NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA SURATHKAL
DEPARTMENT OF INFORMATION TECHNOLOGY

IT 301 Parallel Computing LAB 10

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1. In a smart agriculture system in a large area like a state, sensors are deployed to collect temperature and humidity. The sensed information are stored in a server in the cloud. A query on calculating the average temperature and average humidity of the complete state needs the processing of 10 lakh data elements. Write a parallel program using MPI in which N number of processes run in parallel to calculate the average of 10 lakh elements stored in an array, in order to improve response time. Compare the execution time with sequential code.

a) Note: You may use number of elements to be smaller than 10 lakh for testing, as you have to initialize that many elements.

b) Justify the usage of MPI routines used in the program with clear comments. [2 marks]

c) Code, results and analysis [3 marks]

2. Consider random deployment of sensor nodes in field to sense the environment. The nodes are deployed randomly and the position of each sensor node is sent to centralised server. The server would like to cluster these nodes. Use K-means algorithm to cluster the nodes. Write an MPI program to cluster the sensor nodes and compare the result with sequential and OPENMP approach.

For implementation consider the following things.

a) Assume 1000 sensor nodes are deployed in 1000m x 1000m area. Generate the position of each node using random function. [Already done in Lab 7]

b) Implement the algorithm to make 2 clusters, 4 clusters and 8 clusters. Compare the result with sequential algorithm. [2 Marks]

c) Using some graphical tools, plot the clusters and positions of each node. [1 Mark]

d) Program Code with comments on MPI routines used and results [2 Marks]