Problem set 1 - Theory

Øyvind Robertsen

September 2, 2015

1 GENERAL THEORY

1.1 FLYNN'S TAXONOMY

	Single Instruction	Multiple Instruction
Single Data	A single processing unit performing one instruction at a time on a single data element. (SISD)	Multiple processing units performing different instructions on the same data element. (MISD)
Multiple Data	Multiple processing units performing the same instructions on different data elements in parallell. (SIMD)	Multiple processing units performing different instructions on different data elements. (MIMD)

Additionaly, MIMD is often subcategorized into SPMD (Single Program, Multiple Data) and MPMD (Multiple program, Multiple Data). SPMD refers to executing the same program across several processes, each operating on different datasets. MPMD, on the other hand, executes at least two different programs, often in a host/node or manager/worker configuration.
MPI falls under SPMD in this categorization. We instantiate several processes of the same program, where each process itself decides its behavior based on its rank.

1.2 SHARED MEMORY

On shared memory systems, all cores share access to the computers memory. MPI processes running on such a system defaults to using shared memory to facilitate message passing between processes.

1.3 DISTRIBUTED MEMORY

On distributed memory systems, each core has its own, private memory. MPI processes running on these systems uses network interfaces to facilitate message passing between processes.

2 CODE THEORY