The Second Annual Mechanical Engineering Graduate Student Symposium 2001
October 6, 2001

Department of Mechanical Engineering
University of Michigan
Ann Arbor, MI, USA
2nd Annual Mechanical Engineering Graduate Student Symposium 2001

Organized By
Mechanical Engineering Graduate Council
http://www.engin.umich.edu/dept/meam/Gradcnccl

Sponsored By
Rackham School of Graduate Studies
http://www.rackham.umich.edu/
The Department of Mechanical Engineering
http://me.engin.umich.edu/

Council Members & Support
Tershia Pinder Matt Cavalli
Gullu Kiziltas John Parmigiani
Darryl Taylor Nagesh Belludi
Jeremy Michalek Melissa Chernovsky
Kangwon Wayne Lee James Santosa
Alan McGaughey Yuan-Hung Ma

Advisors
Prof. Volker Sick
Prof. Margaret Wooldridge
Dear Attendees,

Welcome to the Second Annual Mechanical Engineering Graduate Student Symposium at the University of Michigan! It is the desire of the council to increase communication between graduate students and to help develop and foster a greater sense of community for all the graduate students in our department. The Mechanical Engineering Graduate Symposium is the ideal event at the beginning of the school year to do so.

The goal of the Graduate Students Symposium is to bring together all mechanical engineering graduate students and to give them the opportunity to present and discuss their research with interested academic and industrial organizations in a constructive and diverse atmosphere.

The symposium aims:

- To present current graduate students’ work to incoming graduate students.
- To provide a setting for mutual feedback on current research and guidance on future research directions.
- To give graduate students the experience of presenting and discussing their views or results on different research areas via posters and/or oral presentations.

Thank you for your participation in this exciting event. Hope to see you all next year.

Tershia Pinder
Gullu Kiziltas
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<td>- Fluid Mechanics, Heat Transfer and Combustion – EECS 1001</td>
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<td>11:45-1:20</td>
<td><strong>Lunch and Poster Session</strong></td>
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<td>1:30-3:00</td>
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<td>3:10-4:00</td>
<td><strong>Panel Discussion</strong></td>
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<td>“Opportunities for Graduate Students in Industry”</td>
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<td>- Dr. Ramprasad Krishnamachari, Design &amp; Manufacturing</td>
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<td>- Prof. Anna Stefanopoulou, Dynamics, Systems and Controls</td>
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<td>- Dr. Judy Che, Fluid Mechanics, Heat Transfer and Combustion</td>
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<td>- Dr. Yung-Li Lee, Solids and Materials</td>
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<td>- Prof. Michael Thouless, Solid Mechanics and Materials</td>
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<td>4:10-5:00</td>
<td><strong>Awards Presentation &amp; Closing Remarks</strong></td>
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**DESIGN AND MANUFACTURING**

**Felecia Brittman**  
Experimental Study of the Self-Piercing Riveting Process

**Haseung Chung**  
A Model of Laser-Powder Interaction in Selective Laser Sintering of Metals

**Brian Jensen**  
DC-Voltage-Controlled Frequency Tuning of MEMS Resonators

**Jeonghan Ko**  
Reusability Indexes of Manufacturing Systems: Evaluation of Intrinsic and Extrinsic Reconfigurability

**Byungwoo Lee**  
Design of Part Family Robust to Production Plan Variations based on Qualitative Manufacturability Evaluation

**Sangwon Lee**  
Design and Characterization of Micro/Meso-scale Machine Tool Systems

**Jeremy Michalek**  
Interactive Layout Design Optimization

**James Santosa**  
Design of a Hopper Array for Multi-Material Powder Deposition used in Selective Laser Sintering

**Brian Trease**  
Design of Thermal Microactuators for Out-of-Plane Motion

**Fu Zhao**  
Microfiltration of Metalworking Fluid – Mechanism Study and Model Development
FLUID MECHANICS, HEAT TRANSFER AND COMBUSTION

Aristotelis Babajimopoulos
Full Cycle Simulation of a Homogeneous Charge Compression Ignition Engine using CFD and Detailed Chemistry

Christos Chryssaki
Modeling Fuel Spray Breakup Phenomena in Direct-Injection Spark-Ignition (DISI) Engines

Luciana DaSilva
Integrated Micro-Thermoelectric Cooler in Gas Sensing

Josh Driscoll
Nitric Oxide Prediction and Measurement in Non-Premixed Methane/Air Counter-flow Flames

Doug Frieden
Flame Propagation in a Gasoline Direct-Injection Engine

Charles Funk
Cyclic Variability of Turbulent Structures in IC Engine Flows

David Hall
Combustion Synthesis of Tin Oxide Nanoparticles
Sang Hun Kang
Premixed Flame Instabilities in the Hele-Shaw Cell

Alan McGaughey
Molecular Dynamics Calculations of the Thermal Conductivity of Zeolites

Tershia Pinder
Transient Combustion Control to Reduce Pollution and Increase Efficiency

Karim Sabra
Broadband Performance of a Time-Reversing Array in Shallow Water

Bin Wu
Hydraulic Hybrid Vehicle Modeling and Simulation
SOLID MECHANICS AND MATERIALS

Lesley Berhan
Response of Fused Porous Carbon Networks: 3D Simulations of Electrochemical Materials

Sarah Calve
Developmental Biology and the Mechanics of Skeletal Muscle

Steven Creighton
Variable Multiscale Methods in Computational Solid Mechanics

Mahmoud Hussein
Design of Composite Materials for Desired Wave Dispersion Characteristics

Alan Jones
The Thermomechanical Degradation of Polymer Materials

Bradley Layton
The Role of Collagen Morphology in Diabetic Peripheral Neuropathy

John Parmigiani
Disordered Materials Reinforcement in Marine Invertebrate Eggs

Darryl Taylor
Experiments for the Investigation of Assembly and Durability of Tapered Bimetallic Joints
Alaa Ahmed
On the Loss of Control in a Balancing Task: A Study in Healthy Young Adults

Farshid Maghami Asl
Dynamic Modeling and Control of Reconfiguration in Manufacturing Systems

Mari Endo
Effects of Age and Gender on Toe Flexor Muscle Strength

Hosam Fathy
Combined Plant/Controller Optimization

Jae Hong Lee
Real-time Simulation of Tracked Vehicle Dynamics

Paul Otanez
Performance Optimization of Networked Control Systems Using Optimal Control and Estimation

Polat Sendur
Physical System Modeling: Algorithms for Generating Models of Appropriate Complexity and Accuracy

Hakan Yilmaz
Control of Turbocharged Diesel Engine using Advanced Actuating Schemes
PRESENTATIONS

DESIGN AND MANUFACTURING

Chair: Jeremy Michalek
Session I - Room 1500 EECS

Haseung Chung 10:00 am
A Model of Laser-Powder Interaction in Selective Laser Sintering of Metals

James Santosa 10:15 am
Design of a Hopper Array for Multi-Material Powder Deposition used in Selective Laser Sintering

Valerie Maier-Speredelozzi, Theodor Freiheit & Weiping Zhong 10:30 am
Off-Line Error Prediction, Diagnosis, and Recovery using Virtual Assembly Systems

Jamie Cemelio 10:45 am
Modeling Variation Propagation of Multi-Station Assembly Systems with Compliant Parts

Frank Wang 11:00 am
Simulation of Metal Transfer in Gas Metal Arc Welding

Fu Zhao 11:15 am
Microfiltration of Metalworking Fluid – Mechanism Study and Model Development

Session II - Room 1500 EECS

Gullu Kiziltas 1:30 pm
Application of Homogenization Design Methodology to Electromagnetics

Brian Trease 1:45 pm
Design of Thermal Microactuators for Out-of-Plane Motion

Brian Jensen 2:00 pm
DC-Voltage-Controlled Frequency Tuning of MEMS Resonators
Jeremy J. Michalek 2:15 pm
Interactive Layout Design Optimization

Panayiotis Georgiopoulos 2:30 pm
Enterprise-wide Product Design

Michael Sasena 2:45 pm
Exploiting Disparities in Function Computation
Time in Simulation-Based Optimization
SOLID MECHANICS AND MATERIALS

Chair: Matt Cavalli
Session I - Room 1003 EECS

Matt Cavalli 10:00 am
Modeling the Deformation and Fracture of Structural Joints

Shih-Huang Lin 10:20 am
Modeling of Spot Weld Failure Under Combined Loading Conditions

Kristen Mills 10:40 am
Behavior of Pressure-Sensitive Adhesive Joints

Wei-Yi Chen 11:00 am
Failure Prediction of Laser Welds in Aluminum Sheets

Chair: John Parmigiani
Session II - Room 1003 EECS

Darryl Taylor 1:30 pm
Experiments for the Investigation of Assembly and Durability of Tapered Bimetallic Joints

Shan Li 1:50 pm
The Energy Release Rate of DCB Due to Pure Shear

Mahmoud Hussein 2:10 pm
Design of Composite Materials for Desired Wave Dispersion Characteristics

Sung-Tae Hong 2:30 pm
Plastic Behavior of Honeycomb Materials Under Combined Loading Conditions
DYNAMICS, SYSTEMS AND CONTROLS 1

Chair: Kangwon Lee
Session I - Room 1200 EECS

John Harder III  10:00 am
Analysis of Thermal Control of Spindles for Reconfigurable Machines

Hakan Yilmaz  10:20 am
Control of Turbocharged Diesel Engine Using Advanced Actuating Schemes

Robert White  10:40 am
Modeling and Design of a MEMS Cochlear-like Acoustic Transducer

Liang-Kuang Chen  11:00 am
Experimental Evaluation of Driver Steering Assist Controllers Using Desktop Driving Simulator

Paul Otanez  11:20 am
Performance Optimization of Networked Control Systems Using Optimal Control and Estimation

Session II - Room 1200 EECS

Mari Endo  1:30 pm
Effects of Age and Gender on Toe Flexor Muscle Strength

Alaa Ahmed  1:50 pm
On the Loss of Control in a Balancing Task: A Study in Healthy Young Adults

Sibylle Thies  2:10 pm
Influence of an Irregular Surface on Step Width, Step Width Variability, and Velocity in Peripheral Neuropathy

Chan-Chiao Lin  2:30 pm
Power Management Strategy for a Parallel Hybrid Electric Vehicle

James S Dunn  2:50 pm
A Bond Graph Approach to Modeling Engines
DYNAMICS, SYSTEMS AND CONTROLS 2

Chair: Yuan-Hung Ma
Session I - Room 1311 EECS

Farshid Maghami Asl  10:00 am
Dynamic Modeling and Control of Reconfiguration in Manufacturing Systems

Kathy Peterson  10:20 am
Soft Landing Controller for Electromagnetic Camless Valves

Hosam Fathy  10:40 am
Combined Plant/Controller Optimization

Oliver Poudou  11:00am
A 3D Model of Damper for the Dynamics of Dry Friction Damped Systems

Konstantinos Varsos  11:20 am
Distributed Manipulation Along Trajectories Using Open-Loop Force Fields

Session II - Room 1311 EECS

Geoff Rideout  1:30 pm
Output-Specific Proper Modeling Using Bond Graph Junction Structure Activity

Caroline Gatti  1:50 pm
Numerical Simulations of Large Deformation Cable Dynamics

Yigit Ungoren  2:10 pm
Worst-Case Evaluation of Dynamic Systems

Jay Pukrushpan  2:30 pm
Dynamic Modeling and Control of Fuel Cell Propulsion System
FLUID MECHANICS, HEAT TRANSFER AND COMBUSTION

Chair: Alan McGaughey
Session I - Room 1001 EECS

Alan McGaughey 10:00 am
Molecular Dynamics Calculations of the Thermal Conductivity of Zeolites

Melissa Chernovsky 10:20 am
Spherical Diffusion Flames in Microgravity

Ron Grover 10:40 am
A Spray Wall Impingement Model Based Upon Conservation Principles

Tim Jacobs 11:00 am
Visual Analysis of Diesel Engine Fuel Injection and Combustion Using Engine Videoscope Technology

Ghanem Oweis 11:20 am
PIV Measurement of a Tip Leakage Vortex

Session II - Room 1001 EECS

David Hall 1:30 pm
Combustion Synthesis of Tin Oxide Nanoparticles

Karim Sabra 1:50 pm
Broadband Performance of a Time-Reversing Array in Shallow Water

Ramanan Sankaran 2:10 pm
A Computational Study on the Effects of Mixture Composition Fluctuations on Laminar Premixed Flames

Bruno Vanzieleghem 2:30 pm
Three Dimensional Modeling of Combustion for Direct Injection Gasoline Engines

Bin Wu 2:50 pm
Hydraulic Hybrid Vehicle Modeling and Simulation