Homework 4 of CS 3211, 2010, Total 10 marks [Posted on Wednesday March 31]

Please submit in the IVLE workbin by **Thursday 22 April 2010 before 11:59 PM**. **Kindly note that there will be no extensions. If you are not finished by the deadline, please submit whatever partial answer you may have - this is better than not submitting at all. Only submissions in the IVLE Workbin will be graded. Submissions sent by e-mail, unfortunately, cannot be considered.**

Upload one single zip file containing all the files including the programs (.c files) . Also include a README.txt file in the zip which will say what each file contains.

If your tutor is Seth, upload your file to the folder ***HW4-Seth***

If your tutor is Dawei, upload your file to the folder ***HW4-Dawei***

If your tutor is Abhik, upload your file to the folder ***HW4-Abhik***

MPI usage instructions

Beginning with MPI: *refer to the file* ***tembusu-MPI-access.pdf*** *in* ***Workbin\Assignments*****.**

Please only use access node 0- 4, do not use any other access node or computing node.

Let your program be cpi.c

MPI program running over Ethernet (MPICH)
[user@access0]$ /opt/mpich/bin/mpicc -c cpi.c
[user@access0]$ /opt/mpich/bin/mpicc -o cpi cpi.o

For MPICH, create a machine file that looks like this. Call it "mynodes" for example

```
access0
access1
access2
access3
access4
```

Run binary MPI program (MPICH)
[user@access0]$ /opt/mpich/bin/mpirun -machinefile mynodes -np 8 ./cpi

Question 1 [6 marks]

A frequently used operation is parallel computing is prefix sum. Given a sequence of numbers x0, x1, …, xn, prefix sum computes all the partial sums as follows:

s0 = x0
s1 = x0 + x1
s2 = x0 + x1 + x2
: : :
sn = x0 + x1 + … + xn

Write an MPI program to compute parallel prefix sum. Use the algorithm described in Figure 2 of the paper Data Parallel Algorithms" by Hills and Steele, see

http://cva.stanford.edu/classes/cs99s/papers/hillis-steele-data-parallel-algorithms.pdf

For simplicity, you can assume the length of sequence and number of processes (specified by –np) are the same. Submit the C source code to compute prefix sums, as well as sample output.

Question 2 [4 marks]

Consider a collection of processes, where each process has an array of 10 integers. For each of the 10 locations, compute the smallest value, and rank of the process containing the smallest value. Submit the C source code as well as the sample program output.