the Tarang weighting comes out to be the best.

Conclusions/Discussion

Fig. 1 shows the plot of the signal gain obtained at each angle location for different antennae weighting schemes. We see that the Raised Cosine weighting provides the best interference rejection at the angles farthest to the source but as interference comes closer to the source, in terms of the look angle, it provides the least interference rejection. Tarang weighting provides maximum rejection of the interference at the angles close to the source, compared to the other two kinds of weightings. The Rectangular weighting provides the best rejection of interference at the mid range of angles.

Summary Statement

The focus of this project was on developing and simulating an adaptive algorithm in which an antennae array in a receiver can automatically adjust itself to provide the optimum rejection of interference without knowing which direction it is

Help Received

Mother helped with poster board; Dad helped with getting computer.