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HPC ASSIGNMENT 1

TITLE:

a] Implement parallel reduction using min, max, sum & average operations.

b] Write a CUDA program that given an N element vector, find:

i] The minimum ~~vector~~ element in vector.

ii] The maximum element in vector.

iii] The arithmetic mean of vector.

iv] The standard deviation of values in vector.

Test for input N & generate a randomized vector V for length N (N should be large). The program should be able to generate output as the two computed maximum value as well as the time taken to find each value.

OBJECTIVES:

1] Understand data parallel model of computation.

OUTCOMES:

1] Design & implement parallel programs using CUDA.

2] Differentiate between code written for host & code written for device.

THEORY:

1] Cuda is a parallel computing platform & programming model that enables dramatic increases in computing performance.

2] Since its introduction in 2006, cuda has been widely deployed through thousands of

applications & published in research papers & supported by a hundreds of millions of Cuda enabled GPUs.

Parallel Reduction:

i] Reduce is a collective communication primitive used in the context of parallel programming model to combine multiple vectors into one, using associative operator.

ii] Every vector is present at a distant processor in the beginning.

iii] The goal of the primitive is to apply the operator in the order given by the processor - induces to the vector until only one is left.

ALGORITHM:

1] Read the size of vector N & read the numbers in the vector randomly.
2] Read the start time.
3] Using kernel <<<...>>> function in CUDA, transfer the data to device, parallelize your code for given size of vector. Properly define size of grid block & thread.
4] Read end time.
5] Display execution time as end time - start time.
6] Apply it for various sizes of vector & compare execution with serial program.

CONCLUSION:

The concept of parallel reduction operation in parallel programmis studied & implemented successfully for given problem statement.