Meeting: 998, Houston, Texas, SS 1A, Special Session on Graph Theory and Combinatorics

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Catherine Yan* (cyan@math.tamu.edu), Department of Mathematics, Texas A&M University, College Station, TX 77845, and **Robert Ellis** and **Xingde Jia**. *On Random Points in the Unit Disk.*

Let n be a positive integer, and $\lambda > 0$ a real number. Let V_n be a set of n points randomly located within the unit disk, which are mutually independent. Define $G(\lambda, n)$ to be the graph with the vertex set V, in which two vertices are adjacent if and only if their Euclidean distance is at most λ. We call this graph a *unit disk random graph*. Let $\lambda = c\sqrt{\ln n/n}$ and let X be the number of isolated points in $G(\lambda, n)$. We prove that almost always $X = 0$ when $c > 1$, and $X \sim n^{1-c^2}$ when $c < 1$. Penrose proved that with probability approaching 1 the graph $G(\lambda, n)$ is connected when it has minimum degree 1. Extending Penrose's method, we show that under the condition that $G(\lambda, n)$ is connected, there exists a constant K such that the diameter of $G(\lambda, n)$ is bounded above by K/λ. Furthermore, with a new geometric construction, we show that when $c > 2.26164\cdots$, the diameter of $G(\lambda, n)$ is bounded by $(4 + o(1))/\lambda$; and modify this construction to yield a function $c(\delta) > 0$ such that the diameter is at most $2(1 + \delta + o(1))/\lambda$ when $c > c(\delta)$. (Received March 01, 2004)