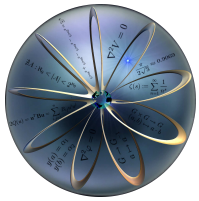

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controllability of LTI systems

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Consider the linear time invariant (LTI) system given by:

$$\dot{x} = Ax + Bu$$

where A is an $n \times n$ matrix, B is an $n \times m$ matrix, u is an $m \times 1$ vector - called the control or input vector, x is an $n \times 1$ vector - called the state vector, and $\dot{x}$ denotes the time derivative of x.

Definition Of Controllability Matrix For LTI Systems: The controllability matrix of the above LTI system is defined by the pair (A, B) as follows:

$$C(A, B) = \left[B, AB, A^2B, A^3B, ..., A^{n-1}B\right]$$

Test for Controllability of LTI Systems: The above LTI system (A, B) is controllable if and only if the controllability matrix $C(A, B)$ has rank n; i.e. has n linearly independent columns.