Non-Asymptotic Connectivity of Random Graphs and Their Unions

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Graph-theoretic methods have seen wide use throughout the literature on multi-agent control and optimization. When communications are intermittent and unpredictable, such networks have been modeled using random communication graphs. When graphs are time varying, it is common to assume that their unions are connected over time, yet, to the best of our knowledge, there are not results that determine the number of finite size random graphs needed to attain a connected union. Therefore, this paper bounds the probability that individual random graphs are connected and bounds the same probability for connectedness of unions of random graphs. The random graph model used is a generalization of the classic Erdos-Renyi model which allows some edges never to appear. Numerical results are presented to illustrate the analytical developments made.