2009/2010 Seminar Series

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"I/O-efficient Rectangular Segment Search"

BY

Gautam K. Das

Post-doctoral Fellow in the Faculty of Computer Science, University of New Brunswick

We consider the I/O-efficient rectangular segment search problem in 2D. The problem involves storing a given set $\mathcal{S}$ of N line segments in a data structure such that an axis aligned rectangular range query $\mathcal{R}$ can be performed efficiently; i.e., report all line segments in $\mathcal{S}$ which intersect $\mathcal{R}$. We give a data structure requiring space $O(\frac{N}{B}\frac{\log_B N}{\log\log_B N} + \lambda/B)$ disk blocks that can answer a range query $\mathcal{R}$ using $O(\log_B N + K/B)$ I/Os, where λ is the number of intersection points among the line segments in $\mathcal{S}$, B is the number of line segments transferred in one I/O, and K is the number of line segments intersecting $\mathcal{R}$. We also consider the problem of finding all the line segments which are entirely within the rectangle $\mathcal{R}$ if the set $\mathcal{S}$ contains only vertical and horizontal line segments. For this problem, an optimal data structure is presented with size $O(\frac{N}{B}\frac{\log_B N}{\log\log_B N})$ disk blocks that requires $O(\log_B N + K/B)$ I/Os to answer the query.

Gautam K. Das received his M. Sc. degree in Applied Mathematics from the Calcutta University in 2000; and his M. Tech and Ph.D. degrees in Computer Science from the Indian Statistical Institute in 2002 and 2008 respectively. He received a national scholarship from the Government of India in 1998 on the basis of undergraduate result for pursuing higher education. Currently, he is a postdoctoral fellow in the Faculty of Computer Science, University of New Brunswick.

Wednesday, March 24th @ 3:30pm
Information Technology Center, C-317