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CS 007 - Parallel Computing

Assignment 2.1 Parallel Algorithms

1. **Parallel Algorithm**
   A parallel algorithm divides duties among numerous processors to perform multiple processes at once. The goal of this method is to outperform sequential algorithms in the solution of complicated computational problems. It takes advantage of processes running concurrently to produce quicker outcomes.

2. **Concurrent Processing**
   Multiple processes are executed simultaneously during concurrent processing, and their interleaving can be unpredictable. In a multitasking setting, this technique enhances system performance and resource utilization. It permits the advancement of several tasks without requiring them to run simultaneously.

3. **Multiprocessors**
   In multiprocessor systems, two or more CPUs collaborate to complete tasks while sharing a common memory area. By splitting up the burden among several processors, these systems allow for speedier data processing. Applications that benefit from parallel task execution and demand high-speed processing are a good fit for them.

4. **Multicomputers**
   A multicomputer is made up of several separate computers connected by a network, each having its own operating system and memory. These systems work together to complete a shared task by breaking it up into distinct subtasks. They work especially well for applications that may be divided into more manageable, standalone procedures.

5. **Distributed system**
    A distributed system is a network of autonomous computers that communicate and coordinate their actions by passing messages. Designed to achieve a common goal, these systems handle varying levels of communication latency and potential faults. They enable resource sharing and task coordination across multiple machines.

6. **Time Complexity**

   Time complexity, a concept in parallel computing, gauges an algorithm's effectiveness by comparing its execution time per processor to the length of time it takes to solve a given task. It offers information about the algorithm's potential for acceleration and scalability. Optimizing the performance of parallel algorithms is made easier with an understanding of temporal complexity.

7. **Data parallelism**

   By dividing up the data among several processors, data parallelism enables the same operation to be carried out simultaneously on various data sets. This technique uses simultaneous computations to speed up processing times for large datasets. It works especially well for tasks that can be applied consistently across big data sets.

8. **Hybrid algorithm model**

   Elements of several parallel computing models, including task and data parallelism, are combined in the hybrid algorithm concept. This method seeks to maximize resource usage and performance for particular kinds of issues. It may meet the varied needs of intricate applications by combining several models.

9. **Point-to-Point Communication**

   Coordinating tasks and exchanging information across processor pairs is made easier using point-to-point communication, which transfers data directly between them. For effective data interchange in distributed and parallel systems, this technique is crucial. It facilitates the preservation of coherence and synchronization amongst processors engaged in shared tasks.

10. **Hypercube Network**

    A hypercube network is a kind of parallel computing network topology in which all of the processors are connected to one another in a way that creates an n-dimensional cube. Effective communication and scalability are made possible by this design, which reduces the number of connections required for data flow between processors. Communication channels with low latency and robustness are characteristics of hypercube networks.

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"I affirm that I have not given or received any unauthorized help on this activity, and this work is my own."

- Johan Santos