

Internet-based bilateral teleoperation based on wave variable with adaptive predictor and direct drift control.

ASME.ORG



THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

[Home](#) | [Journals](#) | [Conference Proceedings](#) | [eBooks](#) | [Topic Collections](#) | [Library Services](#)

[Journal of Dynamic Systems, Measurement, and Control](#) | [Journal Home](#) | [Newest Issue](#) | [All Issues](#)

[Journal of Dynamic Systems, Measurement, and Control | Volume 128 | Issue 1 | TECHNICAL PAPERS](#)

[< PREVIOUS ARTICLE](#)

[NEXT ARTICLE >](#)

TECHNICAL PAPERS

Internet-Based Bilateral Teleoperation Based on Wave Variable With Adaptive Predictor and Direct Drift Control

Ho Ching and Wayne J. Book

[\[+\] Author and Article Information](#)

J. Dyn. Sys., Meas., Control 128(1), 86-93 (Sep 28, 2005) (8 pages)

doi:10.1115/1.2168161

History: Received April 01, 2005; Revised September 28, 2005

[ARTICLE](#) | [REFERENCES](#) | [FIGURES](#) | [CITING ARTICLES](#)

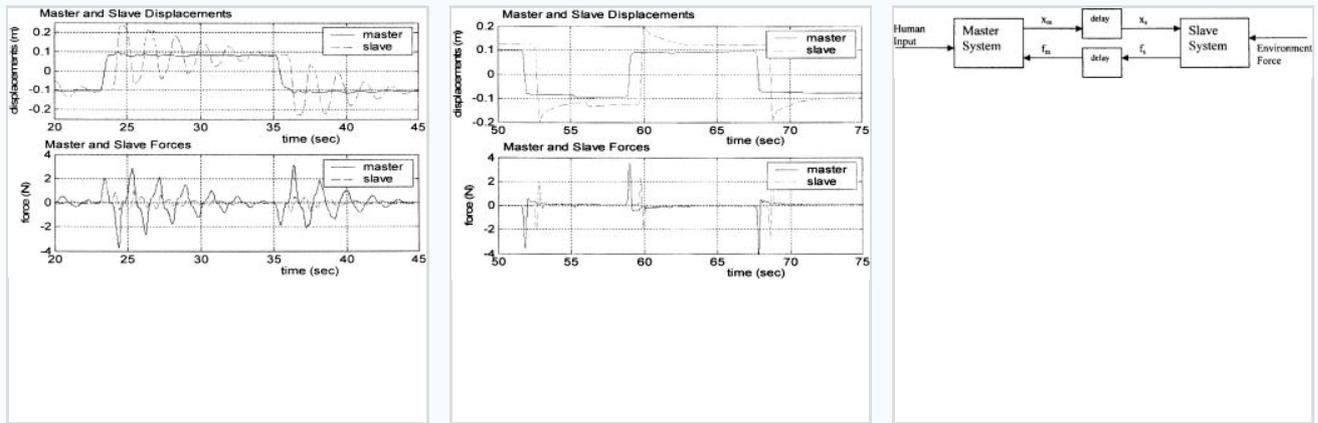
Abstract

[Abstract](#) | [Introduction and Previous Works](#) | [Background on Wave Variables](#) | [Wave Variable and Predictor](#) | [Wave Variable With Predictor and Drift Control](#) | [Semi-Adaptive and Fully Adaptive Predictor](#) | [Experimental Setup](#) | [Experimental Results](#) | [Conclusion](#) | [Acknowledgements](#) | [References](#)

In a conventional bilateral teleoperation, transmission delay over the Internet can potentially cause instability. A wave variable algorithm guarantees teleoperation stability under varying transmission delay at the cost of poor transient performance. Adding a predictor on the master side can reduce this undesirable side effect, but that would require a slave model. An inaccurate slave model used in the predictor as well as variations in transmission delay, both of which are likely under realistic situations,

can result in steady-state errors. A direct drift control algorithm is used to drive this error to zero regardless of the source of the error. A semi-adaptive predictor that can distinguish between free space and a rigid contact environment is used to provide a more accurate force feedback on the master side. A full adaptive predictor is also used that estimates the environmental force using recursive least squares with a forgetting factor. This research presents the experimental results and evaluations of the previously mentioned wave-variable-based methods under a realistic operation environment using a real master and slave. The algorithm proposed is innovative in that it takes advantage of the strengths of several control methods to build a promising bilateral teleoperation setup that can function under varying transmission delay, modeling error, and changing environment. Success could lead to practical applications in various fields, such as space-based remote control, and telesurgery.

FIGURES IN THIS ARTICLE



Copyright © 2006 by American Society of Mechanical Engineers

Topics: [Force](#) , [Waves](#) , [Delays](#) , [Algorithms](#) , [Vacuum](#) , [Errors](#)

Sign in or create your free personal ASME account. This will give you the ability to save search results, receive TOC alerts, RSS feeds, and more.

[Sign into or create your free personal account](#)

Sign in via [Shibboleth](#)



What is Shibboleth?

Shibboleth is an access management service that provides single sign-on protected resources. It replaces the multiple user names and passwords necessary to access subscription-based content with a single user name and password that can be entered once per session. It operates independently of a user's location or IP address. If your institution uses Shibboleth authentication, please contact your site administrator to receive your user name and password.

Purchase this Content

\$25.00

[Purchase](#)

[Learn about subscription and purchase options](#)

Your Session has timed out. Please sign back in to continue.

Sign in or create your free personal ASME account. This will give you the ability to save search results, receive TOC alerts, RSS feeds, and more.

Sign into or create your free personal account

Sign in via [Shibboleth](#)



What is Shibboleth?

Shibboleth is an access management service that provides single sign-on protected resources. It replaces the multiple user names and passwords necessary to access



ASME Digital Collection

Alerts

Service Center

Membership

Contact Us

Permissions / Reprints

Policy

of Use

ASME

American Society of Mechanical

Engineers

Journals

Submit a Paper

Announcements

Call for Papers

Title History

Conference Proceedings

About ASME Conference Publications

Conference Proceedings Guidelines

Conference Publications



This site uses cookies. By continuing to use our website, you are agreeing to [our privacy policy](#) | [Accept](#)

Loading [Contrib]/ally/accessibility-menu.js