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Homework #3 for TCN 6270

Problem 1:

Questions related to channel fading.

A. What is fast fading, and what is slow fading?

Answer:

Fast fading is due to moving through the constructive & destructive interference patterns caused by multipath with frequency.

Slow fading is due to mobility, changes in shadowing or changes in the path.

B. What is the most-widely distribution that is used to model shadowing effects?

Answer:

Log-normal distribution is the most-widely used distribution to model shadowing effect. The law of large numbers is used to explain this concept.

C. What is the basic idea of diversity techniques in wireless communications? State three diversity techniques and two combining techniques. What is the optimal combining technique in terms of maximizing the receive SNR?

Answer:

The Basic idea is to send same bits over independent fading paths which are obtained by time, space, frequency, or polarization diversity and to combine paths to mitigate fading effects. The three diversity techniques are Time diversity, Frequency diversity and spatial diversity and the two combining techniques are Selection combining and Equal Gain combining. The optimal combining technique in terms of maximizing the receive SNR is Maximal Ratio combining.

Problem 2:

Consider downlink transmission with “opportunistic scheduling” in Lecture #7.

A. Which layer(s) are involved in opportunistic scheduling?

Answer:

Physical Layer, Mac and Network Layer

B. Explain briefly why opportunistic scheduling increases the system throughput?

Answer:

Opportunistic scheduling increases the system throughput because the Base station schedules the best channel among of number of channels with the highest gain since each channel experience different gains. As a result the system throughput will be increased.

C. State one major problem with opportunistic scheduling and your proposed solution to address the problem.

Answer:

Proportional fair and other kinds of Fair scheduling algorithms can be used to solve the problem that some of the users never transmit.