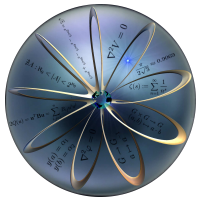

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Hurwitz matrix

Canonical name	HurwitzMatrix
Date of creation	2013-03-22 14:02:45
Last modified on	2013-03-22 14:02:45
Owner	lha (3057)
Last modified by	lha (3057)
Numerical id	4
Author	lha (3057)
Entry type	Definition
Classification	msc 93D99
Defines	Hurwitz transfer function
Defines	stability matrix

A square matrix A is called a *Hurwitz matrix* if all eigenvalues of A have strictly negative real part, $Re[\lambda_i] < 0$; A is also called a *stability matrix*, because the feedback system

$$\dot{x} = Ax$$

is stable.

If $G(s)$ is a (matrix-valued) transfer function, then G is called Hurwitz if the poles of all elements of G have negative real part. Note that it is not necessary that $G(s)$, for a specific argument s, be a Hurwitz matrix — it need not even be square. The connection is that if A is a Hurwitz matrix, then the dynamical system

$$\begin{aligned} \dot{x}(t) &= Ax(t) + Bu(t) \\ y(t) &= Cx(t) + Du(t) \end{aligned}$$

has a Hurwitz transfer function.

Reference: Hassan K. Khalil, *Nonlinear Systems*, Prentice Hall, 2002