Software Workshop – Exercises

27 October 2015

Submissions must be made using Canvas, in the following format.

SUBMISSIONS NOT COMPLYING WITH THESE GUIDELINES WILL HAVE 2 MARKS DEDUCTED.

Uploaded file must be: studentid.zip
in the zip format. Rar or tar.gz will not be accepted.

Archive must contain: Transmitter.java, Network.java, SignalMap.java (containing your solutions) and Test.java (containing your test code).

All submissions must be made midnight on Sunday. Submissions after this time WILL NOT BE MARKED and will receive ZERO.

Your answers should be based on the classes **`Transmitter`** and **`Network`** which we developed in the lab on Tuesday. You can find these on Canvas.

Don't forget that every time you write a method you should test it in Test.java. You should also document your code with comments using the javadoc format.

Question 1 [8 marks]

Create a class **`SignalMap`**. This will contain a 2-dimensional array of **`boolean`**s, indicating whether or not a particular area has a poor signal (that is, the signal is below some threshold).

(a) Create fields for: the **`boolean`** array representing the **`map`**; the **`threshold`** which determines whether the signal is poor; the **`size`** of the array; the **`network`**.

[4 marks]

(b) Write a constructor which initialises the **`threshold`**, the **`size`** of the map and the **`network`**. It should create the array to have **`size`** indices in both dimensions (that is, it should be a **`size`** by **`size`** array). It should also initialise the array as follows: If the location with coordinates (i, j) has a poor signal (that is, below the threshold), then the array records **`true`** at this position, otherwise **`false`**.

[4 marks]

Question 2 [4 marks]

Write a method **`display`** in the **`SignalMap`** class which prints the array showing those areas which have poor signal (for example, display an **`X`** if the signal is poor).

Test your method by creating a map of size 20 by 20, with transmitters located at positions (1.0, 0.5), (8.0, 1.2) and (17.5, 17.0) all with power 80.0.

Question 3 [4 marks]

Write a method **`poorSignal`** in the **`SignalMap`** class that calculates the fraction of the map which has a poor signal. Test your method.

Question 4 [4 marks]

Write a method **`important`** in the **`SignalMap`** class that works out which transmitter in the network contributes most to the coverage. That is, which transmitter, if removed from the network, would cause the biggest increase in sites with poor signal. Test your method.

Question 5 [4 marks]

Write a method **`compare`** in the **`SignalMap`** class, which takes a new network as a parameter and displays a map showing those areas where the new network has a stronger signal than the original one.