Exercise 5.2

**Algorithm:** $A := \text{UDUT\_TRI}(A)$

**Partition** $A \rightarrow \left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L^T & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right)$ $U \rightarrow \left(\begin{array}{c|c} U_{00} & u_{01} \\ \hline 0 & 1 \end{array}\right)$ $D \rightarrow \left(\begin{array}{c|c} D_{00} & 0 \\ \hline 0 & \delta_1 \end{array}\right)$

**where** $A_{LL}$ is $0 \times 0$

**while** $m(A_{LL}) < m(A)$ **do**

**Repartition**

$$\left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c|c} A_{00} & \alpha_{01} e_L & 0 & 0 \\ \hline \star & \alpha_{11} & \alpha_{12} & 0 \\ \hline \star & \star & \alpha_{22} & \alpha_{23} e_F^T \\ \hline \star & \star & \star & A_{33} \end{array}\right)$$

**where**

$\alpha_{22} = \delta_1$

$u_{01} = a_{01} / \alpha_{11}$

$A_{00} = A_{00} - u_{01} a_{01}^T$

$a_{01} = u_{01}$

**Continue with**

$$\left(\begin{array}{c|c|c} A_{FF} & \alpha_{FM} e_L & 0 \\ \hline \star & \alpha_{MM} & \alpha_{ML} e_F^T \\ \hline \star & \star & A_{LL} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c|c} A_{00} & \alpha_{01} e_L & 0 & 0 \\ \hline \star & \alpha_{11} & \alpha_{12} & 0 \\ \hline \star & \star & \alpha_{22} & \alpha_{23} e_F^T \\ \hline \star & \star & \star & A_{33} \end{array}\right)$$

**endwhile**

Figure 9: Algorithm for computing the the $UDU^T$ factorization of a tridiagonal matrix.