Graph theory – exercise 2, practical part

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1. In networking, every piece of equipment costs money. When represented by a graph this means every node and edge costs money. By applying a bound to T2 we can lower costs or keep a budget
2. If the probability to generate a graph that complies with the condition is 0 or very close to 0, the algorithm might be stuck in an infinite loop because the condition will never be true. Two examples are: (A) a 1 regular graph. (B)
3. T1 is more likely to occur because all T2 compliant graphs are also T1 compliant. That is because if a node has a degree of 0 the graph cannot be linked, this means that there are more T1 compliant graphs than T2, which means that the probability to generate a T1 compliant graph is greater than that of a T2 compliant graph.
4. We estimate that T1 will take less time then T2
5. The T1 compliant graph which has the least amount of edges is a 1 regular graph. A 1 regular graph has n/2 edges, which means the lower bound of T1 is n/2.

9. A) the average time for a T1 compliant graph to be generated is larger than that of a T2 compliant graph, the difference between times grows with the number of nodes in the graph.

B) T2 cannot exist without T1 (all T2 compliant graphs are also T1 compliant), but T1 can exist without T2. That means that there are more graphs that comply with T1 than T2, therefore the probability to generate a T1 compliant graph is greater that the probability to generate a T2 compliant graph. This difference in probabilities grows with the number of iterations and nodes.

C) These conclusion sit well with the answer to question 4, we predicted the same results.

D) The average degree of a T1 compliant graph is between 1 and 2. the average degree of a T2 compliant graph is between 2 and 3.

10. The lower bound of T2 is (n-1) because that is the minimum amount of edges for a linked graph to be generated. That is also the maximum amount of edges that will give an acyclic graph, Therefore the upper bound for a T3 compliant graph to be generated is ((T2’s lower bound)+1)

11. We reckon that a randomly generated graph will comply with T3 first because of the statement we proved in question 10. The upper bund of T3 is very close to the lower bound of T2. That means that for T2 to occur without T3 a very specific combination of edged must be chosen, and the probability of that is quite low.