MOCS Project Proposal

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We will be using a hand-constructed network of the Marvel Comic book characters and groups to examine network dynamics with random walks. The network was constructed using a bipartite matrix from an adjacency list of group membership. This actually gives us two networks: Peer to Peer (referred to as P2P) and Group to Group (referred to as G2G). We will be doing this in 3 phases:

The first phase will just be a simple examination of random walks in higher non-standard distribution dimensions (each node has non-uniform degree) to see if there are any anomalies that appear due to the changes from uniform to non uniform, or if there are not, to see why that isn't so.

The second will be an examination of random walks at different initial starting positions in a network. The starting positions will be determined using centrality (betweenness and/or eigenvector), and the goal will be to see if a random walk starting a more central position covers a greater portion of the total network compared to less central starting positions.

Finally, we will attempt to walk across the G2G network using the P2P network, in a mirrored attempt of the small-world experiment. Using the base knowledge of a P2P node's neighbors and their groups, the goal would be to select a member of a random group, and attempt to traverse the G2G network to a target group by solely moving one step at a time. Node A can only see its neighbors and their groups, and then, using weights based on group interconnectivity, attempting to move ever closer, either by reaching the target group, or by trying to move to someone who either is in the target group or would be closer than the current node. Essentially, a node has 3 moves to possibly make: if it is part of the target group, do not move. If it is neighbors with a node in the target group, move there. If it is not neighbors with any of the target group, attempt to move to the node with the best chance of having a neighbor in the target group.