MVP Assignment 4 - MPI

Due date: 28/4/2010

1 OpenMP

The idea is to parallelize the matrix multiplication with OpenMP in a very easy way.

Exercise 1: Copy `pmatrix.c` from your previous assignment.

Q: *Parallelize the rearranged and the block-matrix multiplications using OpenMP.*

```

/* Your relevant code goes here. */
```

Listing 1: Your OpenMP implementation.

2 MPI

Exercise 2: Warm-up with a hello-world program.

Q: *Complete the hello-world program so that every process prints its rank and the size of the (world) communicator.*

```
/* The whole file goes here. */
```

Listing 2: Your hello-world implementation.

Exercise 3: You will experiment blocking and non-blocking communications and deadlock issue. The goal is to have all processes starting with sending to the next process in the ring its own rank (times n). Then the processes forward the messages around *size* times.

Q: *Complete the cycle-mpi program with MPI_Send.*

Exercise 4: As it turns out, the OpenMPI manual states "This routine will block until the message is sent to the destination." whereas the LAM manual says " This function may block until the message is received. Whether or not MPI_Send blocks depends on factors such as how large the message is, how many messages are pending to the specific destination, whether LAMD or C2C communication is being used, etc.".

Q: *Experiment with n to see when the sending becomes really blocking and find the deadlock.*

Q: *Fix the deadlock by breaking the cycle-dependency.*

Exercise 5: It is possible to break the deadlock by using non-blocking communication instead.

Q: *Fix the deadlock by using the non-blocking MPI_Isend.*

```
/* Your relevant code goes here. NOT the whole file. */
```

Listing 3: Cycle 1: Blocking, deadlock.

```
/* Your relevant code goes here. NOT the whole file. */
```

Listing 4: Cycle 2: Blocking, no deadlock.

```
/* Your relevant code goes here. NOT the whole file. */
```

Listing 5: Cycle 3: Non-blocking, no deadlock.

3 Authors

I/We have solved these exercises independently, and each of us has actively participated in the development of all of the exercise solutions.

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