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

$$\mathbf{x}_{k+1} = \mathbf{A}\mathbf{x}_k + \mathbf{B}\mathbf{u}_k$$

$$\mathbf{y}_k = \mathbf{C}\mathbf{x}_k$$

 $\mathbf{y}_k = \mathbf{C}\mathbf{x}_k$ 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 $n \times n$, **B** has dimension $n \times m$, and **C** has dimension $p \times n$.