Effect of weather on cellular signal
1 Introduction

As per a recent study, around 67 percentage of American adult owns smart phone. Smart phone has become an object of our day to day life. But a recent study by Pen Internet has shown that 72 percentage of American owners experience some form issue due to poor cellular network strength. And 32 percentage of them experience dropped calls atleast few times a week. These can result due to some failure in cell tower, over crowding etc. But weather also plays an important role in affecting the cellular signal.

To overcome these issues cellular companies tries to place as many cell tower as possible in the area. The solution works, but there is a wastage of cellular strength and energy. Let us consider a scenario when the whether is perfectly fine and there is nothing to attenuate the signal strength, then the redundant cellular strength is waste.

With this project I planning to gather data from an Android phone and find a co-relation between Cellular signal strength and Weather factors (Currently I am considering factors like Humidity and Temperature).

2 System Design

![Diagram](image)

Fig 1 Hardware Component: Nexus 5x, Arduino processor, Humidity sensor, Temperature sensor and Server (Laptop)
Blocks in term of Classes and their functionality

1. Main class(Main APP): The main functionality is to get the data from SensorManager and pass it on to the server.

2. Server: Listen the data from the client and save the data in the DBMS

3. SensorManager: Initialize each sensor one at a time and gather the reading and pass it on to the main class. Sensor manager manages the sensor and all the error handling code will be in this class. It will create object for each sensor.

3 Related work

1. The Effects of Tropical Weather on Radio-Wave Propagation Over Foliage Channel [1]
2. Effect of rainfall on link quality in an outdoor forest deployment [2]
3. Effect of Environmental Parameters on GSM and GPS [3]
4. Understanding the effect of environmental factors on link quality for on-board communications [4]
6. Atmospheric effects on radio frequency (rf) wave propagation in a humid, near-surface environment. [6]

Current Available Solution: Wireless backhaul system Mostly used in case of wireless system

4 Current Status and Future Plan

Current Status: In the Fig 1, I have completed the blocks highlighted in green.

Task Completed:

1. Method to get the Signal strength of Cellular network
2. Method to get the pressure using Nexus 5x pressure sensor
3. I am almost done with the code to transfer the data from Android mobile to Computer over WIFI.
Pending Task:

1. Select the humidity sensor and temperature needed for the project. Code to connect to Arduino processor to get the Humidity and Temperature reading

2. Write code for the server backend to store the Data gathered.

3. Process the Data using R
Final expected Graph will be similar to:

![Graph showing signal strength over time]

Fig. 5. The effect of humidity on the measured signal strength.

Fig 1. The effect of humidity on the measured signal strength.

Fig 2. Effect of Environmental Parameters on GSM.

Note: We might get different plot as the above research were conducted in rural areas or forest area.
References

[1] Yu Song Meng, Student Member, IEEE, Yee Hui Lee, Member, IEEE, and Boon Chong Ng, Senior Member, IEEE. The Effects of Tropical Weather on Radio-Wave Propagation Over Foliage Channel. 2009

[2] Andrew Markham, Niki Trigoni, Oxford University Computing Laboratory, UK, Stephen Ellwood Wildlife Conservation Research Unit, Oxford University, UK. Effect of rainfall on link quality in an outdoor forest deployment. 2007

[3] Dalip and Vijay Kumar. Effect of Environmental Parameters on GSM and GPS

[4] Irene Chan, Albert Chung Mahbub, Hassan y, Kun-chan Lany Lavy Libmany. Understanding the effect of environmental factors on link quality for on-board communications


[6] Samuel P. Mason, Atmospheric effects on radio frequency (rf) wave propagation in a humid, near-surface environment. 2002