

Software Workshop – Exercises

24 November 2015

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

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

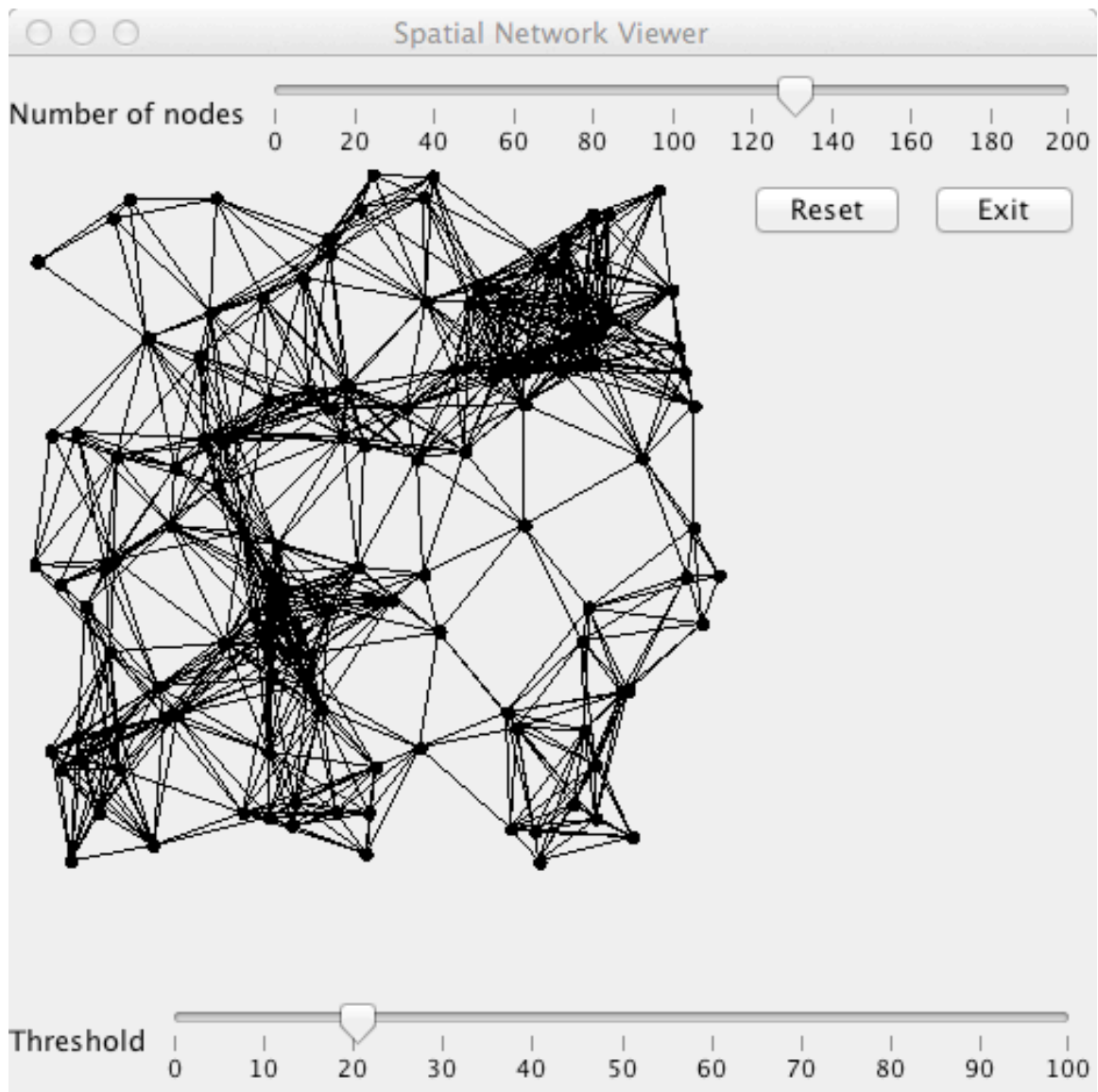
Uploaded file must be: studentid.zip
in the zip format. Rar or tar.gz will not be accepted.

Archive must contain: SpatialNetwork.java, SpatialModel.java, SpatialView.java, SpatialGUI.java, ThresholdPanel.java, SpatialComponent.java, NumberPanel.java, ButtonPanel.java (and Spot.java if you used it).

Don't forget to javadoc your classes.

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

A **random spatial network** is made up of a collection of points located randomly in a given 2-dimensional area. Points that are closer to each other than some specified threshold are said to be **connected**. The aim of this week's assignment is to write a program which generates such networks, with different numbers of points and with different thresholds, and to display them in a graphical user interface (see picture).



Question 1 [8 marks]

Create a class **SpatialNetwork** to represent the points of a random spatial network, with a given number of points and a given threshold. There should be “get” methods to: get the co-ordinates of each point; get the number of points in the network; get the threshold; determine if two points are connected. There should be “set” methods which: change the threshold; change the number of nodes. Assume that the points are in a space that measures 1 by 1.

Create a class **SpatialModel** to be a model of a **SpatialNetwork**.

Question 2 [4 marks]

Create a class **SpatialView** which should be a **JPanel**. When painted, it should draw spots for the points (use the **Spot** class if you want), and draw a line between any connected points. Write a class **SpatialGUI** with a main method which creates a **JFrame** and displays a **SpatialView** for a particular network. Make sure the network picture resizes properly when the frame is resized.

Question 3 [4 marks]

Write a class **ThresholdPanel**. This should be a panel containing a slider and a label describing what it does. The slider should change the value of the threshold. The picture should be re-drawn accordingly. Use an anonymous inner class for the slider’s listener. Create a class **SpatialComponent** to contain the **SpatialView** and the **ThresholdPanel**. Test it in your **SpatialGUI** class.

Question 4 [4 marks]

Write a class **NumberPanel**. This should be a panel containing a slider and a label describing what it does. The slider should change the number of points in the network. The picture should be re-drawn accordingly. Use an anonymous inner class for the slider’s listener. Add a **NumberPanel** to your **SpatialComponent**.

Question 5 [4 marks]

Write a class **ButtonPanel** which contains a button to reset the network to its original number of points and threshold. Make sure the sliders also get reset. It should also have a button that closes the program. Use anonymous inner classes for the listeners. Add a **ButtonPanel** to your **SpatialComponent**.

Challenge

Imagine the points in the network represent trees. Trees can suffer from certain diseases. Diseased trees should be coloured red. If a healthy tree is sufficiently close to a diseased one (i.e. within the threshold distance), then it will get the disease with some probability. Start with some randomly chosen diseased trees. Add a button to the GUI that, when clicked, simulates the passing of one day. Add a reset button to start the simulation again.