Assignment 6 Report

The program demonstrates various matrix operations, such as addition, subtraction, multiplication, and determinant calculation, to find solutions for linear equations. This is achieved through several custom classes: Matrix, SMatrix, and Vector. First, we need to initializes matrices and vectors necessary for solving the system of equations. And then we need to random values are assigned to matrix A and vector C

```cpp
// Populate matrix A with random values
for(int i=0;i<e;i++)
{
    for(int j=0;j<e;j++)
    {
        A.setElement(i, j, rand()%10001/10000.0);
    }
}

// Populate vector C with random values
for(int i=0;i<e;i++)
{
    C.setElement(i, 0, rand()%10001/10000.0);
}
```

I use Cramer's Rule to solve the system of linear equations. It replaces columns of the coefficient matrix with the constant vector and computes determinants.

```
// Use Cramer's rule to solve the system of linear equations
for(int i=0;i<e;i++) {

    R=C.vector_replace(i , A); // Replace column i of A with C
    X.setElement(i, 0, (double) R.determinant()/A.determinant()); // Calculate the solution for
        X_i

}
```

In matrix class:

The Matrix class encapsulates a general matrix and includes operations for matrix allocation, deallocation, element access, and basic arithmetic operations: Constructors, Destructor, and Assignment Operators: Manage matrix memory. setElement and getElement: Handle individual matrix elements. Friend Functions (operator>> and operator<<): Enable input and output operations.

In Smatrix class:

SMatrix inherits from Matrix and adds functionality specific to square matrices, such as determinant calculation and size setting.

In Vector Class:

Vector inherits from Matrix, representing a column vector and providing methods for vector-specific operations.