

Cohesive Subgroups

Areas of the network in which actors are more closely related to each other than actors outside the group

Regions

- Components weak and strong
- Newman-Girvan

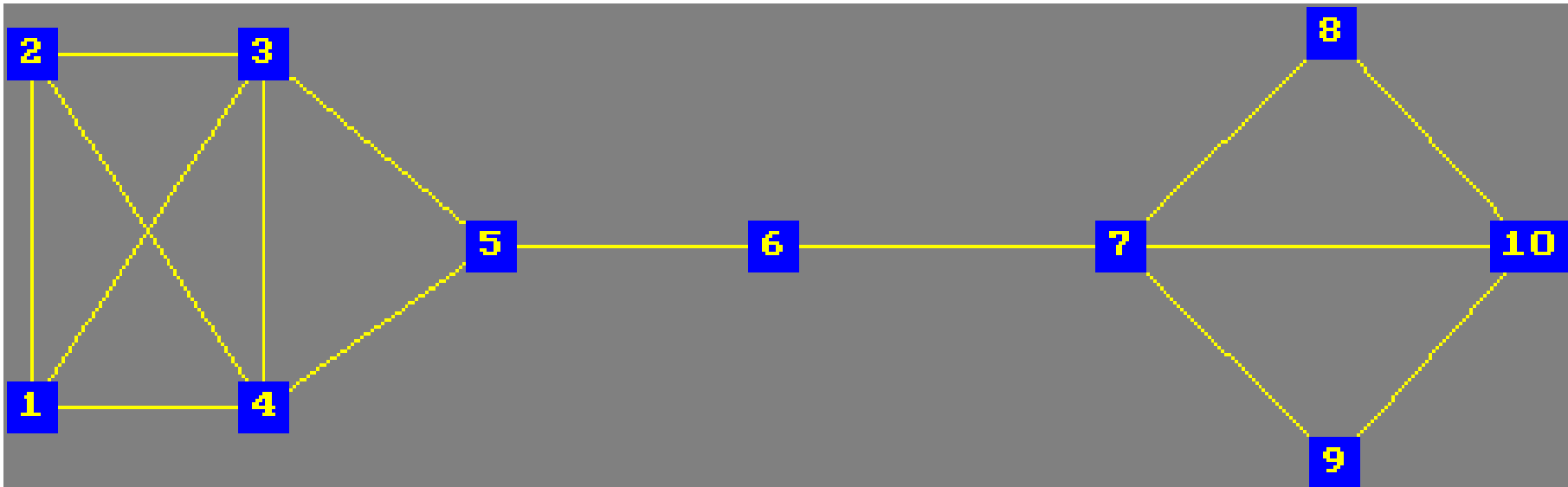
Iteratively delete the bridge with the highest betweenness to form groups- not in UCINET but part of netdraw

- K-cores

Cliques

- Maximal complete subgraph
- Undirected data
- For directed just consider reciprocal ties
- Insist cliques have at least three members

Example



Two issues

- Cliques can overlap
- Too many or too few cliques emerge
- Clique analysis usually requires a secondary analysis to analyze the cliques found.

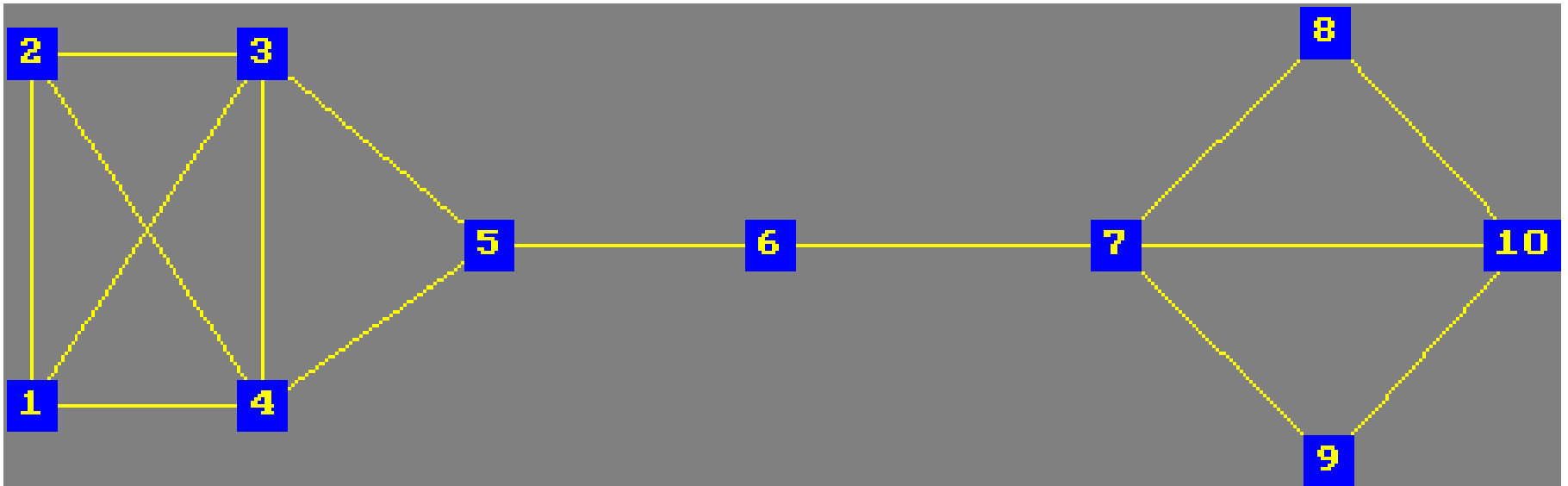
Example

Bank Wiring Room Games Data

- I1 W1 W2 W3 W4
- W1 W2 W3 W4 S1
- W1 W3 W4 W5 S1
- W6 W7 W8 W9
- W7 W8 W9 S4
- We note that although these cliques overlap there are two distinct groups, namely $\{I1, W1, W2, W3, W4, W5, S1\}$ and $\{W6, W7, W8, W9, S4\}$

Other Definitions

- Many relaxations of the clique concept
- In real data most are of no use
- Very occasionally k -plex is useful
- A k -plex is a group in which every actor is connected to everyone else with k exceptions
- A 1-plex is a clique



7,8 9 10 is a 2-plex
1,2,3,4,5 is a 3-plex

Minimum Size

- $k = 2$ Min size 3
- $k = 3$ min size 5
- Min size $2k-1$

Overlap

- A graph with 21 vertices can have as many as 2187 cliques
- Secondary analysis looks at the overlap matrices
- Two methods: form a matrix of actors which records how many cliques each pair of actors have been together in, or a matrix of cliques which records how many actors each pair of cliques has in common

Factions

- Partition the data into a pre determined number of groups
- Has a fit function which measures how well this is done and applies combinatorial optimization to improve the fit
- Computationally difficult
- User has to define the number of groups
- No overlap

6 Steps for Cohesive Subgraphs

Step 1

If not binary dichotomize the data or use MDS or clustering

Step 2

Find the components if OK stop

Step 3

If partition required go to 6 else do cliques if too few or no cliques go to step 5

Step4

Analyze overlap pattern end.

Step 5

Find k-plexes if enough go to 4

Step 6

Do Factions

Core-Periphery Models

- A core periphery structure has a single cohesive subgroup with a loosely connected group attached.
- Core members interact with other core members
- Peripheral members interact with core members.

Two approaches

- A factions type of approach ie use an optimization method to determine the core and the periphery.
- A continuous approach finding a coreness score to each actor

K-cores

- Areas in which each actor is connected to k other actors all of whom have degree at least k
- Not cohesive but cohesive groups are contained within k -cores
- Useful for large datasets

