

Homework 9

Problem

Code

```
% CPU

A = rand(2000,2000); % 2000x2000 random matrix
b = rand(2000,1); % 2000x1 random vector

% Single Precision

A = single(A);
b = single(b);
tic;
for i=1:20000
    C=A*b;
end
t1 = toc;
fprintf("Computational Time on CPU with Single Precision: %f\n",t1);

% Double Precision

A = double(A);
b = double(b);
tic;
for i=1:20000
    C=A*b;
end
t2 = toc;
fprintf("Computational Time on CPU with Double Precision: %f\n",t2);

% GPU

A = gpuArray.rand(2000,2000); % 2000x2000 random matrix
b = gpuArray.rand(2000,1); % 2000x1 random vector

% Single Precision

A = single(A);
b = single(b);
tic;
for i=1:20000
    C=A*b;
end
t3 = toc;
fprintf("Computational Time on GPU with Single Precision: %f\n",t3);

% Double Precision

A = double(A);
b = double(b);
tic;
for i=1:20000
    C=A*b;
end
t4 = toc;
fprintf("Computational Time on GPU with Double Precision: %f\n",t4);
```

Result

>> Computational Time on CPU with Single Precision: 2.403918
>> Computational Time on CPU with Double Precision: 4.477786
>> Computational Time on GPU with Single Precision: 1.436687
>> Computational Time on GPU with Double Precision: 0.998810

Ranking

1. Computational Time on GPU with Double Precision: 0.998810
2. Computational Time on GPU with Single Precision: 1.436687
3. Computational Time on CPU with Single Precision: 2.403918
4. Computational Time on CPU with Double Precision: 4.477786

Summary

Computation on GPU is faster than CPU

Computation on GPU with Single Precision: Speedup 1.67

Computation on GPU with Double Precision: Speedup 4.48