Lab Practice - V

Assignment No. 03

Title :- Implement min, max, sum and Average Operations using Parallel Reduction.

Objective :- To understand the concept of parallel Reduction and how it can be used to perform basic mathematical Operations on given datasets

Prerequisite :- 1. Parallel computing architectures
2. Parallel computing models
3. Proficiency in programming languages.

Contents For theory :-

1. What is parallel reduction and its usefulness for mathematical operations on large data ?
2. Concept of OpenMP
3. How do parallel reduction algorithm for Min, Max, Sum and Average work, and what are their advantages and limitations.

Theory :-

Parallel Reduction :

Here's a function wise manual on how to

understand and run the sample c++ program that demonstrates how to implement Min, Max, Sum and Average Operations Using Parallel reduction

1. Min_Reduction Function:

- The function takes in a vector of integers as inputs and finds minimum value in the vector using parallel reduction
- The OpenMP reduction clause is used with the "min" operator to find the min value across all threads.
- The final minimum value is printed to the console.

2. Max_Reduction function:

- The function takes in a vector of integers as input and finds the maximum value in the vector using parallel reduction.
- The OpenMP reduction clause is used with the "max" operator to find the maximum value across all threads.

3 Sum_Reduction function

- The maximum value found by each vector of integers as inputs and finds the sum of all values in vector using

parallel reduction

- The OpenMP reduction clause is used with the "+" operator to find the sum across all threads.
- The sum found by each thread is reduced to the overall sum of the entire array.

4. Average Reduction function

- The function takes in a vector of integers as input and finds the average of all the values in the vector using parallel reduction
- The sum found by each thread is reduced to the overall sum of the entire array.

5. Main Function

- The Function initializes a vector of integers with some values
- The function calls the min_reduction, max_reduction, sum_reduction and average_reduction functions on the input vector to find corresponding values.

6. Compiling and running program:-

Compile program: To compile program you need a compiler supporting OpenMP such as

clang or g++. Then compile the program using following command:

```
$ g++ -fopenmp program.cpp -o program
```

This command compiles your program and creates an executable file named "program"

Run the program:- Simply type the name of executable file in the terminal and press Enter:

```
$ ./program
```

Conclusion: Thus we have implemented the min, Max, Sum and Average operations using parallel reduction in C++ with OpenMP