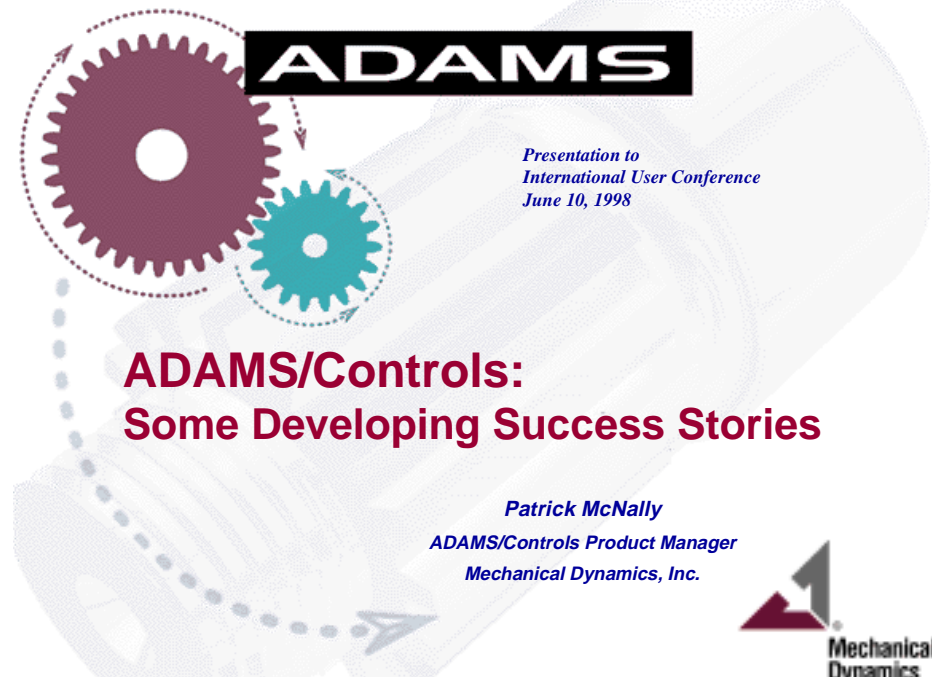


ADAMS/Controls: Some Developing Success Stories




ADAMS

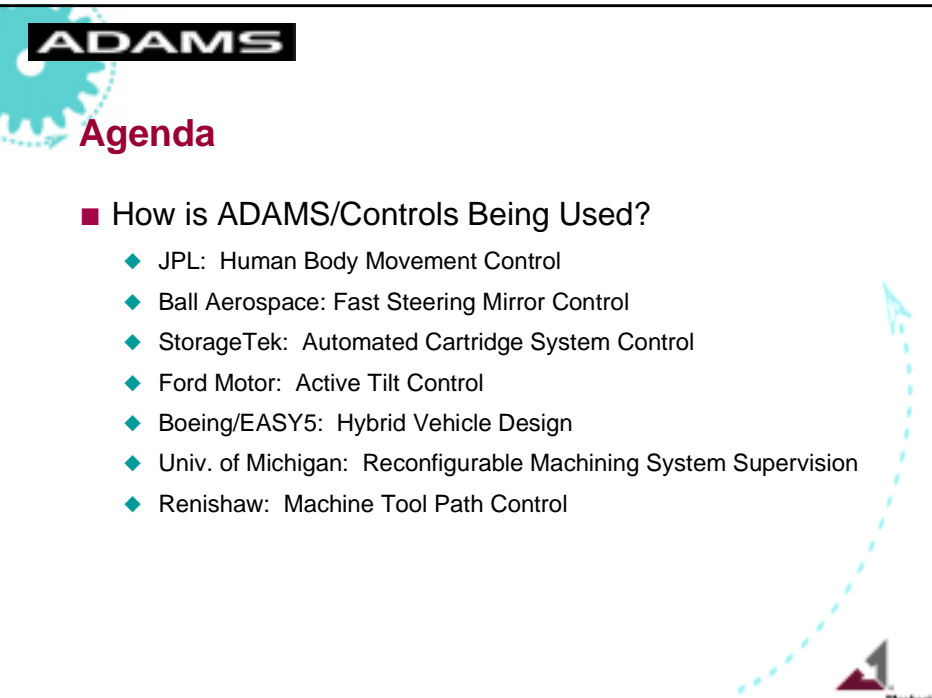
*Presentation to
International User Conference
June 10, 1998*

**ADAMS/Controls:
Some Developing Success Stories**

*Patrick McNally
ADAMS/Controls Product Manager
Mechanical Dynamics, Inc.*




Mechanical
Dynamics



ADAMS

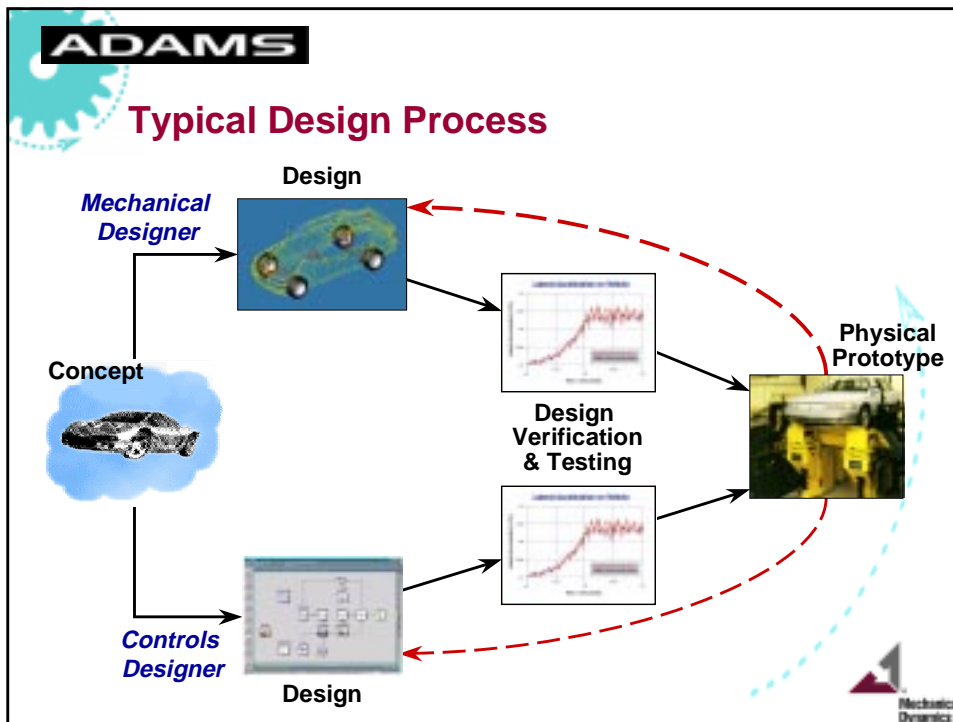
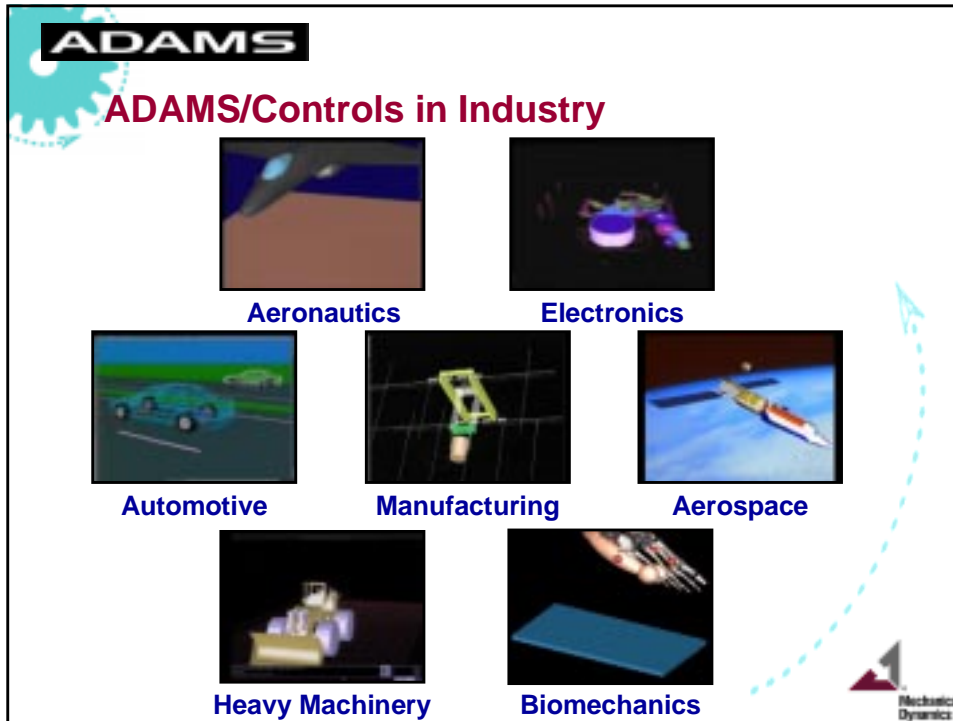
Agenda

- How is ADAMS/Controls Being Used?
 - ◆ JPL: Human Body Movement Control
 - ◆ Ball Aerospace: Fast Steering Mirror Control
 - ◆ StorageTek: Automated Cartridge System Control
 - ◆ Ford Motor: Active Tilt Control
 - ◆ Boeing/EASY5: Hybrid Vehicle Design
 - ◆ Univ. of Michigan: Reconfigurable Machining System Supervision
 - ◆ Renishaw: Machine Tool Path Control

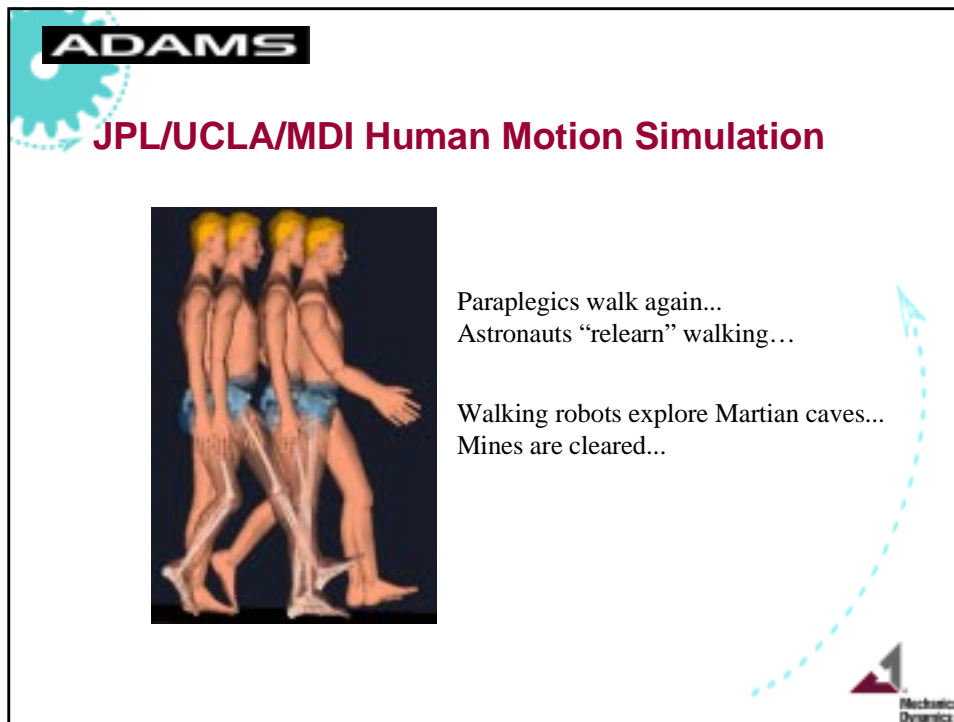
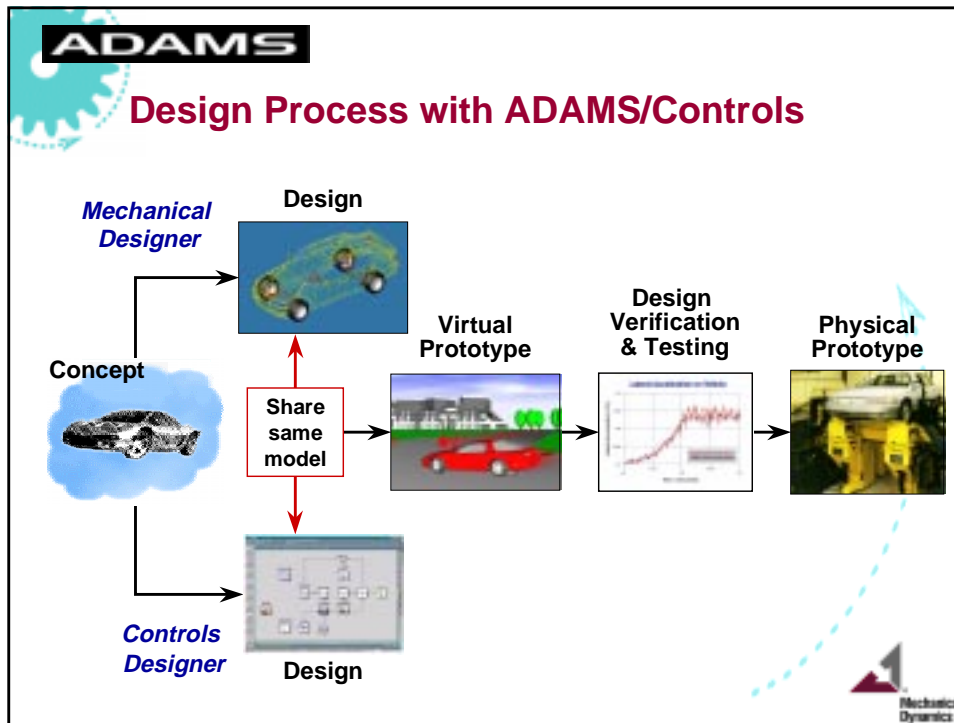


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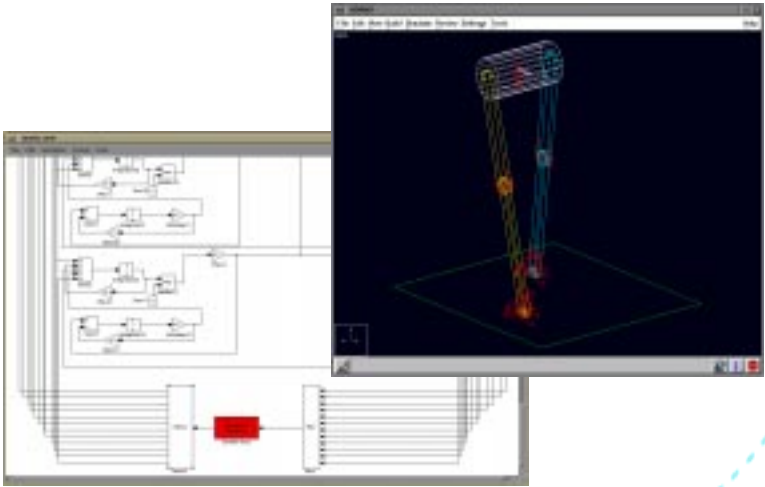
ADAMS/Controls: Some Developing Success Stories



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ADAMS

MATLAB NN Model combined with ADAMS

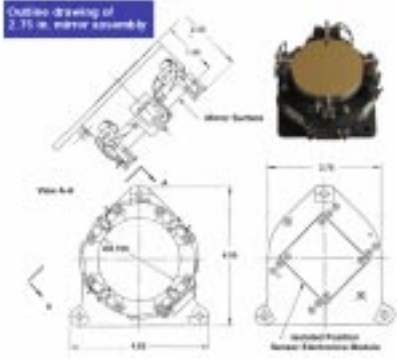


The image displays a software interface for ADAMS. On the left, there is a schematic diagram of a mechanical system with various components and connections. On the right, a 3D rendering shows a mechanical assembly with a cylindrical component at the top, supported by a structure of rods and joints. A dashed blue arrow points from the 3D model towards the bottom right corner.

Mechanical Dynamics

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Ball Aerospace Fast Steering Mirror

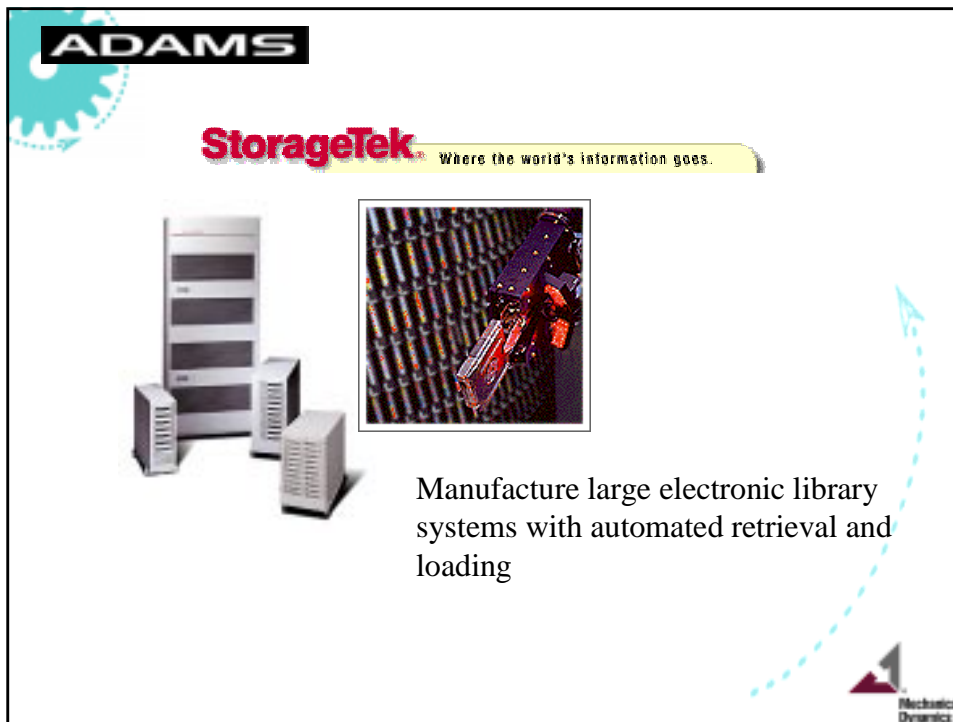
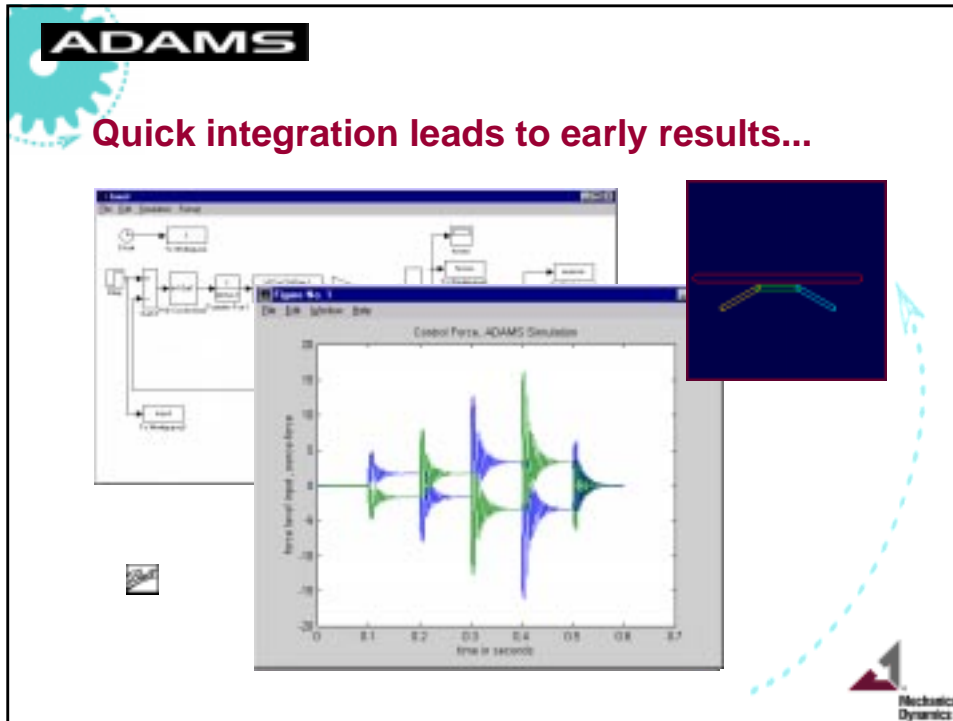


The image shows technical drawings and a photograph of a fast steering mirror assembly. The drawings include an isometric view, a top view, and a side view. A photograph shows the physical assembly, which is a circular device with a central mirror surface. A dashed blue arrow points from the technical drawings towards the bottom right corner.

- Patented flexible 2 DOF mount
- Noncontacting sensor system for angular displacement
- 10 mrad step in 11msec, with <math>< 0.5 \mu\text{rad}</math> RMS stability
- Application: industrial instrumentation, astronomy, laser communications, imaging systems, others

Mechanical Dynamics

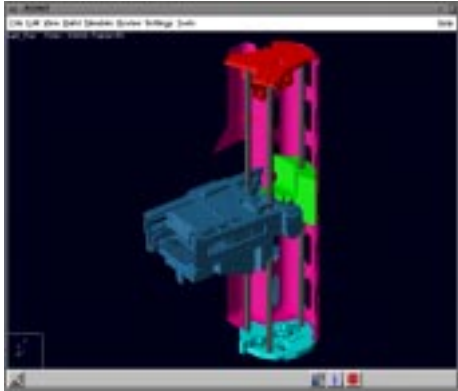
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ADAMS


ADAMS Automatic Cartridge Model accounts for system flexibility...

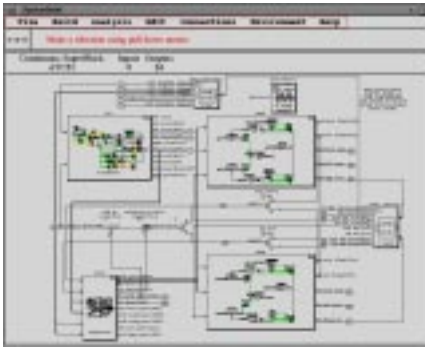


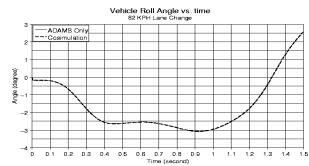
- Used for selecting and loading tape cartridge
- flexible mounting and stiffeners
- belt driven motion
- initial controller developed with rigid model - unstable
- flexible system model verified against test data
- now modify controller to account for flex effects

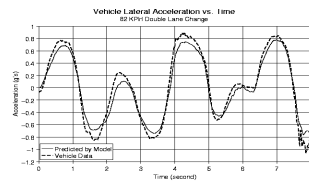


ADAMS

 **COSIMULATION**








FORD ATC correlates ADAMS/Controls data with test and ADAMS


See George Villec's paper in the proceedings



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ADAMS - EASY5 Hybrid vehicle



- Strong powertrain-vehicle dynamics coupling
- Test model developed in conjunction with Boeing

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Univ. of Michigan: Flexible Manufacturing



- Quickly design and configure a manufacturing system to provide exactly the production capacity and functionality needed
- Readily upgrade with new process technologies and new functions
- Rapidly reconfigure to provide new functionality to produce future products

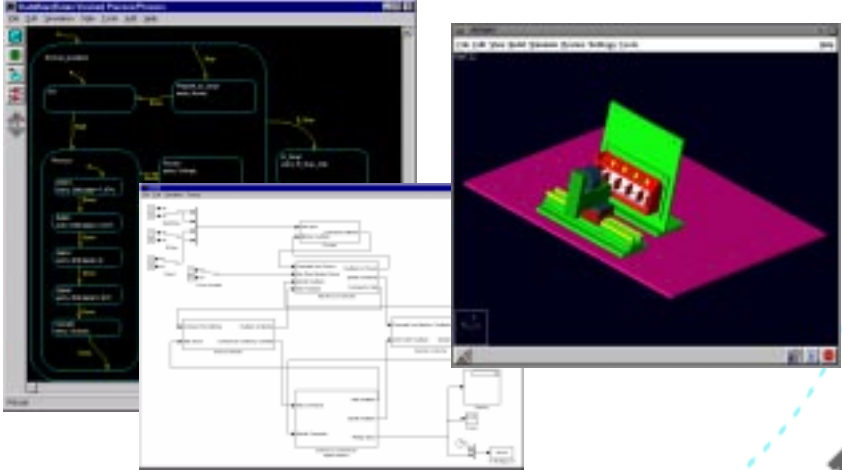
Mechanical Dynamics

ADAMS/Controls: Some Developing Success Stories

ADAMS

COLLEGE OF ENGINEERING
UNIVERSITY OF MICHIGAN
CONTROLS GROUP

Integration of ADAMS with MATLAB/Stateflow




The image displays a screenshot of the ADAMS software interface. On the left, a Stateflow control logic diagram is visible, showing various states and transitions. On the right, a 3D model of a mechanical assembly is shown, consisting of several green and red components. The assembly is positioned on a pink rectangular base. A dashed blue arrow points from the 3D model towards the bottom right corner of the slide.

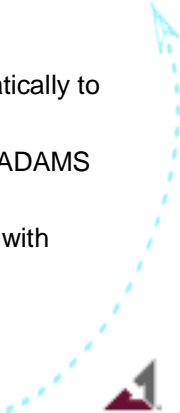
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ADAMS

Renishaw PLC



- Command machine tool around arbitrary paths
- design paths in MATLAB
- drive ADAMS model kinematically to design feedforward loop
- design dynamic servo from ADAMS results
- virtual test of final controller with ADAMS model



Mechanical Dynamics

ADAMS/Controls: Some Developing Success Stories

ADAMS

Conclusion

- ADAMS/Controls makes it easy to directly transfer data to and from these leading control system design packages:

MATRIX_x
with SystemBuild



Integrated Systems, Inc.
Sunnyvale, CA

MATLAB
with SIMULINK



The Math Works Inc.
Natick, MA

EASY5



The Boeing Company
Seattle, WA

