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## **Research Topic**

Developing the full potential of Parallel Computing

## **Research Problem**

How can we take advantage of parallel computing to execute existing serial algorithms?

## **Problem Statement**

Given a set of existing serial algorithms, construct a set of techniques that enable existing serial algorithms to run on a parallel computing environment.

Where a serial algorithm is a well know algorithm that was conceived to be executed in a single thread of operation.

A parallel computing environment is understood to be multiple independent processes executing simultaneously to produce a single result.

## **Problem Description**

As processors appear to be reaching a computational limit, multi-core and multi-processor machines are becoming an increasingly popular way to improve performance. In order to fully take advantage of these machines, however, we need to start thinking in parallel and begin adapting existing serial algorithms. We also need to be able to analyze the parallelized computational complexity of these new algorithms and implementations.

## **Computer Science Perspective**

Parallelism is an extremely important and interesting problem in computer science. Concurrency and message passing are just two examples of the kinds of complex problems faced in parallel systems.

## **Disciplines actively involved**

- Mathematics
- Statistics

## **Description of Disciplines Involved**

To prove that an algorithm will yield the exact same result, many times scientist construct mathematical proofs with the aid of mathematicians.

The execution of the process is sometime dictated by probability, so statistics and it child discipline probability are always heavily involved.

## **References**

Presenter web page:

<http://www.cs.cmu.edu/~guyb/>

Publications on parallel algorithms:

<http://www.cs.cmu.edu/~guyb/research.html#algorithms>

Multiprocessor Garbage Collection:

<http://www.cs.cmu.edu/~guyb/research.html#gc>

**By:** Jamie Olson

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