Assignment 3

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Aim:-

Implement min, max, sum & average operations using parallel reduction.

Objectives:-

To understand the concept of parallel reduction & how it can be used to perform basic mathematical operations on given datasets.

Pre-requisites:-

1. Parallel computing architecture.
2. Parallel programming model.
3. Proficiency in programming language.

Theory:-

Parallel Reduction:

Parallel reduction, also known as parallel prefix or parallel scan, is a technique used in parallel computing to perform associative binary operations on set of data elements.

In parallel reduction, dataset is divided into smaller chunks, operations are performed simultaneously on these chunks in parallel. The partial result obtained from each chunk are then combined iteratively until final result is obtained.

This technique is particularly useful in mathematical operations involving large datasets because it allows for significant speedily.

Here's function-wise manual on how to understand and run sample c++ program & demonstrate how to implement min, max, sum & average operations using parallel reduction.

1) Min - Reduction function:
- The function takes in vector of integers as input & finds the maximum value in the vector using parallel reduction.

2) Sum reduction function:
- This function takes in vector of integers as input 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 the threads.

3) Max reduction function:
The function takes in vector of integer as input & finds the minimum value in the vector using parallel reduction.

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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.

5) Main function:
- It initializes vector of integers with some values.
- It calls the min reduction, max reduction, sum reduction & average reduction on the input vector to find corresponding values.

Compile and running the program :-
You need to use a c++ compiler that supports OpenMP, such as g++ or clang
Open a terminal and navigate to the directory where your program is.
The '-fopenmp' flag tells the compiler to enable openMP.
Run the program.
To run program, simply type the name of the executable file in the terminal & press enter.

Conclusion:-
Thus, we have successfully implemented Min, Max, Sum, Average operations using parallel reduction technique.