HW 1 Report

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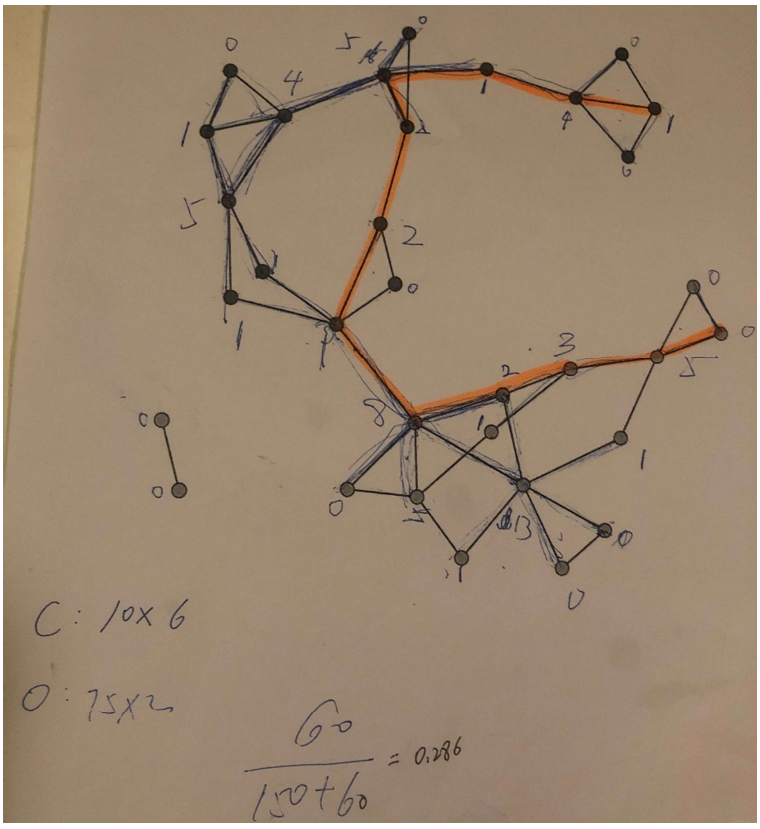
Introduction

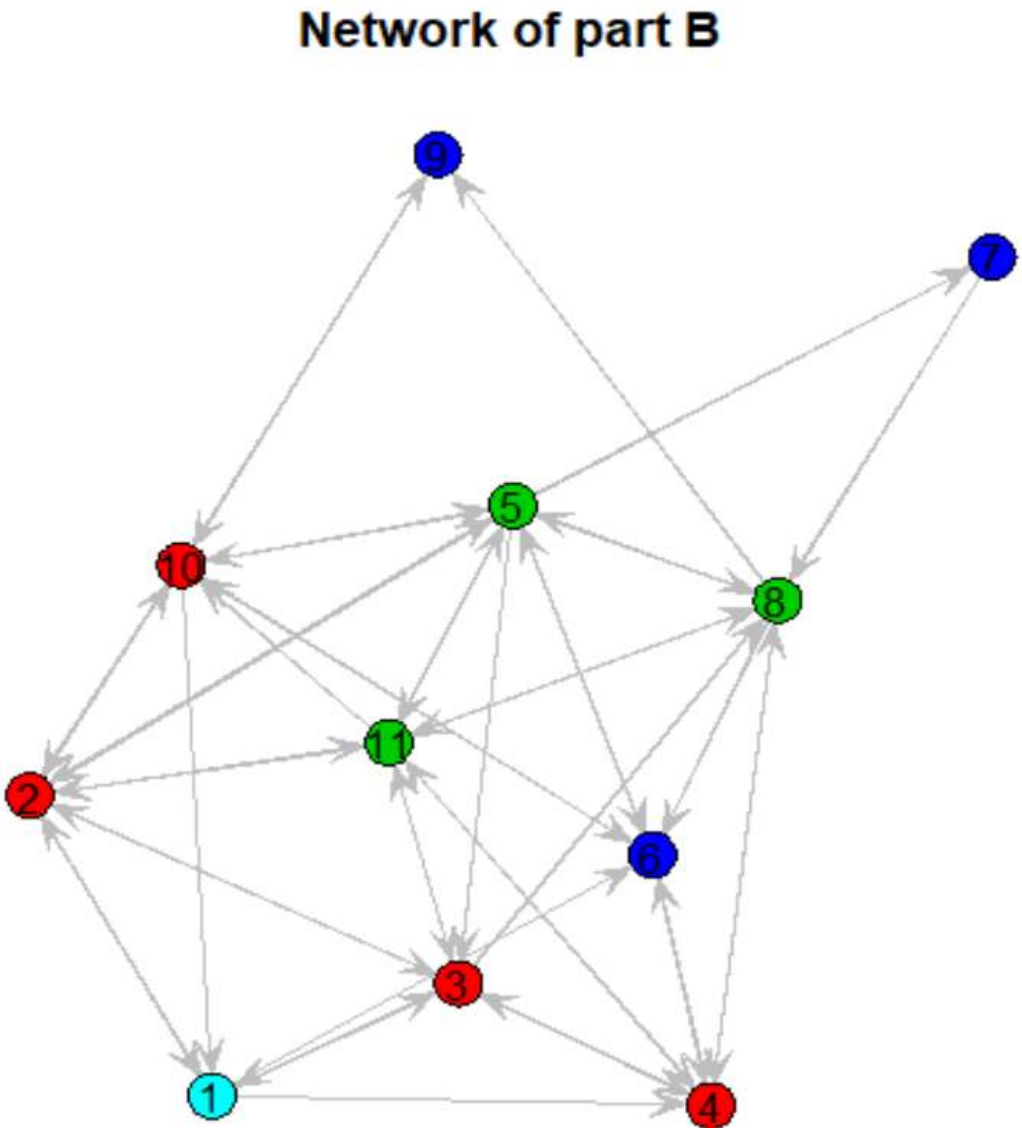
There are five concepts, named size, density, components, diameter and transitivity, are essential for a network. Typically, the size is simply the number of members, usually called nodes, vertices or actors. As for density, it is the proportion of observed ties (also called edges, arcs, or relations) in a network to the maximum number of possible ties. Generally, A network is sometimes split into several subgroups (subgraphs), then a component is a subgroup (subgraph) in which all actors are connected, directly or indirectly. A useful measure of compactness (or network efficiency) is the diameter. The diameter for an entire network is the longest of the shortest paths across all pairs of nodes. Last but not least, transitivity (a clustering coefficient) is defined as the proportion of closed triangles to the total number of open and closed triangles.

Part A



Comments: From the picture, we can know the diameter is 11 and one of the diameters is showed as the orange path. Also, there are 60 closed triangles and 150 open triangles, which means that the network contains 210 triads, so the transitivity is 60/210 which is equal to 0.286.

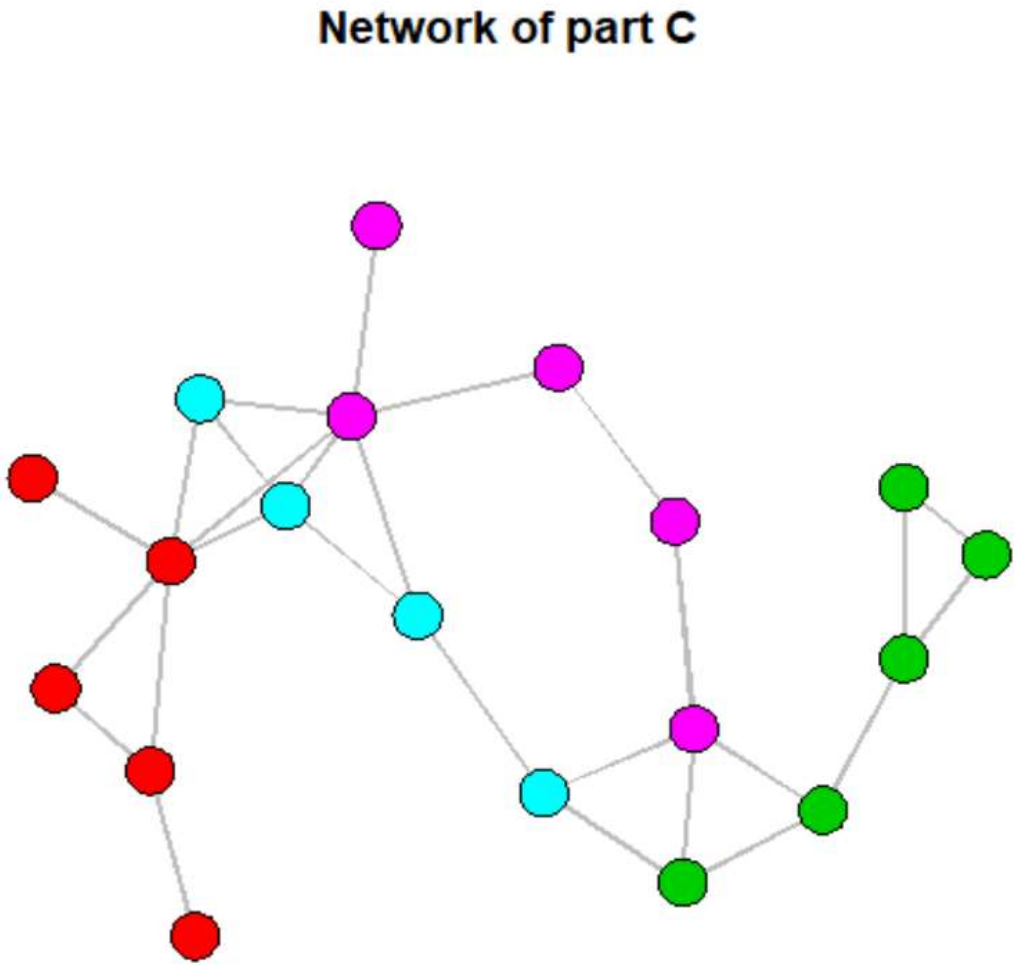
Part B



Comments: Here is the network constructed from the plot in slides by adjacency matrix. For this network:

The size is 11;
The density is 0.4181818;
The components are 1;
The diameter is 4;
The transitivity is 0.4636872.

Part C



Comments: Here is the network constructed from the plot in slides by adjacency matrix. For this network:

The size is 19;
The density is 0.1578947;
The components are 1;
The diameter is 9;
The transitivity is 0.3970588.

Appendix

Part B:

```
library(UserNetR)
library(statnet)

 netmat = rbind(c(0,1,1,1,0,1,0,0,0,0,0),
                c(1,0,1,0,1,0,0,0,0,1,1),
                c(1,1,0,1,0,0,0,1,0,0,1),
                c(0,0,1,0,0,1,0,1,0,0,1),
                c(0,1,1,0,0,1,1,1,0,1,1),
                c(0,0,0,1,1,0,0,0,0,1,0),
                c(0,0,0,0,0,0,0,1,0,0,0),
                c(0,0,0,1,1,1,0,0,1,0,1),
                c(0,0,0,0,0,0,0,0,0,1,0),
                c(1,1,0,0,1,1,0,0,1,0,0),
                c(0,1,1,1,1,0,0,1,0,1,0))
net = network(netmat, matrix.type = "adjacency")  # Use adjacency matrix to
 creat the network
cat("Size\n")

network.size(net) # Get the size

cat("Density\n")

gden(net) # Calculate the density

cat("Component\n")

components(net) # Get the number of components

ld<-geodist(lgc);  # Find all shotest distances
max(ld$gdist)  # Calculate the diameter
cat("Transitive:\n");

gtrans(net, mode = "digraph")  # Get the transitive

gplot(net, vertex.col = c(5,2,2,2,3,4,4,3,4,2,3),displaylabels = TRUE,labe
l.pos = 5, edge.col = 8, arrowhead.cex = 0.8,edge.lwd = 0.2, main = "Networ
k of part B" )  # Make a plot
```

Part C

```
netmat_c=rbind(c(0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
                c(1,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
                c(0,1,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
                c(0,1,1,0,1,1,1,0,1,0,0,0,0,0,0,0,0,0,0),
                c(0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
                c(0,0,0,1,0,0,1,1,1,0,0,0,0,0,0,0,0,0,0),
                c(0,0,0,1,0,1,0,0,1,0,0,0,0,0,0,0,0,0,0),
```

```
                c(0,0,0,0,0,1,0,0,1,0,1,0,0,0,0,0,0,0,0),
                c(0,0,0,1,0,1,1,1,0,1,0,1,0,0,0,0,0,0,0),
                c(0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0),
                c(0,0,0,0,0,0,0,1,0,0,0,0,1,0,0,1,0,0,0),
                c(0,0,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,0),
                c(0,0,0,0,0,0,0,0,0,0,1,0,0,1,1,1,0,0,0),
                c(0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0),
                c(0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,1,0,0),
                c(0,0,0,0,0,0,0,0,0,0,1,0,1,0,1,0,0,0,0),
                c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,1,1),
                c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,1),
                c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0))

net_c = network(netmat_c, matrix.type = "adjacency")  # Use adjacency matri
x to creat the network

cat("Size\n")

network.size(net_c)  # Get the size

cat("Density\n")

gden(net_c)   # Calculate the density

cat("Component\n")

a=components(net_c)  # Get the number of components

cat(a)

cat("\n")

cat("Diameter\n")

lgc_c = component.largest(net_c, result = "graph");  # Find the largest com
ponent

ld_c<-geodist(lgc_c);   # Find all shotest distances
max(ld_c$gdist)   # Get the diameter

cat("Transitive:\n")

gtrans(net_c, mode = "graph")

gplot(net_c, gmode = "graph",  vertex.col = c(2,2,2,2,2,5,5,5,6,6,5,6,6,6,
3,3,3,3,3),edge.col = 8,displaylabels = FALSE, object.scale = 0.013, main =
 "Network of part C") # Make a plot
```