Definition (Discrete-time linear systems). A discrete-time linear time-invariant proper open system is defined by three matrices $\mathbf{A}, \mathbf{B}, \mathbf{C}$. Together they give a recurrence of the type

$$
\begin{aligned}
\mathbf{x}_{k+1} &= \mathbf{A}\mathbf{x}_k + \mathbf{B}\mathbf{u}_k, \\
\mathbf{y}_k &= \mathbf{C}\mathbf{x}_k.
\end{aligned}
$$

If $\mathbf{x}$ has dimension $n \geq 1$, u dimension $m \geq 1$ and $\mathbf{y}$ dimension $p \geq 1$, then $\mathbf{A}$ has dimension $n \cdot n$, $\mathbf{B}$ has dimension $n \cdot m$, and $\mathbf{C}$ has dimension $p \cdot n$.