National University of Computer and Emerging Sciences-FAST Karachi Campus



PDC Project Proposal

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Section: C (PDC)

**Matrix Multiplication In-Parallel Using Open MP API**

**Introduction:**

This project discusses the ability to utilize parallel processing to solve the problem of matrix multiplication, especially multiplying two matrices of the squared size of MxM of randomly generated numbers. Which is simply consisting of applying multiple dot products between the rows and the columns of the two matrices.

The matrix multiplication is defined as a binary operation that produces a matrix from two matrices. One condition for the operation to be applied, the number of columns in the first matrix must be equal to the number of rows in the second matrix. The resulting matrix, known as the matrix product, has the number of rows of the first and the number of columns of the second matrix. The product of matrices A and B is then denoted simply as AB or A · B. Matrix multiplication falls under linear algebra, and fortunately, it is a very suitable operation for parallel processing. Parallel processing is a method in computing of running two or more processing units, by dividing the problem into sub-problems, and each processing unit process a portion of the problem. By doing so, will help reduce the amount of time to run a program. Parallel processing is commonly used to perform complex tasks and computations.

So, the aim of this project is to use the power of parallel processing on applying matrix multiplication in different sizes of matrices and a different number of processing units. Parallel processing can be utilized using multiple schemes, such as MPI, OpenMP, and more.

**Methodology:**

The project follows the OpenMP scheme, since it uses shared memory as a way of communicating between processing units, which makes it easier for the programmer to use parallel processing. On the other hand, MPI uses message passing to communicate among processing units, which leads to more effort at the programmer side

**Programming Platform Used:**

* Language: C Programming
* OS: Ubuntu