Complex Networks: Quiz #1

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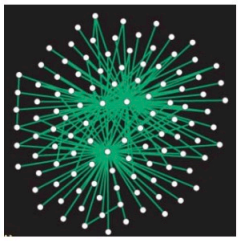
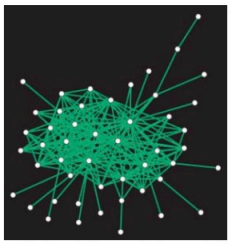
Problem 1

One is a social network (users and their friendship)and the other is the Internet (routers and theirconnections).
(i) Answer which is which.
(ii) Explainthe reasons from the following viewpoints.
– degree distribution
– distance between two nodes
– the number of cycles (loops)

(a) 

(b) 

Part One

figure(b) is a social network and figure(a) is an Internet

Part Two

Degree distribution

Degree distribution means the distribution of the connections between the nodes in a network. We can see the spectrum of degree distribution in figure(a) is centralised and in (b) is decentralised.

In user's social network, some user may have many friends and others only have few friends. And it is rare that all of users know one specific person, so it should be decentralised. On the other hand, in the Internet, all of the clients should be connected to a server, so the network is centralised.

Distance between two nodes

Distance means the shortest path from one node to another. The distance in (a) is almost same for all the nodes, it is more like an Internet. However, the distance in (b) is different for different nodes. It is like in social network, some person has few friends and hard to know a stranger from social network.

Num of loops

There are fewer loops in (a), and nodes have almost same chance to be in a loop, like every clients connect to the router and only few of them connect to each other.

On one hand, there are more loops in (b). On the example of Facebook, every user is average 4.74 persons away from another user, which means there are more loops in social network. On the other hand, some nodes are in many loops and others are not in a loop because of the difference of human's character.