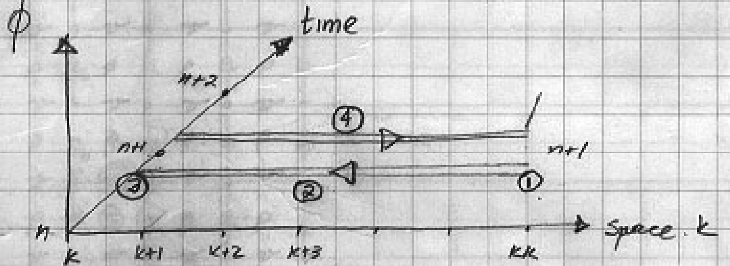
We could repeat the downward indexing process for successive $k-2$, $k-3$, etc and would learn that each successive $E_{k-1}$ and $F_{k-1}$ values can be readily calculated from adjacent $E_k$ and $F_k$ using (5) and (6). Thus (5) and (6) become the recurrence relations for calculating the set $\{E_k, F_k\}$ from $k = kk$ to $k = 1$. These additional variables are used in a second set of successive computations of $\phi_{k+1}^{n+1} = E_k \phi_k^{n+1} + F_k$ to readily compute all values of the solution starting at $k = N$ where $\phi_N^{n+1}$ is a known boundary condition.

The technique is as follows:

We first calculate $E_{kk}$ and $F_{kk}$ to get started and then use (5) and (6) recursively and sweep across to calculate $E$ and $F$ for all grid points $kk-1$ to $k=1$. Then using this stored $E, F$ information and (2) we sweep back computing $\phi_k^{n+1}$ for all grid points $k=2$ to $kk-1$. Thus the name of double sweep algorithm.




① Pick-up RHB condition at $n+1$
② Sweep across to compute coefficients $E_k$, $F_k$
③ Pick-up LHB condition at $n+1$
④ Sweep back to compute $\phi_k^{n+1}$

$$
\begin{array}{c}
\\ 1 \\ \vdots \\ \vdots \\ k-1 \\ k \\ k+1 \\ \vdots \\ \vdots \\ kk
\end{array}
\begin{array}{c}
\begin{array}{ccccccccc} 1 & \cdots & k-1 & k & k+1 & \cdots & kk \end{array} \\
\left[\begin{array}{cccccccc}
B & C & & & & & & \\
A & B & C & & & & & \\
 & A & B & C & & & & \\
 & & A & B & C & & & \\
 & & & A & B & C & & \\
 & & & & A & B & C & \\
 & & & & & A & B & C \\
 & & & & & & A & B \ C \\
 & & & & & & & A \ B
\end{array}\right]
\end{array}
\begin{array}{c} \\ \left[\begin{array}{c} \phi_1 \\ \vdots \\ \vdots \\ \phi_{k-1} \\ \phi_k \\ \phi_{k+1} \\ \vdots \\ \vdots \\ \phi_{kk} \end{array}\right] \end{array}
\begin{array}{c} \\ = \end{array}
\begin{array}{c} \\ \left[\begin{array}{c} D_1 \\ \vdots \\ \vdots \\ D_{k-1} \\ D_k \\ D_{k+1} \\ \vdots \\ \vdots \\ D_{kk} \end{array}\right] \end{array}
$$