**מחשוב מקבילי ומבוזר**

תרגיל #5

**The purpose of this exercise is to have experience with heterogeneous environment MPI + OpenMP + CUDA**

Calculate the histogram of the very large array of integers using MPI + OpenMP + CUDA environment.

**Requirements**:

* Run two processes
* The given array **A** of **N** integers is known to one of these processes, say process **0.** This process reads values of **A** from the given text file. The first line of the file contains a value of **N**, following lines contain one member of **A** per line.
* The purpose of the application is to calculate how many are members of **A** for which the given function f(A[i]) is positive.

**#define HEAVY 10000**

**double f(int i) {**

**int j;**

**double value;**

**double result = 0;**

**for (j = 1; j < HEAVY; j++) {**

**value = (i+1)\*(j%10);**

**result += cos(value);**

**}**

**return cos(result);**

**}**

* Process **0** sends half of the array **A** to process **1**
* Both processes work on their parts of **A** concurrently, using **OpenMP** for the first portion of the part and **CUDA** for the second
* Process **1** sends the result for its part to process **0**
* Process **0** combines and displays result of all computations

**Grading Policy**:

* **10 points** for code quality:
  1. The code has to be divided into small functions (not more than 40 lines of code).
  2. Use meaningful names for variables, functions, files, constants.
  3. Place enough comments to understand the code
  4. No unused lines of code. Don't repeat the code – use functions!
  5. Write README.TXT file if special instructions are needed to run the solution. The file has to be in the root folder of the solution.
* **70 points** – for proper implementation of the requirements.
* **20 points** – for Load Balancing
* The Homework must be delivered in time. No delay will be accepted.

**Restriction:**

* Each CUDA thread may calculate only one value of f(x).
* The value of N is bigger than 100000 but less than 500000

**Important:**

* The homework may be performed in pairs. Each member of the pair has to submit the solution through the Moodle. The whole project have to be zipped and named as

**111111111\_222222222.zip**

Where **111111111** is ID of the one student and **222222222** is Id of another student.

בהצלחה