

OVERVIEW OF RESEARCH DEVELOPMENTS AND EXPERIENCE OF HYBRID SIMULATION ACROSS THE ENGINEERING DISCIPLINES AT THE UNIVERSITY OF BRISTOL

PROF C.A. TAYLOR, PROF D.P. STOTEN, PROF N. LIEVEN, PROF A. CHAMPNEYS, DR D. WAGG, DR S. NEILD, DR A.J. CREWE, DR J. MACDONALD

Bristol Laboratory for Advanced Dynamics Engineering, Faculty of Engineering, University of Bristol, Queen's Building, University Walk, Bristol BS8 1TR, United Kingdom
Corresponding author: Prof C.A. Taylor, colin.taylor@bristol.ac.uk,

The Bristol Laboratory for Advanced Dynamics Engineering (BLADE) at the University of Bristol has a cross-disciplinary research theme in hybrid simulation. This theme involves mechanical, electrical, aerospace and civil engineers, and engineering mathematicians working together across a broad portfolio of projects. The projects seek to establish a sound theoretical basis for hybrid simulation from which robust control algorithms can be established and then applied to practical laboratory and industrial applications.

This paper will outline some key developments in hybrid control theory with particular reference to the application of the Bristol originated Minimal Control Synthesis (MCS) algorithm and to the adaptation of conventional PID type controllers. These developments have been particularly concerned with identifying and minimising sources of errors and thereby extend understanding and handling of the associated stability issues.

The theoretical issues will be set in the context of a selection of application examples drawn from across the engineering fields. These will include earthquake engineering applications (involving shaking tables and reaction wall test rigs), simulations of stay-cable dynamics, helicopter rotor dampers, and vehicle suspension systems. The application examples will be used to highlight important theoretical and practical application issues that need to be addressed in future research.

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