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CSE-6010 Assignment 3: Graph Analytics Part 2

Literature Search And Expected Results, Sam

Herrera and Zufiria use a random walk algorithm to generate a scale-free network in [1]. They also outline a more traditional approach to generating a scale free network in the beginning of the paper. That approach is outlined here:

Initializing

1. Initialize the graph with m_0 nodes
2. Create an edge between each of the initial nodes

In our implementation, m_0 was chosen to be 5.

Filling out Rest of Nodes

For each remaining node to be generated, the node most be connected to m nodes. In our implementation, m was also chosen to be 5.
Determine which node to connect the new node to was done using a probabilistic distribution where:

$$p_i = \frac{k_i}{\sum_{j=1}^{n} k_j}$$

Where k_i represents the number of edges connected to node i, and n is the set of nodes already in the graph that are not already connected to node i. We draw from this distribution m times, each time updating the set n to no longer include the last edge that node i was connected to.

Graph Analysis, Jipeng

The result:

1. N:10, diameter:0.560740
2. N:100, diameter:1.524168
3. N:1000, diameter:1.805032

The result shows that all scale-free graphs are connected graphs. The diameter is also satisfies:$(1-e)\frac{logn}{loglogn} \leq diam(G) \leq (1+e)\frac{logn}{loglogn}$.

References

[1.] latexcompanion Carlos Herrera and Pedro J. Zufiria. *Generating Scale-free Networks with Adjustable Clustering Coefficient Via Random Walks*. http://arxiv.org/pdf/1105.3347.pdf