Jipeng, Sam

October 18, 2015

CSE-6010 Assignment 3: Graph Analytics Part1

Literature Search And Expected Results–Jipeng

Theorem 1. (Size of Largest Components In A Random Graph) *Consider a random graph $G \in G_{n,p}$ where $p = c/n$ for some constant c. Then:*

1. *If $c < 1$, then a.a.s., the largest component of G has size $O(log(n))$, or more exactly, at least $\frac{3ln(n)}{(1-c)^2}$.*
2. *If $c > 1$, then a.a.s., G has a largest component of size $O(n)$. It is a unique "giant" component of size $(1 + o(1))\beta n$, where β is the unique solution in $[0, 1]$ to the equation $\beta + e^{-\beta c} = 1$. All other components have size $O(log(n))$.*
3. *If $c = 1$, then a.a.s., G has a component of size $O(n^{\frac{2}{3}})$.*

The phrase "a.a.s"(asymptotically almost surely) is used to denote an event that holds with probability tending to 1 as $n \to \infty$.

According to this theorem, the expected size of the largest component can be plotted. For example, the expected largest component of the result of "graphgen1 1000 0.001 topology" has a size $O(1000^{2/3}) = O(100)$. There is no exact expected size value. We can evaluate the correctness by judging whether the size is consistent with $log(n)$, n or $n^{\frac{2}{3}}$ in probability.

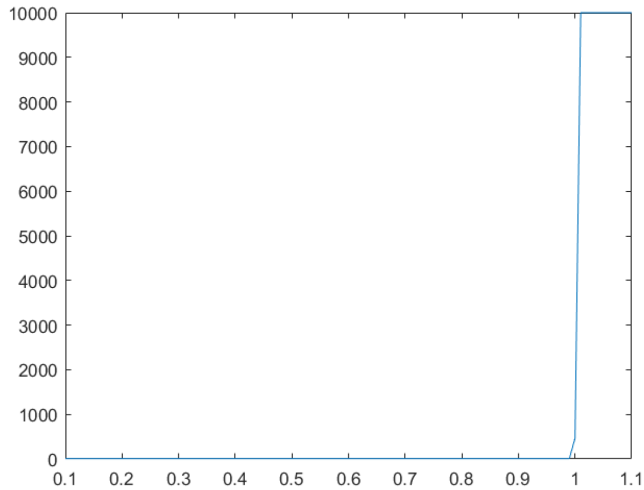

Figure 1: Expected Largest Component Size in Probability

Graph Analysis–Sam

References

[1.] latexcompanion S. Janson, T. Luczak, and A. Rucinski. *Random Graphs*. Wiley, 2000.