

## List of Dissertation Abstract (Environment and System Sciences)

Name	Supervisor	Title	Abstract
Satoshi ASAMI	Toshihiko SHIRAISHI	A Study of a Reduced-order Controller Using Nonlinear Balanced Truncation to Reduce Cold Start Emissions of Spark-ignition Engines	Automatic control of the automotive SI engine has been an active research area to reduce hydrocarbon emissions during the cold start period. The model order reduction is a key technology to embed a model-based controller on a electrical control unit.. Although few nonlinear engine models have been reduced to design the model-based controller for the cold start problem. In this study, a representative nonlinear cold start engine model was reduced by a proposed balanced truncation approach. Based on the reduced nonlinear model, a sliding mode controller was designed. The availability of the controller was verified by numerical simulations.
Toshiyasu KOIKE	Shin MORISHITA	Measurement Technology and Its Uncertainty in Evaluation Test of Marine Turbocharger	This paper describes systematic handling and its uncertainty evaluation of various measurement technologies taking the case of marine turbochargers evaluation test. To perform these tests, automation of the data measurement and the control system should be improved. By means of these improvements, it becomes possible to extract necessary data from a lot of measurement data. The macro function of the spreadsheet software enables us to process and calculate data necessary for evaluation and to display them graphically during the test. Statistical processing of such a big amount of data also enables instantaneous check of “uncertainty” of measurement during the test, an index of measurement accuracy.
Hirofumi SUGIYAMA	Takahiro YAMADA	Development of finite cover method for ductile fracture	In this study, the simulation method, which enables to simulate the situations from initial state with small strain to their failures with large plastic and discontinuous deformation. To achieve these kinds of simulations, some special treatments are required, that is, not only the volumetric locking-free approximation for large plastic deformation but also the expression capability for the discontinuities. This study employed the Finite Cover Method to describe the strong discontinuities, and P1-iso-P2/P0 element for avoiding the volumetric locking. Then some numerical examples show the capabilities the method in typical ductile failure of metal materials.

Takeki YAMAMOTO	Takahiro YAMADA	Numerical analysis using shell element to represent thickness–stretch for thick-walled structure	<p>In the finite element analysis, computational costs and accuracy of calculation are contradictive properties. For the purpose of overcoming such properties, this paper proposes a technique for evaluating the behavior in the thickness direction using shell elements. The behavior of the proposed shell element to represent thickness–stretch is similar to that of the solid element, and hence both elements can be connected with satisfying the continuity of the behavior of each element by developing a numerical procedure based on Nitsche’s method. In this approach, the continuity condition for displacements and stress vectors can be imposed on the connecting surface. Several numerical examples are presented to examine the fundamental performance of those techniques.</p>
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