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INSTITUTE OF COMPUTER SCIENCE

CMSC 180: Introduction to Parallel Computing
Second Semester 2022-2023

Laboratory Exercise 01 Part 1

Interpolating the elevations into a higher resolution digital elevation matrix M given a lower resolution digital elevation matrix N

Research Activity: Write a computer program using the programming language of your choice to interpolate the unknown elevation of all the grid points of a $n \; x \; n$ matrix M. Just randomize the elevation of grid points that are divisible by 10.

Exercise Specifications

Write the main program lab01 that includes the following:

1. Read n as a user input (maybe from a command line or as a data stream)
2. Create a zero $n \; x \; n$ square matrix **M.** Assigned a randomized non-zero value (1-1000) to grid points divisible by 10 such (0,0), (0,10), (10,0), (20,0),(10,10) …… You can use a function for this but the running time of this will not be considered in the $time\_elapsed$
3. Take note of the system $time\_before$;
4. Call your function $terrain\_inter\ (M)$;
5. Take note of the system time $time\_after$;
6. Obtain the elapsed $time\_elapsed \; = time\_after \; - \; time\_before$;
7. Output the $time\_elapsed$
8. (*Optional*) You can output the resulting matrix.

For example, for computing the matrix of a 100x100 square matrix M:

$ lab01 < 100

$ time elapsed: 10.2345 seconds

Note: used float data type to get the exact interpolated value.

Submit your code through the Google Classroom Laboratory Exercise 01 Part 1 portal.

References

Kidner, D., Dorey, M., & Smith, D. (1999). What's the point? Interpolation and extrapolation with a regular grid DEM. In *Proceedings of the 4th International Conference on Geocomputation: Mary Washington College : Fredericksburg, Virginia : 25-28 July, 1999* (-). GeoComputation CD-ROM. http://www.geocomputation.org/1999/082/gc_082.htm

Terrain Elevation Interpolation. (1999). SoftWright. Retrieved January 19, 2023, from https://www.softwright.com/faq/support/Terrain%20Elevation%20Interpolation.html