Homework 4 assignment for ECE597/697SI
Posted: 11/26/2013
Due: 12/09/2013

Note: In all written assignments, please show as much of your work as you can. Even if you get a wrong answer, you can get partial credit if you show your work. If you make a mistake, it will also help the grader show you where you made a mistake.

Problem 1 (22 Points):
For the final project assignment (http://server.casa.umass.edu/~zink/ECE697SI/assignments/Final_Assignment.pdf) I have specified a series of high-level systems requirements. In the lecture “Writing and Reviewing Requirements” I gave some examples on how to write technical requirements (starting at slide 23). Based on these examples specify

a. 6 requirements for the radar system.

b. 5 requirements for the network that connects the radars with the control node.

c. 6 requirements for the control system.

d. 5 requirements for the end users.

Problem 2 (36 Points): Phased Array Weather Radar
The National Severe Storms Laboratory of the Weather Service is investigating options for the replacement of the current NEXRAD (WSR-88D) system. NSSL proposes to replace the existing radars with a new radar type that is based on phased array technology and the system requirements for this radar are specified here: http://server.casa.umass.edu/~zink/ECE697SI/Papers/LMCO_Consult2.pdf
Read this document carefully to answer the following questions:

a. Identify the parameters specified for the phased array weather radar and compare them to the ones of the CASA radar. (Use table from BAMS paper).

b. Based on these parameters present a simple model of such phased array weather radar.

c. Why would NWS meteorologists like to extend the coverage of the radar to higher elevations? Why is this not necessary in a network of CASA radars?

d. What would be the vertical size of the antenna of this phased array weather radar? Why is this size required?

e. Based on the requirements for the phased array weather radar specified in this document briefly mention the advantages and disadvantages in comparison to the CASA system.
f. Put yourself in the role of a company that builds weather radars. Based on this systems requirements document, would you agree (most like with a binding contract involved) to build one ore more of these phased array weather radars? Explain why!

**Problem 3 (42 Points): Beyond CASA**

In recent years sensors for a variety of applications (e.g., traffic, air quality, power consumption, etc.) have gained significant popularity. The goal of this problem is for you to develop a system model for a smart city. As an example you should start with your Kansas City scenario that has already a CASA network installed as one group of sensors. This network should be expanded by new sensor groups. This means that the sensors should be integrated in the network and a combination of the sensor data should be presented to the end users.

Note: Smart Santander in Spain is an example for such a smart city (http://www.smartsantander.eu/).

To develop the model perform the following tasks
  a. Identify and briefly describe the functionality of the sensors you plan on adding to the CASA network
  b. Identify NEW stakeholders for these sensors/data.
  c. Specify the system requirements for the integration of the new sensors in the network.
  d. Develop a model for this new, enhanced sensor network. (Again, this should be based on the CASA radar network model.)
  e. Select one of the new sensor groups you decided to add to your network and describe the concept of operations.
  f. Give two examples of how the combination of CASA radar data and data from the new sensors can improve the overall performance of the system.