ASSIGNMENT - 5

SIMPLE MULTITHREADER: An Updated SimpleLoader in C

Link to GitHub: https://github.com/shrutya22487/OS_Assignment_5.git

IMPLEMENTATION:
The provided program facilitates the parallelization of computations through multi-threading. It includes functions for 1D (vector) and 2D (matrix) parallel loops, utilizing Pthreads. The code measures and outputs execution times, enhancing performance by applying user-defined lambda functions to indices or pairs in specified ranges concurrently.

1. get_time():

Returns the current time in milliseconds using the gettimeofday() function. It converts the seconds and microseconds obtained from the system time into milliseconds and returns the result.

2. thread_args_1D and thread_args_2D:

Structures defining the arguments for 1D and 2D thread functions, including the range (low and high indices) and lambda functions to be applied in parallel.

3. *thread_func_1D(void ptr) and *thread_func_2D(void ptr):

Takes a pointer to a thread_args_1D structure, iterates over the specified range, and applies the provided lambda function to each index in parallel.
Takes a pointer to a thread_args_2D structure, iterates over the specified 2D range, and applies the provided lambda function to each (i, j) pair in parallel.

4. parallel_for():

Executes a 1D and 2D parallel loop by dividing the range [low, high) into NTHREADS chunks. It creates and joins threads, each working on a separate chunk, applying the provided lambda function to each index in parallel in 1D and each (i, j) pair in parallel in 2D.

CONTRIBUTIONS:
Swara Parekh (2022524):

- Implemented the get_time function to measure and retrieve the current time in milliseconds using gettimeofday().

- Defined the thread_args_1D structure to encapsulate arguments for thread functions.
- Implemented the thread_func_1D function, handling parallel execution of a 1D loop with a provided lambda function.
- Contributed to the implementation of the parallel_for function for 1D parallelization.

Shrutya Chawla (2022487):

- Implemented the thread_func_2D function, managing parallel execution of a 2D loop with a provided lambda function.
- Defined the thread_args_2D structures to encapsulate arguments thread functions.
- Contributed to implementing the parallel_for function for 2D parallelization, incorporating the 2D thread function.
- Contributed to the structure and design of the main program, including the main function that calls user_main.