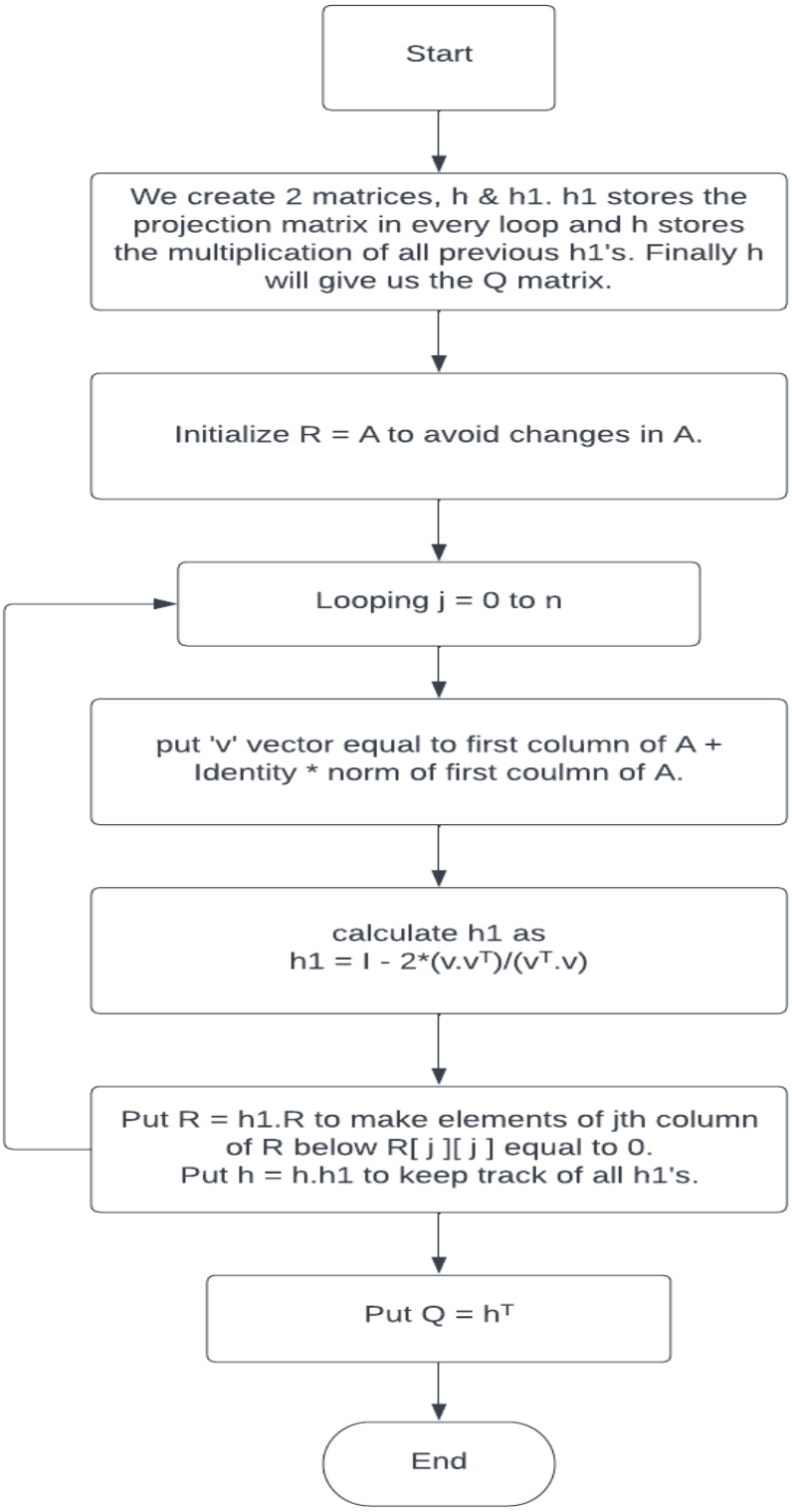
CO21BTECH11002

Aayush Kumar

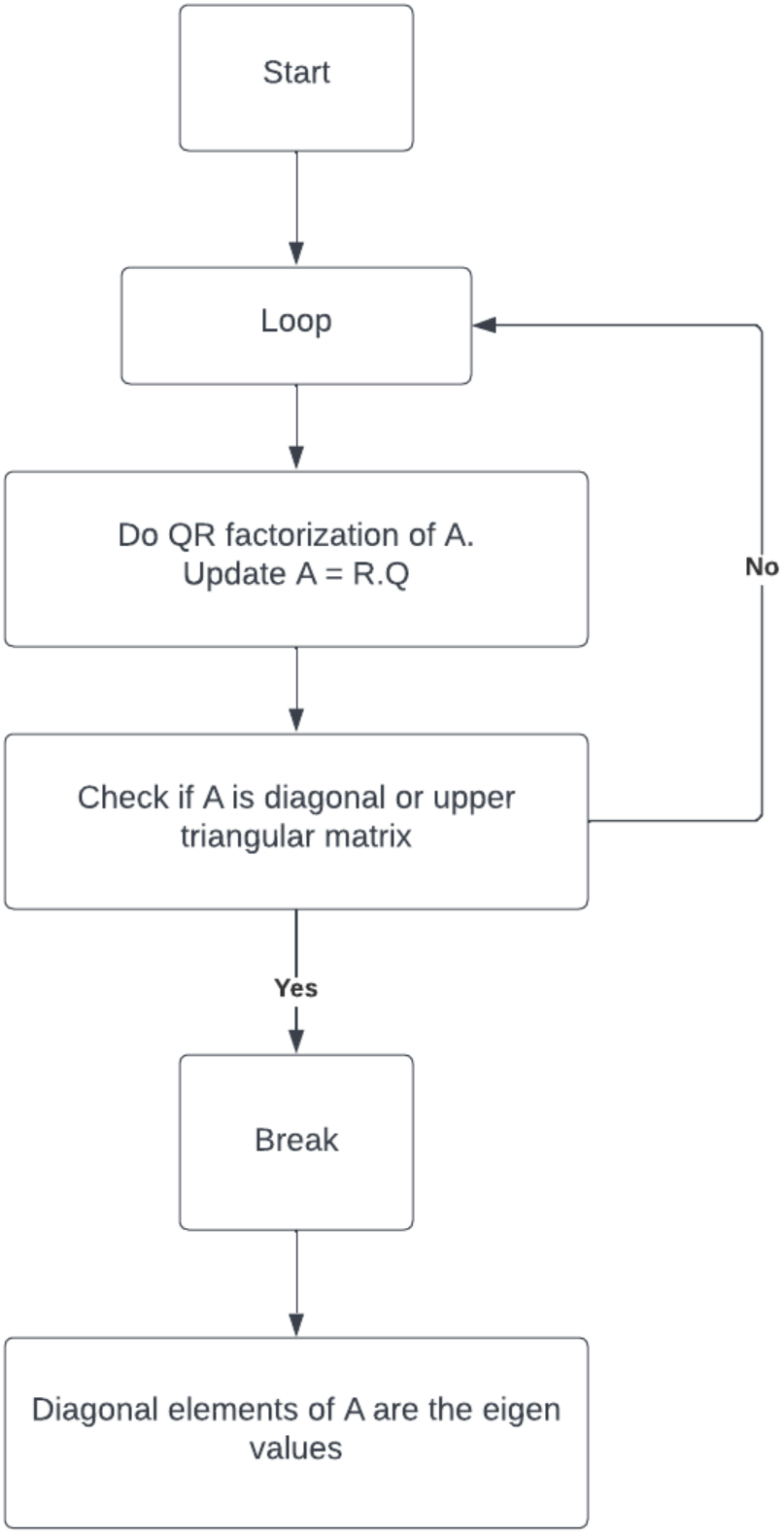
Assignment – Eigenvalues

Algorithm:

To get QR factorization:

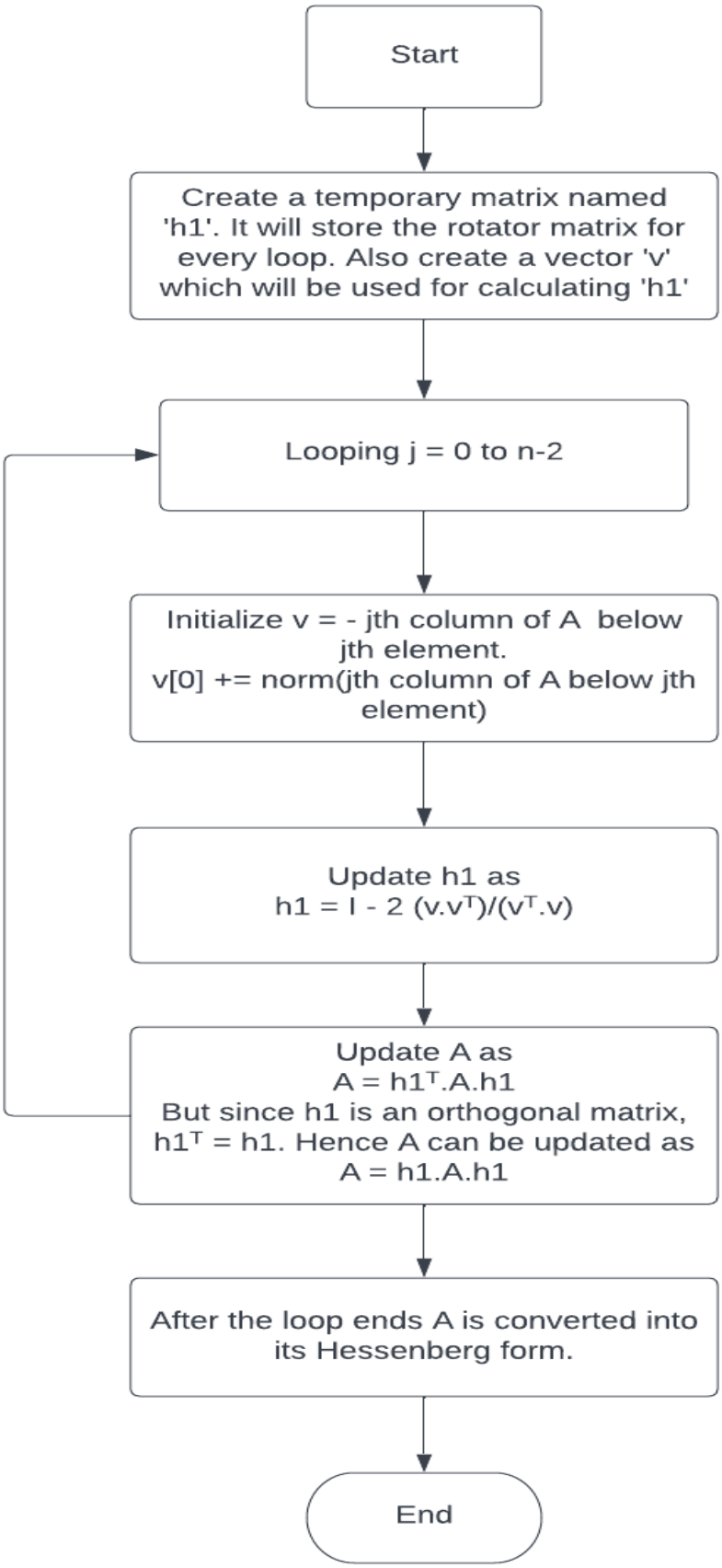


1) Without Calculating Hessenberg Matrix:

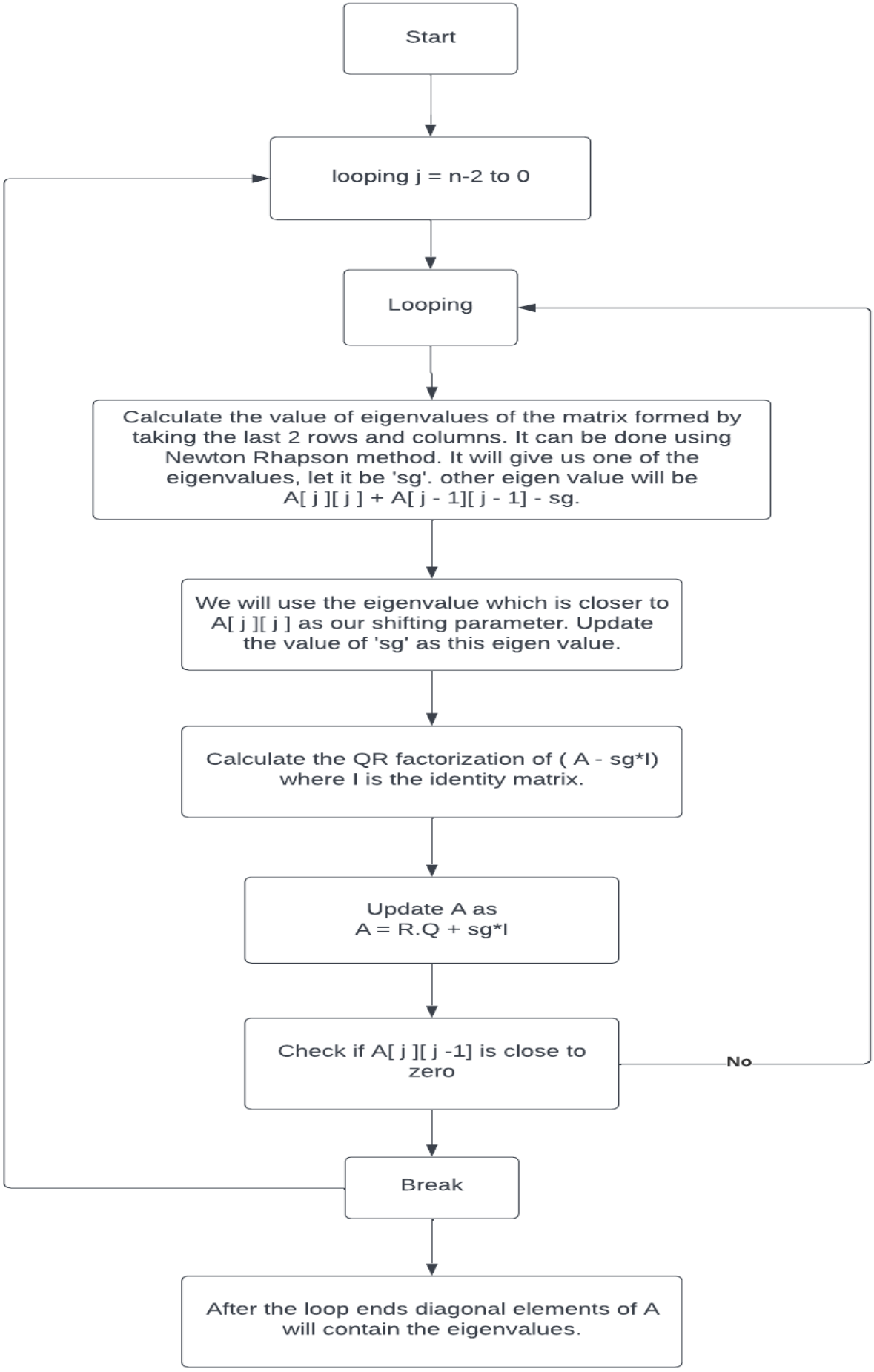


2) After calculating Hessenberg Matrix:

To get Hessenberg Matrix:



Now that we have our Hessenberg matrix, we can use the method of QR factorization with shifts to get eigenvalues.



Input:-

```
Enter the dimension of matrix : 4
Enter the elements of matrix:
1 2 3 4
2 1 2 2
3 2 1 3
4 2 3 1
```

Output:-

```
Eigen Values using QR Factorization:
9.15812
-3
-1.71154
-0.446587

Number of iterations - 40

Time Taken - 0.000355

Eigen Values by first calculating Hessenberg Matrix:
9.15812
-3
-1.71154
-0.446587

Number of iterations - 5

Time Taken - 4.7e-05
```

Hence, we can see that for this example finding Eigen Values after finding the Hessenberg matrix is almost 8 times faster and also converges in just 5 iterations while the first method took 40 iterations.