



Automotive Research Center

A U.S. Army Center of Excellence for Modeling and Simulation of Ground Vehicles
led by the University of Michigan

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ARC Collaborative Research Seminar Series Fall 2005

September 22nd, Thursday (9:30-11:00am)

University of Michigan, Lurie Engineering Center, Level 3, Johnson Rooms B & C

Presented by Thrust Area 5:

Active Set Strategies for Probabilistic Optimization

Kuei-Yuan Chan, Steven J. Skerlos, Panos Y. Papalambros, U. of Michigan

A Bayesian Approach to Reliability Optimization with Incomplete Information

Subroto Gunawan, Panos Papalambros, U. of Michigan

A Design Optimization Method Using Evidence Theory

Zissimos P. Mourelatos, Jun Zhou, Oakland U.

October 12th, Wednesday (9:30-11:00am)

University of Michigan, Lurie Engineering Center, Level 4, GM Room

Presented by Thrust Area 3

Physics-Based Tire-Snow Interaction Models for Combined Slips

Jonah Lee, Qing Liu, Tinggang Zhang, University of Alaska Fairbanks

Abstract: In order to understand and predict the performance of vehicles over snow cover, we have developed several physics-based tire-snow interaction models for combined slips. To the best of our knowledge, these models are the first in this area. We will discuss the finite element and semi-analytical dual approach adopted for our modeling efforts as well as modeling results with preliminary validation and validation plans.

Dynamic tire model for real-time human-in-the-loop driving simulation

Weidong Pan, University of Iowa

Abstract: Research works done at University of Iowa on tire and soil modeling will be reviewed. Recent development on real-time dynamic tire model, including formulation, validation, and issues related to real-time driving simulation will be presented in detail.

October 26th, Wednesday (9:30-11:00am)

University of Michigan, Lurie Engineering Center, Level 4, GM Room

Hosted by Thrust Area 2

Joint presentations by The University of Michigan and the
University of Southern California - Institute for Creative Technologies ([link off-site](#))

Bill Swartout, PhD, Jon Gratch, PhD, Paul Debevec, PhD

We will present our work in building virtual humans at the ICT. We will cover new technology we are developing to create life-like animations that can be controlled dynamically by an artificial intelligence. In addition, we will describe work we are doing on high-fidelity facial animation and techniques we are developing that allow a performance to be captured and then re-animated under

arbitrary lighting conditions.

November 16th, Wednesday (9:30-11:00am)

University of Michigan, [Duderstadt Center](#) (Media Union), Room 1180

Presented by Thrust Area 1

Advances in Proper Modeling Theory and Automotive Applications

Previous research defined a dynamic system model as proper in the context of a particular application if it meets the fidelity required for the application at a minimal complexity. Algorithms were developed for automatically deducing a proper model from simple component models, reducing a complex model to make it proper, and partitioning a proper model to reduce its complexity further. This seminar begins with a brief overview of previous and ongoing Thrust Area 1 research, including proper modeling research and its application to engine-in-the-loop simulation and efficient online vehicle parameter identification. The seminar presents the derivation of concordances between balanced truncation and the activity-based model order reduction algorithm (MORA), i.e., special conditions under which the two algorithms are theoretically guaranteed to furnish the same reduced models. These concordances provide the first published theoretical justification for MORA, and highlight the ways in which MORA extends balanced truncation. Further theoretical developments, particularly the use of MORA for model reduction, are briefly highlighted. The seminar concludes with the development of a novel algorithm for efficiently scaling a given dynamic system to meet new design requirements. The algorithm uses dimensional analysis to derive scaling laws that ensure dynamic similarity, and uses activity analysis to reduce the number of resulting design scaling laws. The algorithm enables the efficient scaling of a fuel cell air supply system to meet new power requirements while maintaining desirable dynamic properties, and is shown to be a powerful aid to optimization-based redesign.

December 7th, Wednesday (9:30-11:00am)

University of Michigan, Lurie Engineering Center, Level 3, Johnson Rooms B & C

Overview of Thrust Area 4 (Advanced Engine and Hybrid Propulsion) research activities at UM Progress in Engine Research at Wayne State University

Highlights include:

Dual use combustion strategies for diesel and JP8 fuel (UM)

Modeling of advanced engine air handling systems (UM)

Synergy between modeling of hybrid propulsion options and engine-in-the loop testing (UM)

Thermal management of engine and fuel cell systems (UM)

A new strategy for Cold Start of Diesel Engines, Naeim A. Henein (WSU)

Second Generation Engine Friction Model, Dinu Taraza (WSU)

Combustion characteristics of bio-diesel fuel , Ming-Chia Lai (WSU)

Progress in Engine Cycle Simulation for High Power Density Diesel Engines, Nabil Chalhoub (WSU)