ECEC-622: Introduction to Parallel Computer Architecture
CUDA Programming Lab 2

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The lab is due June 5, 2013. You can work on this lab in teams of up to two people.

Vector Dot Product. Given two n-element vectors $\mathbf{a}$ and $\mathbf{b}$, their dot product $\mathbf{a} \cdot \mathbf{b}$ is given by

$$\mathbf{a} \cdot \mathbf{b} = \sum_{i=1}^{n} a_i b_i,$$

where a_i and b_i denote the $i^{\texttt{th}}$ elements of vectors $\mathbf{a}$ and $\mathbf{b}$, respectively.

The program provided to you accepts no arguments. It creates two randomly initialized vectors and computes their dot product using both the CPU and the GPU. The solution provided by the GPU is compared to that generated by the CPU. If the solutions match within a certain tolerance, the application will print out "Test PASSED" to the screen before exiting.

Please answer the following questions:

- Edit the `computeOnDevice()` function within the file `vector_dot_product.cu` to complete the functionality of vector dot product on the GPU. You may develop multiple kernels to achieve this functionality. Do not change the source code elsewhere (except for adding timing-related code). The size of the vectors is guaranteed to be 100 million elements. The program will be graded based on how efficiently it uses shared memory and/or texture memory on the GPU.
- Provide a two/three page report describing: (1) the design of your kernel (use code or pseudocode to clarify the discussion); (2) the speedup achieved over the serial version; and (3) sensitivity of the kernel to thread-block size in terms of the execution time.

Email the files needed to run your code to me as a single zip file called `lab_2.zip`.