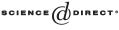


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Nonlinear Analysis 59 (2004) 951-958



www.elsevier.com/locate/na

Weakened Markus–Yamabe conditions for 2-dimensional global asymptotic stability

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Received 14 January 2003; accepted 1 January 2004

Abstract

For a general 2-dimensional autonomous system $\dot{\mathbf{x}} = \mathbf{f}(\mathbf{x})$, it is difficult to find easily verifiable sufficient conditions guaranteeing global asymptotic stability of an equilibrium point. This paper considers three conditions which imply global asymptotic stability for a large class of systems, weakening the so-called Markus–Yamabe condition. The new conditions are: (1) the system admits a unique equilibrium point, (2) it is locally asymptotically stable, and (3) the trace of the Jacobian matrix of \mathbf{f} is negative everywhere. We prove that under these three conditions global asymptotic stability is obtained when the components of \mathbf{f} are polynomials of degree two or represent a Liénard system. However, we provide examples that global asymptotic stability is not obtained under these conditions for other classes of planar differential systems.

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MSC: primary 34D23

Keywords: Global asymptotic stability

1. Introduction and statement of the main results

Since the time of Liapunov, it has become evident that finding conditions which guarantee global asymptotic stability of an equilibrium point in a differential system, even in

0362-546X/\$ - see front matter 0 2004 Elsevier Ltd. All rights reserved. doi:10.1016/j.na.2004.01.010

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