

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

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Recent Progress on Turán's Brickyard Problem: Improved Lower Bounds for the Crossing Numbers of $K_{m,n}$ and K_n .

In the earliest instance of a crossing number problem, Turán conjectured in 1945 that the crossing number $cr(K_{m,n})$ of $K_{m,n}$ is $\lfloor (m-1)/2 \rfloor \lfloor m/2 \rfloor \lfloor (n-1)/2 \rfloor \lfloor n/2 \rfloor$. By using some elementary topological arguments, we set up a quadratic optimization problem whose minimum yields a lower bound for $cr(K_{m,n})$. Although the quadratic problem is intractable because of its size, by using some very recent relaxation techniques for quadratic programming we were able to show that $cr(K_{m,n})$ is at least 0.83 of its conjectured value, for each fixed m and sufficiently large n . This also implies that the crossing number of the complete graph K_n is asymptotically at least 0.83 of its long-conjectured value. (Received March 02, 2004)