REPORT PC

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Section:1
BN:34

Kernal 1

Matrix 1*1000

```
!nvprof ./k1_1_34 "file1_1000.txt" "1000.txt"
```

```
Reading file...
==5870== NVPROF is profiling process 5870, command: ./k1_1_34 file1_1000.txt 1000.txt
Writing to file...
Done writing to file.
==5870== Profiling application: ./k1_1_34 file1_1000.txt 1000.txt
==5870== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   43.90%  3.6800us         1  3.6800us  3.6800us  3.6800us  matrixAdd(float*, float*, float*, int, int)
                   29.01%  2.4320us         2  1.2160us     992ns  1.4400us  [CUDA memcpy HtoD]
                   27.09%  2.2710us         1  2.2710us  2.2710us  2.2710us  [CUDA memcpy DtoH]
      API calls:   83.50%  191.90ms         3  63.968ms  3.3190us  191.89ms  cudaMalloc
                   16.34%  37.554ms         1  37.554ms  37.554ms  37.554ms  cudaLaunchKernel
                    0.06%  140.70us         3  46.898us  5.8290us  117.80us  cudaFree
                    0.06%  136.96us       114  1.2010us     138ns  51.302us  cuDeviceGetAttribute
                    0.03%  74.793us         3  24.931us  8.1650us  44.207us  cudaMemcpy
                    0.00%  10.630us         1  10.630us  10.630us  10.630us  cuDeviceGetName
                    0.00%  4.5930us         1  4.5930us  4.5930us  4.5930us  cuDeviceGetPCIBusId
                    0.00%  3.9770us         1  3.9770us  3.9770us  3.9770us  cuDeviceTotalMem
                    0.00%  1.6410us         3     547ns     206ns  1.1560us  cuDeviceGetCount
                    0.00%     927ns         2     463ns     194ns     733ns  cuDeviceGet
                    0.00%     440ns         1     440ns     440ns     440ns  cuModuleGetLoadingMode
                    0.00%     226ns         1     226ns     226ns     226ns  cuDeviceGetUuid
```

Matrix 1000*1

```
!nvprof ./k1_1_34 "file1000_1.txt" "1000.txt"
```

```
Reading file...
==5885== NVPROF is profiling process 5885, command: ./k1_1_34 file1000_1.txt 1000.txt
Writing to file...
Done writing to file.
==5885== Profiling application: ./k1_1_34 file1000_1.txt 1000.txt
==5885== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   42.06%  3.3920us         1  3.3920us  3.3920us  3.3920us  matrixAdd(float*, float*, float*, int, int)
                   29.76%  2.4000us         2  1.2000us     992ns  1.4080us  [CUDA memcpy HtoD]
                   28.17%  2.2720us         1  2.2720us  2.2720us  2.2720us  [CUDA memcpy DtoH]
      API calls:   99.68%  166.68ms         3  55.560ms  3.0110us  166.67ms  cudaMalloc
                    0.11%  183.53us         1  183.53us  183.53us  183.53us  cudaLaunchKernel
                    0.09%  156.04us         3  52.014us  5.4250us  130.28us  cudaFree
                    0.07%  125.27us       114  1.0980us     134ns  49.784us  cuDeviceGetAttribute
                    0.03%  49.350us         3  16.450us  8.2320us  21.227us  cudaMemcpy
                    0.01%  11.955us         1  11.955us  11.955us  11.955us  cuDeviceGetName
                    0.00%  5.1800us         1  5.1800us  5.1800us  5.1800us  cuDeviceGetPCIBusId
                    0.00%  4.3250us         1  4.3250us  4.3250us  4.3250us  cuDeviceTotalMem
                    0.00%  2.3360us         3     778ns     320ns  1.6890us  cuDeviceGetCount
                    0.00%  1.3320us         2     666ns     192ns  1.1400us  cuDeviceGet
                    0.00%     945ns         1     945ns     945ns     945ns  cuModuleGetLoadingMode
                    0.00%     232ns         1     232ns     232ns     232ns  cuDeviceGetUuid
```

Matrix 1000*1000

```
[ ] !nvprof ./k1_1_34 "file1000.txt" "1000.txt"
```

```
Reading file...
==7638== NVPROF is profiling process 7638, command: ./k1_1_34 file1000.txt 1000.txt
Writing to file...
Done writing to file.
==7638== Profiling application: ./k1_1_34 file1000.txt 1000.txt
==7638== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   50.23%  1.7018ms         1  1.7018ms  1.7018ms  1.7018ms  [CUDA memcpy DtoH]
                   42.88%  1.4529ms         2  726.46us  713.28us  739.65us  [CUDA memcpy HtoD]
                    6.89%  233.54us         1  233.54us  233.54us  233.54us  matrixAdd(float*, float*, float*, int, int)
      API calls:   93.83%  94.504ms         3  31.501ms  79.036us  94.343ms  cudaMalloc
                    5.06%  5.0971ms         3  1.6990ms  902.37us  3.2122ms  cudaMemcpy
                    0.61%  615.94us         3  205.31us  203.46us  208.09us  cudaFree
                    0.32%  325.16us         1  325.16us  325.16us  325.16us  cudaLaunchKernel
                    0.14%  143.72us       114  1.2600us     158ns  56.668us  cuDeviceGetAttribute
                    0.01%  12.764us         1  12.764us  12.764us  12.764us  cuDeviceGetName
                    0.01%  7.1480us         1  7.1480us  7.1480us  7.1480us  cuDeviceGetPCIBusId
                    0.00%  4.9490us         1  4.9490us  4.9490us  4.9490us  cuDeviceTotalMem
                    0.00%  2.2580us         3     752ns     257ns  1.6560us  cuDeviceGetCount
                    0.00%  1.4510us         2     725ns     207ns  1.2440us  cuDeviceGet
                    0.00%     693ns         1     693ns     693ns     693ns  cuModuleGetLoadingMode
                    0.00%     261ns         1     261ns     261ns     261ns  cuDeviceGetUuid
```

kernal 2

Matrix 1000*1

```
!nvprof ./k2_1_34 "file1000_1.txt" "1000.txt"
```

```
Reading file...
==2398== NVPROF is profiling process 2398, command: ./k2_1_34 file1000_1.txt 1000.txt
Writing to file...
Done writing to file.
==2398== Profiling application: ./k2_1_34 file1000_1.txt 1000.txt
==2398== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   45.52%  3.9040us         1  3.9040us  3.9040us  3.9040us  matrixAdd2(float*, float*, float*, int, int)
                   28.36%  2.4320us         2  1.2160us     992ns  1.4400us  [CUDA memcpy HtoD]
                   26.12%  2.2400us         1  2.2400us  2.2400us  2.2400us  [CUDA memcpy DtoH]
      API calls:   66.42%  218.92ms         3  72.973ms  3.4380us  218.90ms  cudaMalloc
                   33.46%  110.29ms         1  110.29ms  110.29ms  110.29ms  cudaLaunchKernel
                    0.05%  161.45us         3  53.818us  4.5600us  138.20us  cudaFree
                    0.04%  138.44us       114  1.2140us     145ns  52.629us  cuDeviceGetAttribute
                    0.02%  62.861us         3  20.953us  8.7400us  30.569us  cudaMemcpy
                    0.00%  10.927us         1  10.927us  10.927us  10.927us  cuDeviceGetName
                    0.00%  7.3370us         1  7.3370us  7.3370us  7.3370us  cuDeviceGetPCIBusId
                    0.00%  3.5970us         1  3.5970us  3.5970us  3.5970us  cuDeviceTotalMem
                    0.00%  1.4110us         3     470ns     202ns     974ns  cuDeviceGetCount
                    0.00%     998ns         2     499ns     173ns     825ns  cuDeviceGet
                    0.00%     519ns         1     519ns     519ns     519ns  cuModuleGetLoadingMode
                    0.00%     218ns         1     218ns     218ns     218ns  cuDeviceGetUuid
```

Matrix 1000*1000

```
!nvprof ./k2_1_34 "file1000.txt" "k21000.txt"
```

```
Reading file...
==3245== NVPROF is profiling process 3245, command: ./k2_1_34 file1000.txt k21000.txt
Writing to file...
Done writing to file.
==3245== Profiling application: ./k2_1_34 file1000.txt k21000.txt
==3245== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   98.42%  195.62ms         1  195.62ms  195.62ms  195.62ms  matrixAdd2(float*, float*, float*, int, int)
                    0.86%  1.7180ms         1  1.7180ms  1.7180ms  1.7180ms  [CUDA memcpy DtoH]
                    0.72%  1.4228ms         2  711.42us  702.16us  720.69us  [CUDA memcpy HtoD]
      API calls:   51.99%  200.53ms         3  66.842ms  899.27us  198.70ms  cudaMemcpy
                   47.77%  184.26ms         3  61.419ms  68.405us  184.11ms  cudaMalloc
                    0.14%  539.35us         3  179.78us  161.78us  196.65us  cudaFree
                    0.06%  227.42us         1  227.42us  227.42us  227.42us  cudaLaunchKernel
                    0.03%  129.37us       114  1.1340us     141ns  50.812us  cuDeviceGetAttribute
                    0.01%  20.726us         1  20.726us  20.726us  20.726us  cuDeviceGetName
                    0.00%  8.0230us         1  8.0230us  8.0230us  8.0230us  cuDeviceGetPCIBusId
                    0.00%  4.5410us         1  4.5410us  4.5410us  4.5410us  cuDeviceTotalMem
                    0.00%  2.1670us         3     722ns     256ns  1.6290us  cuDeviceGetCount
                    0.00%     875ns         2     437ns     182ns     693ns  cuDeviceGet
                    0.00%     648ns         1     648ns     648ns     648ns  cuModuleGetLoadingMode
                    0.00%     395ns         1     395ns     395ns     395ns  cuDeviceGetUuid
```

Matrix 1*1000

```
!nvprof ./k2_1_34 "file1_1000.txt" "1000.txt"
```

```
Reading file...
==3551== NVPROF is profiling process 3551, command: ./k2_1_34 file1_1000.txt 1000.txt
Writing to file...
Done writing to file.
==3551== Profiling application: ./k2_1_34 file1_1000.txt 1000.txt
==3551== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   98.84%  392.73us         1  392.73us  392.73us  392.73us  matrixAdd2(float*, float*, float*, int, int)
                    0.60%  2.3680us         2  1.1840us     960ns  1.4080us  [CUDA memcpy HtoD]
                    0.56%  2.2400us         1  2.2400us  2.2400us  2.2400us  [CUDA memcpy DtoH]
      API calls:   99.56%  208.10ms         3  69.367ms  3.1270us  208.09ms  cudaMalloc
                    0.21%  437.72us         3  145.91us  7.4990us  408.89us  cudaMemcpy
                    0.10%  211.29us         1  211.29us  211.29us  211.29us  cudaLaunchKernel
                    0.06%  128.91us       114  1.1300us     138ns  51.160us  cuDeviceGetAttribute
                    0.06%  122.57us         3  40.855us  5.2150us  101.08us  cudaFree
                    0.01%  10.613us         1  10.613us  10.613us  10.613us  cuDeviceGetName
                    0.00%  5.3560us         1  5.3560us  5.3560us  5.3560us  cuDeviceGetPCIBusId
                    0.00%  4.3300us         1  4.3300us  4.3300us  4.3300us  cuDeviceTotalMem
                    0.00%  1.8530us         3     617ns     216ns  1.3320us  cuDeviceGetCount
                    0.00%     849ns         2     424ns     165ns     684ns  cuDeviceGet
                    0.00%     522ns         1     522ns     522ns     522ns  cuModuleGetLoadingMode
                    0.00%     237ns         1     237ns     237ns     237ns  cuDeviceGetUuid
```

kernal3

Matrix 1000*1

```
!nvprof ./k3_1_34 "file1000_1.txt" "1000.txt"
```

```
Reading file...
==6692== NVPROF is profiling process 6692, command: ./k3_1_34 file1000_1.txt 1000.txt
Writing to file...
Done writing to file.
==6692== Profiling application: ./k3_1_34 file1000_1.txt 1000.txt
==6692== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   98.82%  392.63us         1  392.63us  392.63us  392.63us  matrixAdd3(float*, float*, float*, int, int)
                    0.60%  2.4000us         2  1.2000us     992ns  1.4080us  [CUDA memcpy HtoD]
                    0.57%  2.2720us         1  2.2720us  2.2720us  2.2720us  [CUDA memcpy DtoH]
      API calls:   79.73%  182.66ms         3  60.888ms  3.2510us  182.65ms  cudaMalloc
                   19.95%  45.700ms         1  45.700ms  45.700ms  45.700ms  cudaLaunchKernel
                    0.19%  443.67us         3  147.89us  7.7040us  405.29us  cudaMemcpy
                    0.06%  131.61us       114  1.1540us     141ns  52.595us  cuDeviceGetAttribute
                    0.06%  129.28us         3  43.094us  5.4610us  107.47us  cudaFree
                    0.01%  12.284us         1  12.284us  12.284us  12.284us  cuDeviceGetName
                    0.00%  5.4780us         1  5.4780us  5.4780us  5.4780us  cuDeviceGetPCIBusId
                    0.00%  4.1900us         1  4.1900us  4.1900us  4.1900us  cuDeviceTotalMem
                    0.00%  1.4810us         3     493ns     189ns  1.0110us  cuDeviceGetCount
                    0.00%  1.0610us         2     530ns     204ns     857ns  cuDeviceGet
                    0.00%     569ns         1     569ns     569ns     569ns  cuModuleGetLoadingMode
                    0.00%     231ns         1     231ns     231ns     231ns  cuDeviceGetUuid
```

Matrix 1000*1000

```
[20] !nvprof ./k3_1_34 "file1000.txt" "k21000.txt"
```

```
Reading file...
==6725== NVPROF is profiling process 6725, command: ./k3_1_34 file1000.txt k21000.txt
Writing to file...
Done writing to file.
==6725== Profiling application: ./k3_1_34 file1000.txt k21000.txt
==6725== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   82.73%  14.871ms         1  14.871ms  14.871ms  14.871ms  matrixAdd3(float*, float*, float*, int, int)
                    9.63%  1.7309ms         1  1.7309ms  1.7309ms  1.7309ms  [CUDA memcpy DtoH]
                    7.65%  1.3744ms         2  687.19us  685.14us  689.23us  [CUDA memcpy HtoD]
      API calls:   89.95%  184.25ms         3  61.416ms  72.331us  184.09ms  cudaMalloc
                    9.58%  19.625ms         3  6.5417ms  859.26us  17.850ms  cudaMemcpy
                    0.27%  563.06us         3  187.69us  144.57us  212.68us  cudaFree
                    0.12%  239.74us         1  239.74us  239.74us  239.74us  cudaLaunchKernel
                    0.07%  138.44us       114  1.2140us     141ns  52.698us  cuDeviceGetAttribute
                    0.01%  12.047us         1  12.047us  12.047us  12.047us  cuDeviceGetName
                    0.00%  5.5410us         1  5.5410us  5.5410us  5.5410us  cuDeviceGetPCIBusId
                    0.00%  5.1820us         1  5.1820us  5.1820us  5.1820us  cuDeviceTotalMem
                    0.00%  1.6350us         3     545ns     189ns  1.1560us  cuDeviceGetCount
                    0.00%     956ns         2     478ns     167ns     789ns  cuDeviceGet
                    0.00%     625ns         1     625ns     625ns     625ns  cuModuleGetLoadingMode
                    0.00%     224ns         1     224ns     224ns     224ns  cuDeviceGetUuid
```

Matrix 1*1000

```
[21] !nvprof ./k3_1_34 "file1_1000.txt" "1000.txt"
```

```
Reading file...
==6740== NVPROF is profiling process 6740, command: ./k3_1_34 file1_1000.txt 1000.txt
Writing to file...
Done writing to file.
==6740== Profiling application: ./k3_1_34 file1_1000.txt 1000.txt
==6740== Profiling result:
            Type  Time(%)      Time     Calls       Avg       Min       Max  Name
 GPU activities:   44.36%  3.9040us         1  3.9040us  3.9040us  3.9040us  matrixAdd3(float*, float*, float*, int, int)
                   28.36%  2.4960us         1  2.4960us  2.4960us  2.4960us  [CUDA memcpy DtoH]
                   27.27%  2.4000us         2  1.2000us     992ns  1.4080us  [CUDA memcpy HtoD]
      API calls:   99.71%  180.07ms         3  60.024ms  3.4400us  180.06ms  cudaMalloc
                    0.11%  199.59us         1  199.59us  199.59us  199.59us  cudaLaunchKernel
                    0.07%  122.99us       114  1.0780us     144ns  47.473us  cuDeviceGetAttribute
                    0.07%  121.69us         3  40.564us  5.3050us  102.48us  cudaFree
                    0.03%  51.809us         3  17.269us  8.2510us  22.046us  cudaMemcpy
                    0.01%  11.214us         1  11.214us  11.214us  11.214us  cuDeviceGetName
                    0.00%  5.3580us         1  5.3580us  5.3580us  5.3580us  cuDeviceGetPCIBusId
                    0.00%  4.1960us         1  4.1960us  4.1960us  4.1960us  cuDeviceTotalMem
                    0.00%  2.0210us         3     673ns     255ns  1.4850us  cuDeviceGetCount
                    0.00%  1.0000us         2     500ns     211ns     789ns  cuDeviceGet
                    0.00%     567ns         1     567ns     567ns     567ns  cuModuleGetLoadingMode
                    0.00%     224ns         1     224ns     224ns     224ns  cuDeviceGetUuid
```

	K1	K2	K3
1000*1000	1.7ms	195ms	14ms
1*1000	3.6us	392us	3.9us
1000*1	392.6us	3.9us	3.39us

Comments

Kernel 1 :

- performs better than the other kernels for smaller matrices (1x1000 , 1000*100 and 1000x1) due to its highly parallelism, where each thread handles one element.
- and in kernel is 1000*1000 takes more time than 1*1000 or 1000*1 deu to the whole matrix size (i.e number of elements in 1000*1000 = 1000000 elements while in the other 1000 only)

Kernel 2&3 :

- for Kernal 2 is rowised so if faster for 1*1000 and K3 is columnwise so is faster than K2 in 1000*1

Kernel 2&3 :

- for 1000*1000 we notice that K3 faster than K2 thus deu to how elements are stored in the memory so elemnts in same row are closed to each other so easily to get