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An edge centrality measure based on Kemeny's constant

Given a connected graph G , Kemeny's constant $\kappa(G)$ is a parameter associated with the random walk on G that measures how easily the random walker circulates through the vertices of G . We consider a measure of edge centrality $c(\bullet)$ that is based on Kemeny's constant. In the special case that e is a cut edge of G whose deletion yields the disconnected graph $G_1 \cup G_2$, it turns out that $c(e) = \kappa(G) - \kappa(\hat{G}_1) - \kappa(\hat{G}_2)$, where $\hat{G}_1$ (resp. $\hat{G}_2$) is formed from G_1 (resp. G_2) by adding a loop at the vertex incident with e .

When G is a tree, we produce a formula for $c(e)$ that is completely combinatorial. That formula yields attainable upper and lower bounds on $c(e)$ for trees, and facilitates an analysis of the behaviour of $c(e)$ when a branch of the tree is moved.

Joint work in progress with Max Wiebe.