Observer Form of the Hyperbolic Type Generalized Lorenz System and Its Use for Chaos Synchronization

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Abstract: This paper shows that a large class of chaotic systems, introduced in [S. Čelikovský and G. Chen: Hyperbolic-type generalized Lorenz system and its canonical form. In: Proc. 15th Triennial World Congress of IFAC, Barcelona 2002, CD ROM], as the *hyperbolic-type generalized Lorenz system*, can be systematically used to generate synchronized chaotic oscillations. While the generalized Lorenz system unifies the famous Lorenz system and Chen's system [G. Chen and T. Ueta: Yet another chaotic attractor. Internat. J. Bifur. Chaos *9* (1999)], the hyperbolic-type generalized Lorenz system is in some way complementary to it. Synchronization of two such systems is made through a scalar coupling signal based on nonlinear observer design using special change of coordinates to the so-called *observer canonical form* of the hyperbolic-type generalized Lorenz system. The properties of the suggested synchronization that make it attractive for the the secure encrypted communication application are discussed in detail. Theoretical results are supported by the computer simulations, showing viability of the suggested approach.