CONCORDIA UNIVERSITY

DEPARTMENT OF
COMPUTER SCIENCE AND SOFTWARE ENGINEERING

COMP 426, Fall 2019 Instructor: R. Jayakumar

PROJECT

Issued: Nov. 5, 2019 Due: Nov. 25, 2019

Note: *This project should be done individually and submitted electronically.*

Multicore Implementation of 2D Bouncing Balls Simulation using OpenCL

In this project, you are going to implement the 2D bouncing balls simulation from the assignments using OpenCL to run in parallel on both the CPU and the GPU. You should compute the positions of all the balls in each image frame and display the updated frame image on the screen by appropriately calling OpenGL from OpenCL. Specifically do the following.

- Starting with the control flow of the 2D Bouncing Balls simulation (from the assignments), divide the work to run on the CPU (which is good for task parallelism) and on the GPU (which is good for data parallelism). The goal of your work division should be to minimize data transfer between the CPU's host memory and the GPU's device memory as well as to minimize (completely avoid, if possible) any synchronization.
- Develop the kernel code for the CPU and the kernel code for the GPU according to their designs.
- Develop the necessary host program to run on the CPU which will control and coordinate the two kernel programs running on the CPU and GPU. Also implement the necessary OpenGL calls from OpenCL to display the image frame on the screen.

Your OpenCL program should be as portable as possible so that it can run on different workstations with minimal changes. You have to demo the program in the lab and your project will be marked on the basis of this demo.

Your submission should include the source code of your implementation and a report describing (1) how you divided the work between the CPU and GPU minimizing data movements and synchronization, (2) how your kernel codes for the CPU and GPU perform the corresponding computation, and (3) how the host program guarantees correctness and performance.

Submission Format for Project

Create one zip file, containing the necessary source-code files and the report. Your zip file should be called P_studentID, where studentID is your student ID number.