Motion mapping from human arm to an anthropomorphic robot for tele-operation

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Homogeneous master-slave robots have a wide application for tele-operation in dangerous environments, especially when the environment is so complicate that manual operation is needed. In this report, we present a tele-manipulation robot system with human arms as the master and an anthropomorphic dual-arm robot as the slave. The robot arm has 3 DOFs in shoulder, 2 DOFs in elbow, 2 DOFs in wrist, 2 joints in the thumb, and 3 joints in the other fingers. We adopt a wearable motion capture system to obtain the operator's action command, and employ a motion-mapping algorithm based on unit dual quaternions (UDQs) to perform the joint-to-joint motion-mapping task. We compute the expected/actual joints' angle of the slave robot via the orientation data of the adjoining limbs of the master/slave arm, and successively execute the motion of every joint from the trunk to the distal joint of the robot arms. As a result, we can keep the slave arms possessing the similar configuration of the master arms in the whole course of tele-manipulation. We validate our approach via experiment videos.

Speaker Biography

Daoxiong GONG received the PhD degree in control theory and control engineering from Beijing University of Technology in 2004. He was an academic visiting scholar with the laboratory for robotics and automation, the department of Electrical and Computer Engineering, Michigan State University, US, from 2012 to 2013. He is an associate professor with the Faculty of Information Technology, Beijing University of Technology. His research is supported by the NSFC. His research interests include tele-manipulation robot, evolutionary computation, and intelligent control.

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