
CEE-722/822 = MSIM-695: CLUSTER PARALLEL COMPUTING (Summer'2009) COURSE
<http://www.lions.odu.edu/~skadi002>; Then CLICK appropriated course materials.

Important Notes:

- (a) Instructor has ordered (and paid, \$ 2 per taped lecture * 12 lectures) his video recorded lectures in Summer'2009 [from June 29-Aug.5'2009].
- (b) Descriptions of "EACH" of the above lecture dates are listed on the following paragraphs, which could be useful for out-of-town purposes !

Monday, June 29'2009 Lecture (6:00pm-9:45pm):
Table of Contents (ToC); MFLOPS, Parallel Speed-Up/Efficiency;
DOT/SAXPY with Unrolling Operations; MPI-FORTRAN parallel strategies
and Syntax coding for Computing "pai=3.1416", and matrix-matrix
multiplications (see ToC, and pages 1-17 on ODU web-site).

Wednesday, July 01'2009 Lecture (6:00pm-9:45pm):
Reviewing IF, DO-LOOP, DIMENSION, I/O, COMMENT, ALLOCATE/DEALLOCATE,
and special MPI-FORTRAN statements through simple "teach*fortran*mpi*.f";
Hands-on demonstration: How to compile/execute MPI-FORTRAN of
"teach*fortran*mpi*.f"; Skyline Storage Scheme (large-scale example);
Cholesky (general) 3-step $[A] \{x\} = \{b\}$. (see How to compile/execute MPI-
FORTRAN, and pages 18-26 on ODU web-site).

Monday, July 6'2009 Lecture (6:00pm-9:45pm):
Serial Cholesky (detail) skyline factorization + forward/backward solution;
Fill-in terms; Serial/Parallel_UNROLLING Choleski row-by-row factorization;
Serial/Parallel L^*D^*L _transpose row-by-row factorization (see pages 27-61
on ODU web-site).

Wednesday, July 8'2009 Lecture (6:00pm-9:45pm):
Serial/Parallel L^*D^*L _transpose row-by-row factorization;
Serial/Parallel_Unrolling Unsymmetrical Solver L^*U factorization;
Special homework: Hungarian algorithms;
Discussion on Final Project presentation topic(s); (see pages 62-75,
and 76-123 on ODU web-site).

Monday, July 13'2009 Lecture (6:00pm-9:45pm):

Parallel Distributed Choleski Solver;
"Truely Sparse" storage schemes & LDL_transpose algorithms,
Symbolic factorization (based on efficient chained list ideas);
(see pages 124-150, and 151-180)

Wednesday, July 15'2009 Lecture (6:00pm-9:45pm):

Parallel Distributed Choleski Solver ---->> C_SEND versus I_SEND;
Single_send; double_send, and sequential (or ring)_send; Single & TWICE
"block" distributed factorization;
truely sparse Unrolling strategies; numerical factorization;
(see pages 124-150, and 151-180)

Monday, July 20'2009 Lecture (6:00pm-9:45pm):

adjacency arrays + how to assemble system matrix from 1-D line Finite Element ?? (web-site page 159);
METiS reordering algorithms to minimize "fill-in" terms, METiS subroutine (web-site page 164);
Imposing known boundary conditions into $[A] \{x\} = \{b\}$; page 167
Reordering "CHESS-like" GAME (see
<http://www.lions.odu.edu/~amoha006/Fillinterms/FILLINTERMS.html>).
Domain Decomposition (DD) formulation; including METiS reordering example (web page 192-195)
General concepts about Direct versus Iterative Equation Solvers, Conditioned # of a matrix

Wednesday, July 22'2009 Lecture (6:00pm-9:45pm):

Preconditioned Conjugate Gradient (PCG) for SERIAL computer (web page 230)

DD formulation + imposing boundary conditions under DD; 2-D truss example + PCG + PCG within DD
(Based on a subset of Duc's book; part3.doc; pages 307-422)

Monday, July 27'2009 Lecture (6:00pm-9: and 5pm):

Parallel DD applications in acoustic and structures;
(Based on a subset of Duc's book; part3.doc; pages 307-422)

DD Example #1 (see web page, item #8)

Explain why using PCG, user only needs to create 1 small 2-D array (size = element stiffness matrix) to save computer memory.

Indefinite Sparse Solver, case 1: bottom right matrix is a 1x1 [zero] matrix

(based on a subset of Duc's book, part2.doc; pages 166-178)

Wednesday, July 29'2009 Lecture (6:00pm-9:45pm):

Indefinite Sparse Solver, case 2: bottom right matrix is a 2x2 [zero] matrix
Gershgorin's theorem; NASA-Boeing indefinite example data performance
(based on a subset of Duc's book, part2.doc; pages 166-178)

Parallel DENSE solver with matrix*matrix + unrolling + stride etc... strategies (web page 196)

Generalized Eigen-Solver: by determinant polynomial function, Inverse & Forward Iteration,
Using eigen-vectors to UNCOUPLE 2-nd order ODE equation of motion, including 2 initial conditions,
(based on a subset of Duc's book, part2.doc; pages 295-317)

Monday, August 3'2009 Lecture (6:00pm-9:45pm):

Shifted eigen-problems; Standard and Generalized Jacobi iteration, Subspace Iteration,
Subspace Iterations with DD formulation;
(based on a subset of Duc's book, part2.doc; pages 295-317)

Wednesday, August 5'2009 Lecture (6:00pm-9:45pm):

Students' FINAL PROJECT (parallel processing applications) PRERSENTATIONS !
