

CMSC 420
Fall 2003
MX-Quadtree Homework

December 5, 2003

Problem 1

Letting a_{ij} and b_{ij} denote the elements of row i and column j of matrices A and B , respectively, then the transpose of matrix A is the matrix B with $b_{ij} = a_{ji}$. Give an algorithm to transpose a matrix represented by an MX quadtree.

Problem 2

How many interchange operations are needed to transpose an MX quadtree representation of a $2^n \times 2^n$ matrix so that it is not sparse (i.e., all blocks are of size 1)?

Problem 3

Compare the savings in space and time requirements when a matrix is represented as an MX quadtree and as an array. Use the time required to perform a transpose operation as the basis of the comparison. You should assume the worst case which occurs when there is no sparseness (i.e., all blocks are of size 1).