SIT315- Seminar 5- Multithreading - OMP

Overview

Form a group of 5-6 students and work on the following activities.

Submission Details

Each student should submit the answers in the onTrack individually. Please write the names of all of your group members in the first page of your submission.

Activity 1 - Parallel Vector Addition- OMP

In the resources, you have been provided with a simple vector addition program. In last week seminar, you implemented a parallel version of this program using pthread/std::thread library. In this activity, you need to:

1. Modify the sequential program to use OpenMP to achieve parallelism using `omp parallel` and `omp for` directives.
2. Evaluate the performance of the OpenMP implementation vs pthread implementation vs the sequential program. Discuss your findings.

Activity 2 - Parallel Vector Addition part 2- OMP++

Continue with the previous vector addition example and

1. Add the `default(none)`attribute to the `#pargma omp parallel` directive. Compile and run your code. If you get any compilation error, try to identify the reason. As required, add any of the `shared, private or firstprivate` attributes to fix the compilation error. Try different variations of data sharing (e.g. `shared(size) private(v1) or private(size) shared(v1) or ...`). Is the outcome of your program different? Explain why.
2. Compute the total sum of all the elements in v3 using a shared variable called total and `atomic update` directive.
3. Use the reduction clause to compute the total sum of all the elements in v3.
4. Implement an alternative version where each thread computes its own part to a private variable and then use a critical section (`#pragma omp critical`) after the loop to calculate the total sum. Do you get the exact same results in all cases?
5. Try different OpenMP Scheduling techniques by adding `schedule(type[,chunk])` attribute to `#pargma omp for` directive. Experiment with the chunk size to understand how each Scheduling technique works. Does changing the scheduling techniques or chunk size impact the execution time. Briefly explain your observations.

After finishing these activities, use the remaining time of the seminar to work on TaskM2.T1p individually. You can find the task description from OnTrack.