



THE UNIVERSITY OF  
MELBOURNE

# Mechanical Engineering

SEMINAR SERIES 2011

## Dr Roy Featherstone

Fellow, Department of Information Technology  
Senior Lecturer, Department of Computer Science  
The Australian National University

2pm Friday 4th March 2011  
Mechanical Engineering Lecture Theatre  
Level 3, Building 170  
Mechanical Engineering  
Grattan St, Parkville

## Branch-Induced Sparsity in Rigid-Body Dynamics.

### MORE INFORMATION

For more Mechanical Engineering seminar information contact:

Professor Ivan Marusic  
Department of Mechanical Engineering  
E: [imarusic@unimelb.edu.au](mailto:imarusic@unimelb.edu.au)

### *Abstract:*

*A humanoid robot, a walking machine and a robot hand: these are all examples of mechanical systems having a branched kinematic structure. It has been known for a long time that branches introduce zeros into a matrix called the joint-space inertia matrix, which appears in the equation of motion.*

*However, it has only recently been discovered that this pattern of zeros can be easily exploited, using simple algorithms, to reduce the cost of calculating the equations of motion.*

*This talk introduces the phenomenon of branch-induced sparsity (i.e., the pattern of zeros caused by branches), and it shows how the sparsity can be exploited by a simple factorization algorithm. It also presents an example, based on a simple humanoid (or quadruped) robot, showing how much faster the new algorithm is compared with existing factorization methods.*

### *Brief Biography:*

*Dr. Featherstone is one of the world's leading experts on rigid-body dynamics. He is the inventor of the articulated-body algorithm, and the author of the books "Robot Dynamics Algorithms" and "Rigid Body Dynamics Algorithms". He is also a fellow of the IEEE. In addition to dynamics, Dr. Featherstone has made contributions to robot kinematics, force control and actuator technology, and is currently working on legged locomotion.*