CAAM 419/519, Homework #4

hc54

December 8, 2022

1   main.cpp script

1.1   Code part

```cpp
1 #include <iostream>
2 #include "vector.h"
3 #include "matrix.h"
4
5 int main(void){
6   Matrix A(6,4);
7   Matrix B(4,5);
8   Matrix C(6,5);
9
10   for (int i = 0; i < A.num_rows(); ++i){
11     for (int j = 0; j < A.num_columns(); ++j){
12       A[i][j] = (double) (i+j);
13     }
14   }
15   for (int i = 0; i < B.num_rows(); ++i){
16     for (int j = 0; j < B.num_columns(); ++j){
17       B[i][j] = (double) 1 / (i + j + 1);
18     }
19   }
20   for (int i = 0; i < C.num_rows(); ++i){
21     for (int j = 0; j < C.num_columns(); ++j){
22       C[i][j] = (double) i * j;
23     }
24   }
25
26   Vector x(5);
27   for (int i = 0; i < x.length(); ++i){
28     x[i] = i;
29   }
30   Vector y(6);
31   for (int i = 0; i < y.length(); ++i){
32     y[i] = 1 - i;
33   }
34
35   double a = 1.5;
36
37   std::cout<<"Matrix A:"<<std::endl;
38   A.print();
39
40   std::cout<<"Matrix B:"<<std::endl;
41   B.print();
42
43   std::cout<<"Matrix C:"<<std::endl;
44   C.print();
45
46   std::cout<<"Vector x:"<<std::endl;
47   x.print();
48
49   std::cout<<"Vector y:"<<std::endl;
50   y.print();
51
52   std::cout<<"Scalar a:"<<a<<std::endl;
53
54   Vector z = (A*B + C)*x + a*y;
55   z.print();
56   z = 3*z - (y-1)/2 + 0.5;
57   z.print();
58 }
```

1.2 Output

Figure 1: Print of matrices, vectors, and scalar

Figure 2: Value of z computed

2   Discussion

When using x = x+y or x = x*y, we do an additional new vector or matrix to copy vector or matrix x. Therefore, we need to assign more memory. If we use *= or += operators, we can modify (*this) vector or matrix, which does not need additional memory and is more efficient.