Network Project

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Abstract

1 Implementation of the BA Model

The BA model is a randomly generated model, which usees a mdethod called preferential attachement to favour which nodes to connect to. This means that nodes with a high degree are more likely to be attached to be new nodes. The algorithm I used works as follows: 1. Set of an initial network a time $\mathcal{G}_{\prime}$.

2.Increment time t $\rightarrow$ t+1

3.Add one new vertex. 4. Add m edges as follows.. ....
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There are a few points of ambiguity in this model. The first of which is with respect to $\mathcal{G}_0$. There is no explicit guidance on how to choose $\mathcal{G}_0$, however the choice of starting graph does have an affect. When deriving a solving the master equation for the system, we will use the approximation that $E(t) = mN(t) forlarget$. However we can make this approximation exact by choosing an $\mathcal{G}_0$ such that $E(0) = mN(0)$.
In finding this, one assumption I would like to make is that ever node in $\mathcal{G}_{\prime}$ has the same degree. This make an easily programmably starting graph.This implies that $deg(n) = mforn \in \mathcal{G}_{\prime}$
There are many graphs with this property, however I would like to minimise the number of nodes in my starting graph(So our starting graph does not change our statistic) which implies we want a complete graph. THe algebra is as follow: In a complete graph $E = \sum_{n=1}^{N} n - 1 = \frac{N(N-1)}{2}$
And so $E(0) = mN(0) \Rightarrow \frac{N(0)(N(0)-1)}{2} = mN(0)$

$\Rightarrow N(0)^2 - (2m-1)N = 0$

$\Rightarrow N = 0(trivial)andN = 2m+1$

Therefore choosing $\mathcal{G}_0$ to be a complete graph with $2m+1$ nodes is sufficient for the condition $E(0) = mN(0)$.