Lab Session 09

Tutorial llnl
MPI The complete Reference

Home exercises

1. **[10p]** Write an MPI program with two processes.
    - Process one sends a value to process two.

Lab Exercises

1. **[20p]** Extend the previous program and make it send a vector of 100 elements
2. **[10p]** Write and MPI program with four processes.
    - Process one sends a value to all others
3. **[10p]** Extend the previous program so that process one broadcasts a vector of 100 elements.
4. **[10p]** Write a program with MPI that uses 4 processes. Process 0 initializes a vector v[i]=i. The vector is scattered to all processes. All 4 add the value 42 to the elements corresponding to their part of the vector. The resulting vector should then be gathered to process 0 and printed.
5. **[10p]** Write a program with MPI with N processes. Process 0 sends a value to 1. All other processes receive the variable, add 2 to its current value and send it to the next one. The last sends it process 0, forming a circle. At every step the variable should be printed.
6. **[10p]** Write an MPI program with four processes.
    - Three processes send a value to the fourth one.
    - The fourth process receives the value using MPI_ANY_SOURCE.
    - Print who sent the value, making use of MPI_Status.
7. **[10p]** Write an MPI program with two processes.
    - Process one sends values to the second process with different tags.
    - Process two receives the values using MPI_ANY_TAG.
    - Print the tag matching the value by making use of MPI_Status.
8. **[10p]** Calculate Pi in parallel using the Monte Carlo algorithm.
    - Generated random points inside a square.
    - Number how many points fall inside the circumscribed circle of the square.
    - The ratio between the total number of points and the number of points inside the circle can be used to calculate Pi
    - It makes all the math simpler if the square is centered at 0 and has an edge of 2.