A COMPREHENSIVE STUDY ON CO-OPERATIVE COMMUNICATION

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ABSTRACT
This Generation is meant for Information for information connectivity needed. Wireless connectivity is the best suitable method to connect all the world but then comes the health issue and govt regulation. Because of Govt regulations we can not install cellular towers as and where required. So we have to look after the technology which gives solution to this problem. However the new technology should not only better than current but it should be compatible with the existing technologies. Co-Operative communication can provide solution to this problem.

Key words: Co-Operative, Cellular Towers, Relay

I. INTRODUCTION
In Co-Operative Communication is a need based technology. If somebody needs it can borrow spectrum from other nearby devices. It does not depends upon operators means if a mobile A is having SIM of operator X and other mobile B is having SIM of operator Y and Y has neither have network in that area nor any collaborations with other operator (For Roaming )in that area then services of X can be used by mobile B and this can be done by sharing of network of X by mobile A to mobile B.
The Co-Operative model is also helpful for the cases where a device is unable to receive signal from its parent operator even in the home network eg. Tunnel or in lift Unlike Ad-Hoc networking in which a network is shared by a user which is having services of an operator and it is up to that user's wish to share the network, Co-operative network is based on the demand of a user which is deprive of service and wants to use resources.
Now the problems associated with this system is
1) Identification of actual receiver
2) Battery
3) Security of data
4) Noise
5) Instability of transmitter

[Figures and diagrams are mentioned but not included in the text.

Figure 1 Problem of hindrance in mobile

Figure 2 Illustration of Cooperative communication]
II. AMPLIFY & FORWARD

This is the simplest protocol suggested so far. In this protocol three main components have been presumed
1) Transmitter
2) Relay
3) Receiver

![Image of Linear relay strategies]

The Transmitter and receiver will do their usual work and the work of relay is to receive the signal amplify it and then forward it to receiver.
It has nothing to deal with the correct reception of signal. It will work as an ordinary amplifier. Its work can be defined in three steps
1) Receive the signal
2) Amplify the received signal
3) Transmit the amplified signal
In the protocol it is very clear that the Relay will do both the work i.e. receive as well as transmit.
So if a mobile A under the coverage of some tower $T_A$ which is transmitting signal with power $T_w$ we can write equation as

\[
R_A = \frac{T_w}{4\pi x^2}
\]  

(1)

Power Transmitted by A and received by B at a distance d is

\[
T_A = G\left(\frac{R_A}{4\pi d^2}\right)
\]  

(2)

Where $G$ is the amplification gain provided by node A.
However this is theoretical value in practice the signal will suffer various types of losses so if for simplicity we assume that the loss from Tower to node A is $L_A$ and from A to B is $L_B$ then equation can be written as

\[
R_A = \frac{T_w}{4\pi x^2} - L_a
\]  

(3)

\[
T_A = G\left(\frac{R_A}{4\pi d^2}\right) - L_b
\]  

(4)

Where $d < x$ and $L_b < L_a$
Here it should also be noted that existing mobile antennas are not capable to do both the work simultaneously i.e the mobile antenna will work in a Half duplex mode so we will get a reduced data rate. We have assumed single hop system here however multihop system can be implemented. This is the simplest protocol and various new and amended versions has been published, but this system is very good from battery prospective.
The problem of half data rate has been addressed by various researchers and they have suggested some orthogonal and Non orthogonal schemes.

III. DECODE-AND-FORWARD PROTOCOL

We can relay a signal by using decode and forward protocol. In this protocol the relay will receive the signal decode it and will re-encode the signal before transmission. Thus another step of decoding and encoding involved for relay. It is also possible that the decoded signal at relay may have some error and if it is then the received signal will be worthless. This is a clear advantage of this scheme over the Amplify and forward as forwarding an erroneous signal is only a waste of bandwidth.
On the other hand this scheme will create two major problems
1) Increased energy requirement at relay
2) Increased level of security threat as signal is decoded at relay

![Image of Non Linear relay strategies]

Adaptive decode & Forward

This scheme is a combination of both i.e Amplify and Forward & Decode and Forward If the environment is very noisy and signal is very attenuated then only decoding is done at relay otherwise it is using amplify and forward.

IV. FUTURE SCOPE AND CONCLUSION

This is a very important project for future prospects of mobile networks as with the rise of subscriber base need of bandwidth will reach to a new level as well as development (planned or unplanned) will further impose new challenges for network planning. Use of cooperative network is a very feasible solution to all these problems. This will also increase network penetration to the areas where at present infrastructure based
network planning is not a feasible and economical solution. Implementing this project will also be a leap towards infrastructure less wireless network.

REFERENCES