

Network Properties of the U.S. House of Representatives

Motivation:

Our original interest in studying connections via committee assignments in congress followed both from inherent interest in the application and the feasibility of extending existing network theories via this smaller network.

- A number of possible questions about congressional structure may perhaps be addressed quantitatively in terms of standard measurements on this network/graph. In particular, following from conversations with G. Kingsley, School of Public Policy, we wanted to try to quantify changes in the structure of the House that came about due to the 1994 “Republican revolution”.
- A number of advances have been recently made in determining and understanding the structure of complex networks. Typical networks (both frivolous and of apparent application) considered by the applied math and physics communities have included power grids, web pages, movies and actors, neural network of *c. elegans* earthworms, Marvel comics superhero characters, and the board members of Fortune 1000 companies. Most considered networks, however, have been too large for some computations, such as investigating community structure in detail and applying and testing theories based on generating functions [?]. In contrast, the bipartite congressional network, with ~ 440 representatives/delegates and $O(100)$ committees and subcommittees, is significantly smaller than others (order of magnitude smaller than Fortune 1000), yet large enough to be far from trivial.

Accomplishments:

- Data on the past 8 sessions of the House obtained in pdf format from Clerk’s office website, massaged and manipulated into adjacency matrices in Matlab-useable files. These 8 sessions include 3 Democratically-controlled sessions prior to the 1994 elections, and the 5 subsequent Republican-controlled sessions.
- Different connections projected from the original bipartite graph: committee-to-committee, representative-to-representative, and projected matrices considering only major standing committees (not including their subcommittees).
- Standard network/graph properties on each were computed, including diameter, average path lengths (centrality), clustering coefficients, degree distribution. In particular, investigating structural changes following from the 1994 “Republican revolution”, including a measurable session-to-session trend in the degree distribution.

- Community structure calculated from a modification of existing algorithms [?]. In particular, the existing methodology is known to be appropriate for unipartite graphs, a key step needed to be changed for our bipartite application.
- Looked at, background reading, discussions about theory in terms of generating functions.

Future Work:

- Generating functions
- Bipartite community structure
- Power structure