

C++ code 4.1.7: Building of Mehrstellen system matrix. → [GitLab](#)

```
2 Eigen::SparseMatrix<double> compMehrstellenA(unsigned int M) {
3     // For the sake of efficiency the use of Eigen's sparse matrix data
4     // type is essential. The matrix is stored in CCS format.
5     Eigen::SparseMatrix<double> A(M * M, M * M);
6     // We already know that the matrix has at most 9M non-zero entries
7     // per row and column. This information is passed to Eigen via the reserve()
8     // member function.
9     A.reserve(Eigen::VectorXi::Constant(M * M, 9));
10    // Iterate over all interior nodes of the mesh and apply the stencil
11    // and initialize the matrix in column-wise order, from top to bottom in
12    // every column, which is most efficient for the CCS storage format.
13    for (int i = 0; i < M; ++i) {
14        for (int j = 0; j < M; ++j) {
15            // Index of the current node
16            const int k = i * M + j;
17            // Interaction term with the node below to the left
18            if (i > 0 && j > 0) {
19                A.insert(k - M - 1, k) = -1;
20            }
21            // Interaction term with the node below
22            if (i > 0) {
23                A.insert(k - M, k) = -4;
24            }
25            // Interaction term with the node below to the right
26            if (i > 0 && j < M - 1) {
27                A.insert(k - M + 1, k) = -1;
28            }
29            // Interaction term with the node to the left
30            if (j > 0) {
31                A.insert(k - 1, k) = -4;
32            }
33            // Interaction term with itself
34            A.insert(k, k) = 20;
35            // Interaction term with the node to the right
36            if (j < M - 1) {
37                A.insert(k + 1, k) = -4;
38            }
39            // Interaction term with the node above to the left
40            if (i < M - 1 && j > 0) {
41                A.insert(k + M - 1, k) = -1;
42            }
43            // Interaction term with the node above
44            if (i < M - 1) {
45                A.insert(k + M, k) = -4;
46            }
47            // Interaction term with the node above to the right
48            if (i < M - 1 && j < M - 1) {
49                A.insert(k + M + 1, k) = -1;
50            }
51        }
52    }
53    A.makeCompressed();
54    A /= 6;
```