

Homework Assignment 10 – due on Saturday, December 7 (Midnight)

Description of Assignment:

Complete the CUDA program (area.cu) which computes the area (using the trapezoidal rule) under the curve of a graph $f(x)$ shown in the following figure. Your program should measure execution time using `cudaEvent` and calculate GFLOPS. In the program, use **double** and **long** for variables. Use `#segments ≤ 100000` for tests.



$$f(x) = \frac{9x}{(x^3 + 1)^2}$$

<pre> #include <stdio.h> #include <unistd.h> #include <pwd.h> #define MAX_THREADS 256 #define gflops(n,ms) (((n*18.0)/(ms/1.0e+3))/1.0e+9) __device__ double f(double x) { // (1) COMPLETE } __global__ void area_kernel(double *local_area, long N, double a, double b) { double dx, x; long i = blockDim.x*blockIdx.x+threadIdx.x; int half; extern __shared__ double sdata[]; // (2) COMPLETE } int main() { double *local_area, *local_area_d, area, a, b; long N; int nt, i, smsize, dev; cudaEvent_t start, stop; float elapsed; cudaDeviceProp deviceProp; if (argc != 3) { fprintf(stderr, "usage: %s #segments #threads\n", argv[0]); exit(1); } N = atol(argv[1]); nt = atoi(argv[2]); </pre>	<pre> if (nt > MAX_THREADS) { fprintf(stderr, "%d threads are used.\n", MAX_THREADS); nt = MAX_THREADS; } dim3 dimBlock(nt); dim3 dimGrid((N+dimBlock.x-1)/dimBlock.x); smsize = sizeof(double)*nt; dev = (getpwuid(getuid())->pw_name[3]-'0')%2? 1: 0; cudaSetDevice(dev); cudaGetDeviceProperties(&deviceProp, dev); printf("Device(%d) used: \"%s\"\n", dev, deviceProp.name); local_area = (double*)malloc(sizeof(double)*dimGrid.x); cudaMalloc((void **)&local_area_d, sizeof(double) *dimGrid.x); // (3) timing: start // (4) call GPU kernel function // (5) copy values from GPU memory to CPU memory // (6) timing: stop // (7) sum local_area's computed on GPU printf("area: %5.5lf\n", area); printf("elapsed time: %5.2f milliseconds", elapsed); printf(" (GFLOPS: %5.2f)\n", (N*18.0/(elapsed/1.0e+3)) /1.0e+9); free(local_area); cudaFree(local_area_d); exit(0); } </pre>
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Turnin the assignment:

After done your assignment, type **turnin** in your current working directory. You can retype the command at any time before the due date.