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 $n \geq 1$, $\mathbf{u}$ 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 $p \cdot n$.