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RNN-BASED COOPERATIVE MOTION CONTROL OF 2-DOF ROBOT ARMS

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Abstract. *This paper presents a general recurrent neural network (RNN) model for online control of time-varying robot manipulators. The robot manipulators with different setting parameters work cooperatively on an unknown curve tracing. Each joint of the manipulator is respectively provided a learning method to optimize trajectory by the training RNN model. In this paper, the proposed RNN model shortens the period of learning and improves the cooperative accuracy of the existing neural networks for solving problems such as cutting or welding special types of products. A More complicated construction is to fit it for online cooperation. Simulation results show the effectiveness of this approach and that the proposed RNN model can successfully learn the inverse dynamics of robot manipulators as well as perform accurate tracking for a general trajectory. It is also shown that the proposed method is better than the conventional method due to its improved evolution functions.*

Keywords: Robot arm, Recurrent neural network (RNN), Cooperative motion control, Trajectory generation, Collision avoidance

1. **Introduction.** In this field, many tasks in industry and automation the problem of moving robot agents from its present configuration to a desired configuration under the constraint of a particular trajectory depends heavily on the control scheme used. In such multi-robot systems, which share the common workspace, it is important to provide safe and optimal movements of the participating agents.

There exist some approaches to decentralized cooperative motion control approach for multiple robotic manipulators. Many coordination schemes for multiple arm systems have been reported: the master/slave control [7,12], the centralized control and the decentralized control. To design control architectures for humanoid robots, some approaches have been suggested: task-oriented approaches [13]. In [1], the trajectory of the robot arm is be generated by a RNN model which has a simple construction and an ideal performance for the setting condition. In [2], an RNN model is proposed for cooperative motion control of two robot arms. The task for the arms is to grasp the parts and move them along a specified roadmap in a configured 2D space. The RNN model, based on supervised learning, is proposed for solving nonlinear dynamic trajectory generation problems that try to simulate human action. Based on error feedback dynamics, a learning rule for updating the connection weights of the adaptive RNN model is obtained. Many controllers using neural networks can be developed. These controllers are based on learning from