SOME MODELS OF REPRODUCING GRAPHS

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Pairwise relationships (social, biological etc.) within a population can be represented by a graph, in which individuals are represented as vertices and a relationship between two individuals by an edge. As such the individuals in the population reproduce and die the graph of relationships changes. We (this is joint work with Richard Southwell) model this process.

We consider the following process. The current graph is updated by adding to it a new vertex (the offspring) for each existing vertex (the parent). Each edge of the current graph is replaced by a subset of the edges of the complete graph formed on the pair of parent vertices and their two offspring; we always retain the edge between the parent vertices. Thus the "old" graph is always a subgraph of the "new" graph. The eight distinct ways in which this can be done constitute the set of models we consider (defined precisely below). In the "pure reproduction" model there is no mortality all vertices and edges, once created are immortal. In further models vertices die (and all their incident edges are removed) when they achieve a certain degree or age, while in other models interactions (games) between neighbours determine the survival.