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Marco A. Arteaga–Pérez, Marisol Morales, Mauro López, Emmanuel Nuño

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Marco A. Arteaga–Pérez[a], Marisol Morales[a], Mauro López[a,*], Emmanuel Nuño[b]

[a] *Departamento de Control y Robótica, División de Ingeniería Eléctrica de la Facultad de Ingeniería. Universidad Nacional Autónoma de México. Ciudad de México, México.*
[b] *Departamento de Ciencias Computacionales, Centro Universitario de Ciencias Exactas e Ingenierías, Universidad de Guadalajara. Guadalajara, México.*

Abstract

Bilateral teleoperators are widely used in several applications such as surgical robots and underwater vehicles. However, due to the long distance between the local and remote manipulators, time delay arises over the communication channel, so that neither exact tracking position nor perfect transparency can be achieved. In free movement, most control approaches are meant to guarantee consensus or to synchronize the local and the remote robots by inducing periodic position trajectories. In constrained motion, the human operator can only have some telepresence feeling but not perfect transparency. Furthermore, most algorithms are designed assuming that joint velocities are available, while sometimes this is not the case and it is desirable to estimate joint velocities through an observer. In this work, a novel teleoperation controller–observer scheme is introduced that does not make use of velocity measurements and, more importantly, does not require the exact knowledge of the dynamical model. This scheme has the following properties: a) in free motion and without a human operator, the local and the remote manipulators tend either to a periodic trajectory or to a particular position, thus achieving either synchronization or position consensus; b) when a human operator moves the local robot, the remote manipulator tracks

*Corresponding author
Email addresses: marteagp@unam.mx (Marco A. Arteaga–Pérez), marisol.mm@comunidad.unam.mx (Marisol Morales), mauro-gbto@hotmail.com (Mauro López), emmanuel.nuno@cucei.udg.mx (Emmanuel Nuño)