CISC 372: INTRODUCTION TO PARALLEL PROGRAMMING
Fall 2006
Midterm Exam Study Guide
Midterm Time and Date: classtime on Thursday, October 19, 2006

1 References

- Lectures notes from start of course through October 17.
- Textbook: all readings posted on course schedule web page through October 17.
- Beginner's Guide to MPI on the University of Delaware Cluster: introduction, getting started, and basics of writing MPI programs.
- Individual Labs 1, 2, 3.
- All inclass handouts through October 17.
- Review game.
- Weekly quizzes.

2 Topic Coverage

- analyzing a problem for its potential parallelization opportunities
- phases of parallel programs: distribution, computation, results gathering
- determination of an approach's communication and load balancing characteristics
- parallel algorithm models: data parallel, function/task parallel, pipelining
- (kinds of problems best suited for each model)
- SPMD style programming versus MIMD style
- task dependency graphs
- basic MPI program components and format and purpose of each component
- standard message passing in MPI - send and receive
- Foster's design methodology
- domain decomposition (row-block, column-block, cyclic) and consequences in communication over a grid domain
- collective communication: broadcast, reduce, scatter(v), gather(v)
- allgather(v), allreduce, alltoall(v)
- case study on numerical integration

3 Format of Exam

The exam is closed book, closed neighbor and you will have the full class period to work. You will be given a list of relevant MPI commands with their parameters (with types) for reference. You do not have to memorize the order of parameters for each command. You need to be familiar with how to call the commands using each of the parameters, so you need to understand what each parameter typically holds. In general, the exam will be a combination of testing your basic knowledge and understanding of the concepts covered in class and application of the concepts. The questions will be of the form:
- Short answer.
- Briefly describe a parallel algorithm for a particular problem, using a particular model of parallel computing.
- Explain what will happen when a particular code segment is executed.
- Write a short (5-10) line MPI program, given a list of MPI commands with parameters.
- Compare two different approaches to parallelizing a problem in terms of its communication or load balancing characteristics.
- Write a call to an MPI command to achieve some described action.
- Choose between data distributions and justify the choice.

- Choose between parallelism models for solving a particular problem.
- Draw pictures of memory contents after certain operations have been performed.
- Choose between different communication mechanisms to achieve a certain data distribution/result gathering.

The questions are NOT multiple choice. Instead, partial credit will be given when possible on any question in the exam.

4   How to Study

Review your lecture notes, labs, and textbook chapters. Try doing some of the kinds of tasks specified above that might be part of the assessment.