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SI 301/Romero

Assignment 1

1. The US Federal government
   1. Each node in this network represents an employee of the federal government. This can be anyone from the President, to Supreme Court justices, Congressmen, and any other government official.
   2. The edges in this network represents correspondence and interaction between federal government organizations and the individuals working in them.
   3. The federal government network is undirected. This is because of checks and balances. Practically everyone in the federal government has someone who reports to them, as well as someone to report to. Therefore, information in this network flows both ways on an edge.
   4. Yes, I would expect this network to have giant components. The three giant components would be the three branches of the federal government: The Executive, Judiciary, and Legislative branches. Every government employee falls somewhere under these three branches.
   5. Yes, I would expect many cycles in this network. For example, in the Executive branch, the President and his cabinet exchange correspondence and information among each other constantly. So, certainly there would be ring structured cycles starting and ending with the President.

The Chicago Transit Authority Rail System

1. Each node in this network represents a train stop within the rail system. These nodes are placed around the greater Chicago area.
2. The edges represent the physical rail lines that connect each train stop.
3. This network contains multiple paths that originate from “the loop”, a circle in the middle of the city that contains the intersections of all the paths. Trains flow in and out of the loop constantly. So, because the trains move both up and down the paths, the network is undirected.
4. This network has one giant component, the loop (as described previously).
5. Yes, the loop is one large cycle. The rest of the rail system feeds out of this large cycle.

NCAA Basketball Tournament

a. Each node in this network represents a college basketball team participating in the tournament.

b. The edges in this network represents the games played in the tournament. A team can travel on these edges by winning their respective games.

c. This network is directed. Once a team wins, they travel to the next round on an edge, but cannot travel in the opposite direction.

d. The components of this network change as the tournament moves on. In the beginning, there are two giant components, both sides of the bracket. However, as the tournament proceeds, these components break apart and form smaller ones.

e. No there are no cycles in this network. Because the network is directed, information in this graph never moves backwards, so cycles are impossible.

* 1. The Milgram’s Small World Experiment does not provide enough evidence that the median shortest path between any two people in the planet is six. First, I do not believe that the sample size was large enough. Obviously, it is impossible to survey everyone in the world, so a sample must be collected. But, this experiment was too targeted geographically. A completely random sample is more conclusive than the experiment that occurred.
  2. I do believe that the results of this experiment would change if the target was a different person. The social network of an individual varies, especially with adults in different professions. For example, a politician has a far larger constituency than a stock broker because he/she is more recognized in media. On the other hand, a babysitter has a far smaller professional network and will also provide a different result than a stock broker.
  3. Successful chains do not necessarily have to follow the shortest path to the target. Especially when using letters as the messaging platform, errors are bound to occur. A mistake from the starter, such as writing to the wrong address, or from the mail service can easily change the path of the letter, making it longer.

3.

a. In a graph where every node forms a circle would fit these criteria (no edges connecting nodes in the middle of the circle). Every node in this network is pivotal to the pair consisting of its two immediate neighbors. For this to work, there needs to be at least four nodes.

b. A circle of nodes, in which a node only connects with its right and left neighbor and has at least 6 nodes, fits these criteria. Each node is pivotal to its right and left neighbor, as well as its right neighbor and the node to the left of its left neighbor.

c. A network in which four nodes connect to one in the middle (in the form of a cross) fits these criteria. With X being the node in the middle, the only way to connect a pair on the outside is to go through it.

4. Using the shown network:

a. The largest cycle in this network is G-B-C-E-F-G.

b.



c. This network is not connected. A network is connected if, for every pair of nodes, there is a path between them. The nodes I and J are disconnected from the main component of the network.

d. The largest component in the network has eight nodes.

5.