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Key Laboratory of System Control and Information Processing, Ministry of Education

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Modeling and Control of Social Motor Coordination in Joint Actions

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Abstract:

The mirror game has been recently proposed as a simple, yet powerful paradigm for studying interpersonal coordination. It has been suggested that a virtual partner able to play the game with human subjects provides new clinical interventions for the rehabilitation of patients suffering from social disorders. In this talk we introduce a novel interactive cognitive architecture based on nonlinear control theory to drive a virtual player (VP) to play the mirror game with a human player (HP) in different configurations. Movement of the end-effector of the VP is modeled by means of a feedback controlled Haken-Kelso-Bunz (HKB) oscillator, which is coupled with the observed motion of the HP measured in real time. To this aim, two types of control algorithms (adaptive control and optimal control) are used and implemented on the HKB model so that the VP can generate human-like motion while satisfying certain kinematic constraints. A proof of convergence of the control algorithms is presented together with an extensive numerical and experimental validation of their effectiveness in clinical applications.

Biography:

翟超，中国地质大学自动化学院教授、博士生导师、IEEE 高级会员，2013 年 6 月获中国科学院数学与系统科学研究院理学博士学位。2013 年 7 月至 2019 年 10 月先后在英国布里斯托大学，香港大学和新加坡南洋理工大学从事博士后研究，主持中国地质大学“百人计划”人才引进项目，作为核心成员参与欧盟第七框架科研项目“认知科学与机器人- AlterEgo” 和新加坡科研基金国际合作项目“未来韧性系统”。研究方向包括：多智能体协同控制、交互运动协同、韧性系统和地灾监测预警。研究成果在 IEEE Transactions on Automatic Control, Automatica, Control Engineering Practice, IEEE Transactions on Control Systems Technology 等权威学术期刊上发表。