

Parallel Computing
Assignment – 9
CUDA ASSIGNMENT

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1. preliminary

The following settings are made in the bashrc file.

- .bashrc file is updated and the modules for CUDA are added to that.
- Make bench_gpu is used to submit process to gpu processes.

2. Polynomial expansion

a) Code to copy the array is written in .cu file:-

```
cudaMalloc(&d_array, n*sizeof(float));
cudaMalloc(&d_poly, (poly_d+1)*sizeof(float));
cudaMemcpy(d_array, array, n*sizeof(float), cudaMemcpyHostToDevice);
cudaMemcpy(d_poly, poly, (poly_d+1)*sizeof(float), cudaMemcpyHostToDevice);
```

Code is computed in GPU:-

```
polynomial_expansion<<<(n+255)/256, 256>>>(d_poly, poly_d, n, d_array);
```

Array is again copied to the CPU:-

```
cudaMemcpy(array, d_array, n*sizeof(float), cudaMemcpyDeviceToHost);
cudaFree(d_array);
cudaFree(d_poly);

cudaDeviceSynchronize();
```

3. Measurements

a) make bench_gpu and make bench_cpu are executed to calculate the polynomial function. Comparison table is made by make table command.

DEGREE	N	CPUTIME	GPETIME	GPUSPEEDUP
1	1000000000	0.219462	5.67558	0.0386678
10	1000000000	0.636871	5.48804	0.116047
100	1000000000	7.99728	5.48804	1.37075
1000	1000000000	90.8183	11.9764	7.58311

For lower degree, the CPU time is less as the calculation time is less but the communication time is more for GPU processing. This is not the same case when the intensity increases and the CPU calculation time is more than the communication between GPU and CPU.(as GPU computation time is always less then CPU)