

COMP4097 Mobile Computing Assignment 1

Due: Nov 6, 2019 (before 12:30)

Section 1 Fundamentals of Wireless Communication

1. The world is round and without any intervening obstacles, the optical line-of-sight can be approximately expressed as $d = 3.57\sqrt{h}$, where d is the distance between an antenna and the horizon in kilometers, and h is the height of the antenna in meters.

a) Refer to Figure 1 below and show the construct of this approximation. Given the radius of the earth is 6370km, what other assumption you have to made in order to simplify the approximation to $d = 3.57\sqrt{h}$?

b) From Google, the Head of The Lion Rock is 495m in height, according to the above formula, how far away The Lion Rock is still within the line of sight of the earth. Please consult the Google Map for this distance and what conclusion you can make?

(15 marks)

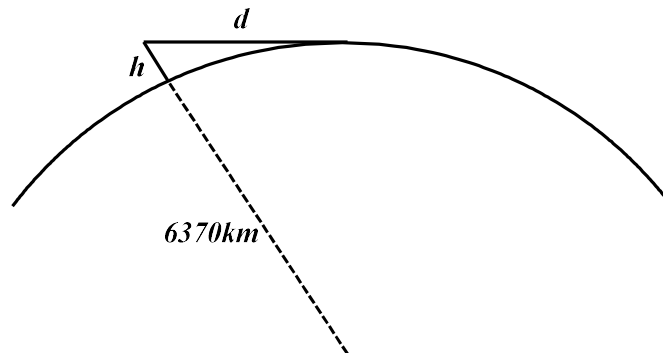


Figure 1. The Line of Sight assuming the radius of the Earth is 6370Km.

2. Two mobile phones are receiving information from the same Access Point (AP), and their locations are shown in the Figure 2. From the specification of the AP, the transmitting power for this AP is 20mW. And the signal power received by mobile phone A is 10mW.

a) What is the signal power received by mobile phone B? Assume isotropic antennas and free space loss.

b) If the antenna design of the mobile phone can detect a signal that is no less than 0.125mW, given that the AP transmitting power is 20mW, what is the coverage of this AP in meters?

c) When mobile phone A is moving towards mobile phone B, in theory, the signal power received by mobile phone A should be decreasing. However, in the real case, the signal power received goes up and then down in cycles. Explain why this will happen.

(15 marks)

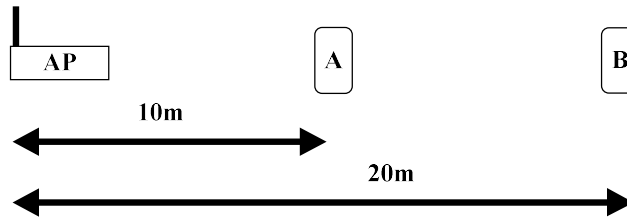


Figure 2. Signal and Distance coverage of Access Point.

Section 2 Advanced Wireless Transmission Techniques

3. In your own words, describe how bit-stream can be transmitted by each of the following methods: ASK, BFSK, MFSK, BPSK and MPSK, respectively.

(20 marks)

4. A wireless communication link uses 16-QAM with 200 KBaud of signal rate. What is the data rate of this link? If 256-QAM can be used, using the same 200 KBaud of signal rate, what is the new data rate for this link?

(5 marks)

5. Explain how FHSS & DSSS can protect wireless communications from being jammed and intercepted.

(10 marks)

Section 3&4 Principles and Standards of Wireless LANs & Management

6. Do a Google search and describe what is the hidden node problem for IEEE 802.11. Why CSMA/CD does not work and how CSMA/CA is going to ease up the problem?

(10 marks)

7. Discuss the advantages and disadvantages of RTS/CTS four frame exchange scheme in IEEE 802.11.

(10 marks)

8. Explain how IEEE 802.11n improves over IEEE 802.11g, and how IEEE 802.11ac further improves over IEEE 802.11n.

(5 marks)

9. Discuss the major flaws of IEEE 802.11 WEP.

(10 marks)