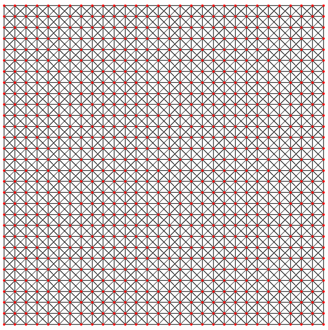
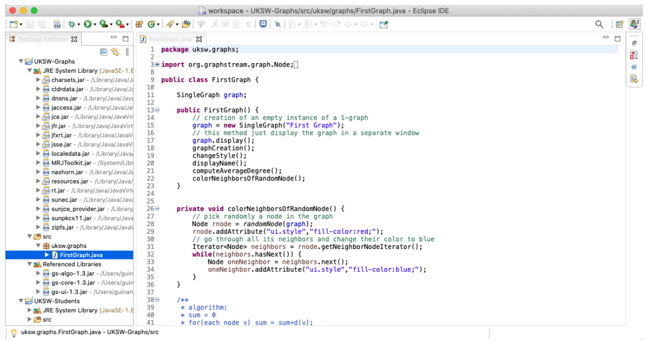
Connectivity and Eccentricities – Labs

frederic.guinand@univ-lehavre.fr





1 Introduction

For this lab, the objective is to travel into the graph in order to measure some properties.

2 Connectivity

The first part consists in determining the connectivity of some graphs using graph traversal algorithms.

1. modify the Grid generator in order to generate some uncomplete grid (need a clue for doing that? Look at the footnote[1]),
2. using either BFS or DFS determine if the graph is connected.
3. propose a method for counting the number of connected components of the graph

3 Giant Component

We define a giant component of a graph $G = (V, E)$ as a connected component $C = (V', E')$ such that the cardinality of V' represents at least k% of the cardinality of V.

Using the Erdos-Renyi model of random graphs, can you find experimentally a relation between n and p such that $G(n, p)$ owns a giant component with $k = 90\%$?

[1] build the complete grid and remove some nodes, edges will be automatically removed

4 Eccentricities

1. Using the grid generator seen during the lecture, generate a von Neumann grid of size 20 and add to each edge an attribute *cost*. The value of this attribute is an integer that will be randomly chosen between 1 and 1000.

2. implement the Dijkstra algorithm as describe during the lecture session

3. determine for each vertex its eccentricity

3bis. Compute the diameter and the radius of the graph

4. according to the value of the eccentricity, associate a color to the vertex between red and black such that red is just the lowest eccentricity value and black for the largest one. Any other vertex should have a color proportional to its eccentricity value between red and black.