On the cover time of two classes of graph.

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The cover time of a graph G is the maximum over vertices $v \in V(G)$ of the expected time for a simple random walk to visit all vertices of G, starting at v. We will review what we know about this question and then focus on two recent results.

Dense Graphs: We consider abritrary graphs G with n vertices and minimum degree at least δn where $\delta > 0$ is constant. If the conductance of G is sufficiently large then we obtain an asymptotic expression for the cover time C_G of G as the solution to some explicit transcendental equation. Failing this, if the mixing time of a random walk on G is of a lesser magnitude than the cover time, then we can obtain an asymptotic deterministic estimate via a decomposition into a bounded number of dense subgraphs with high conductance. Failing this we give a deterministic asymptotic 2-approximation of C_G.

Joint work with Colin Cooper and Wesley Pegden.

Emerging Giant: Let $p = \frac{1+\epsilon}{n}$. It is known that if $N = \epsilon^3 n \to \infty$ then w.h.p. $G_{n,p}$ has a unique giant largest component. We show that if in additon, $\epsilon = \epsilon(n) \to 0$ then w.h.p. the cover time of $G_{n,p}$ is asymptotic to $n \log^2 N$.

Joint work with Wesley Pegden and Tomasz Tkocz.