Procedure of computing functionality of interdependent infrastructure networks

**Calculate pf of components**

1. Calculate PGA of nodes in both networks with distance(x,y)
2. Calculate PGV
3. Calculate pf of nodes and links
4. Calculate length of dependent links
5. Pf of dependent links

Apart from physical or functional or mutual interdependency, include geographic interdependency, this will make interdependency stochastic.

e.g.: E6: water-main breaks flooded co-located utility systems. In the

case of the World Trade Center, the water flooded rail tunnels, a

commuter station, and the vault containing all of the cables for one

of the largest telecommunication nodes in the world.

P1-determined by link length, uncertain due to the randomness in natural hazard intensity

P2-decided by length in a probabilistically.

Actually, if we consider geographic interdependency, then node A in network *I* can be interdependent to several nodes in network *j* as long as their distance is not very large. But right now, jut consider one node.

P2= ( distance *L* -1) ^2, assuming that the dependency strength is parabolically decreasing from 1 at *L*=0 to 0 at *L*=1 km.

But in this case, the edges representing geographic interdependency are bidirectional.

Future work: consider correlation between component failures.

Refs.:

Study of a multi-component system with failure interaction;

Optimal imperfect maintenance cost analysis of a two-component system with failure interactions

**System level**

Search first if the supply nodes are functional

Then search if the end

Network flow

Adjacency matrix to graph (after finding failed nodes and link with consideration of cascading failure), multiple source to single source? Barker’s RESS manuscript.

Ford-Furkson algorithm for finding the maximum flow

<https://www.geeksforgeeks.org/ford-fulkerson-algorithm-for-maximum-flow-problem/>