Distributed FM Radio System

Wei Chen, Marlon Orellana, Jordan Tepper, and Mike Toriello
{wc305, mso50, jst103, mrt97}@scarletmail.rutgers.edu
Advisor: Prof. Spasojevic

Goal

- Successfully establish a radio system where receivers connect to a centralized server.
  - Server will relay data from clients (radios) receiving a strong signal to those clients receiving a severely degraded one.
- Minimize the time a client is not obtaining any useful data.

Methodology

- Using a series of TCP communications between server and clients, we can configure a network of mutually beneficial radios. The communication protocol is shown in Fig. 1.1.

Objectives

- Design a Universal Software Radio Peripheral (USRP) network of receivers where each USRP is a client.
- Calculate signal-to-noise ratio (SNR) from received data and transfer these values from client to server.
- Create a multi-threaded TCP server to relay data from USRPs with strong SNR to those with weak SNR.

Results

- Observed the linear relationship between the received signal power with noise and the transmitted power as shown above.
- Set up the streaming network to accept multiple received signals from USRPs and send higher quality signal to all receivers.

References

[1] https://decibel.ni.com/content/docs/DOC-23110
[2] https://decibel.ni.com/content/docs/DOC-25893

Acknowledgement

Kareem Bonna
John Scafidi

Learn to use LabVIEW and interface it with USRP.
Format data to be sent over TCP in a manner that is suitable for USRP.
Determine an effective way to calculate SNR from captured data.

Future Work

Make the system more autonomous so when SNR returns to a good value the server will cease to send data.
Improve streaming process by switching to UDP protocol so the transition between the server and the client is seamless.

Research Challenges

Figure 1.1

Based on the response of the server, the client decides whether it should receive data locally or from the server. The client structure is shown Fig. 1.3.

Figure 1.2

Figure 1.3