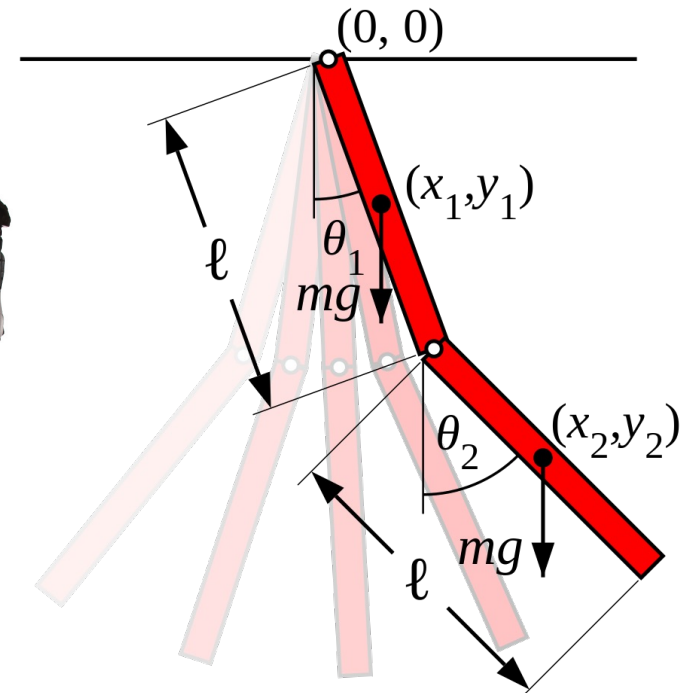
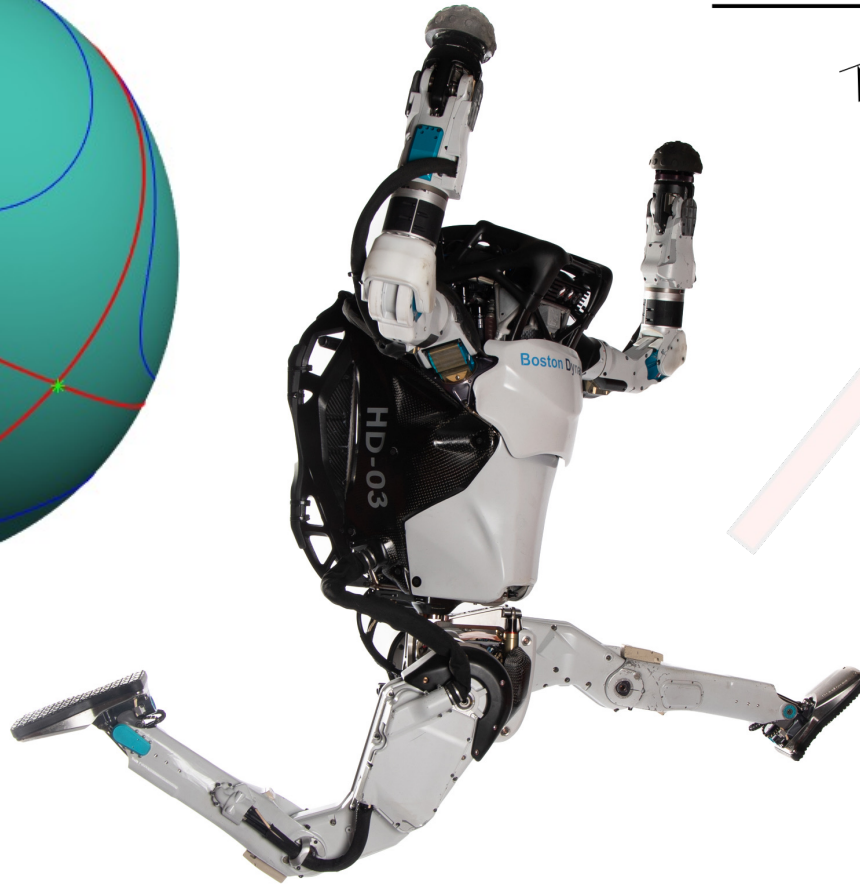
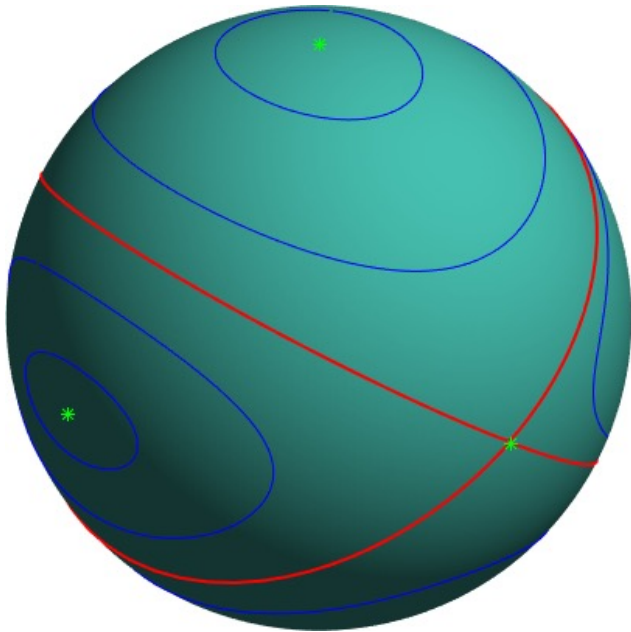


Advanced Robot Dynamics and Simulation

16-715



Fall 2022

Course Team



Zac Manchester
Assistant Professor
Instructor



Anthony Wertz
PhD Student
TA

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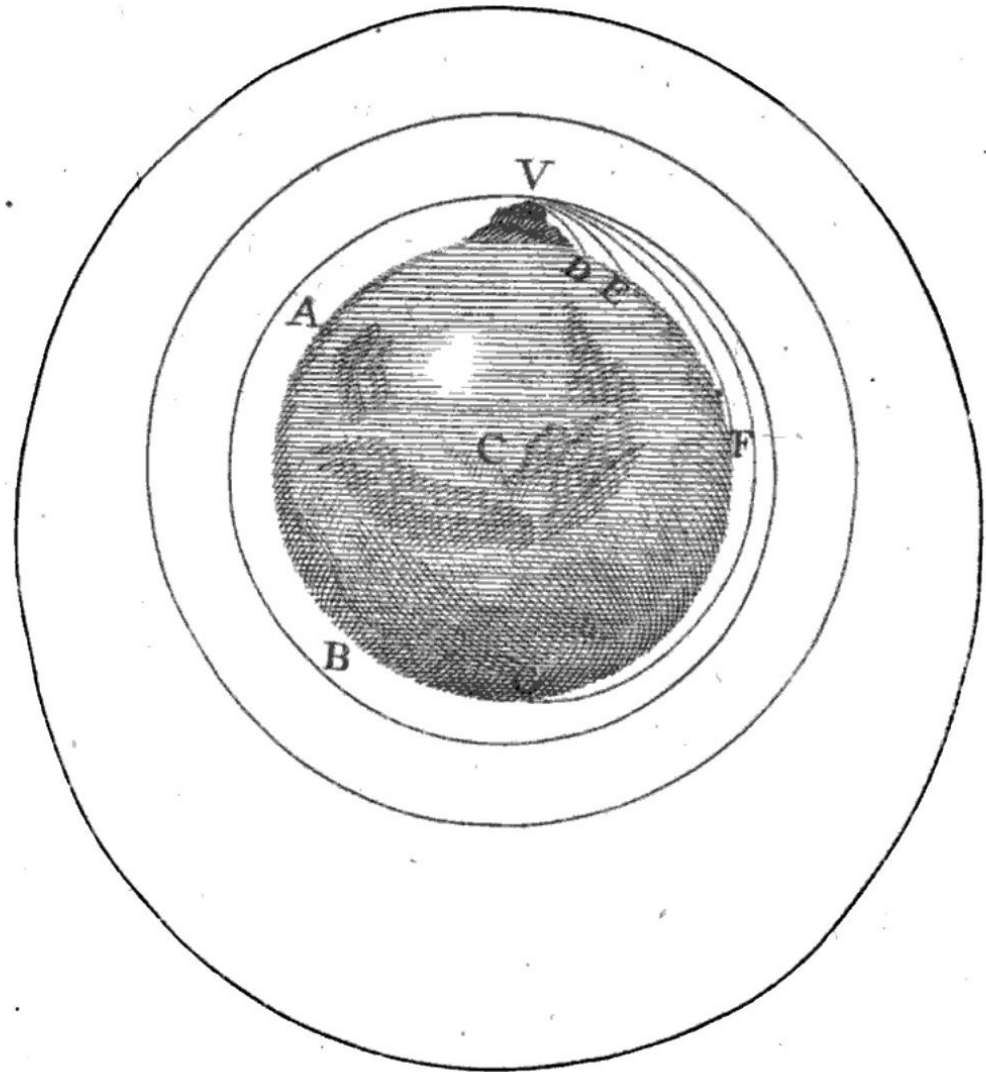
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Autore *J*. S. NEWTON, *Trin. Coll. Cantab. Soc. Matheseos*
Professore Lucasiano, & Societatis Regalis Sodali.

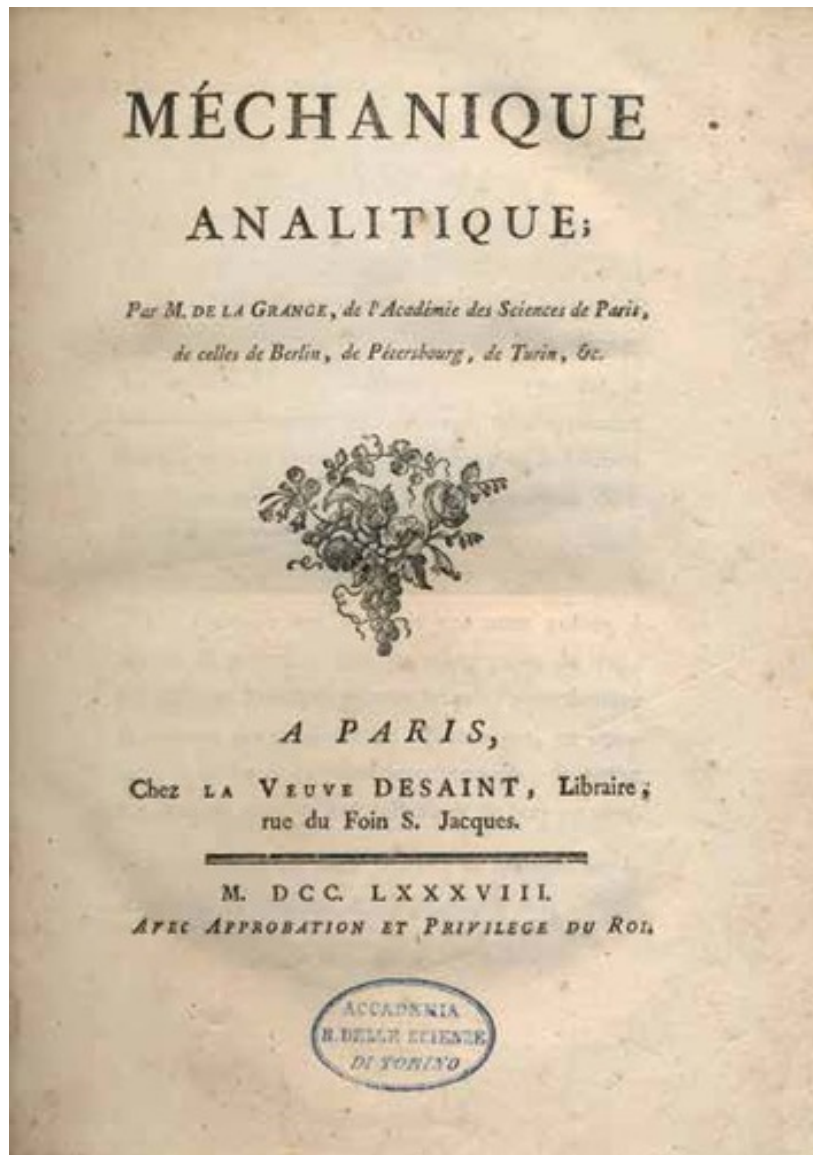
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S. PEPYS, *Reg. Soc. PRÆSES.*
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plures Bibliopolas. Anno MDCLXXXVII.



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$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{q}} \right) - \frac{\partial L}{\partial q} = Q$$

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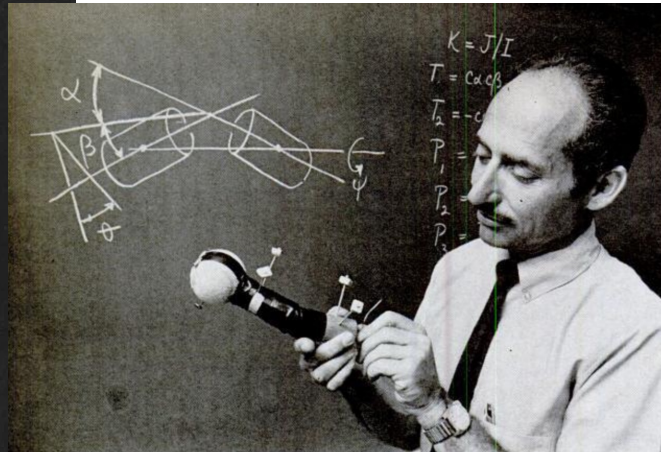


$$\mathcal{S} = \int_{t_0}^{t_f} L(q(t), \dot{q}(t)) dt$$

$$\frac{\delta \mathcal{S}}{\delta q(t)} = 0$$

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DYNAMICS: Theory and Applications



Thomas R. Kane

Stanford University

David A. Levinson

Lockheed Palo Alto Research Laboratory

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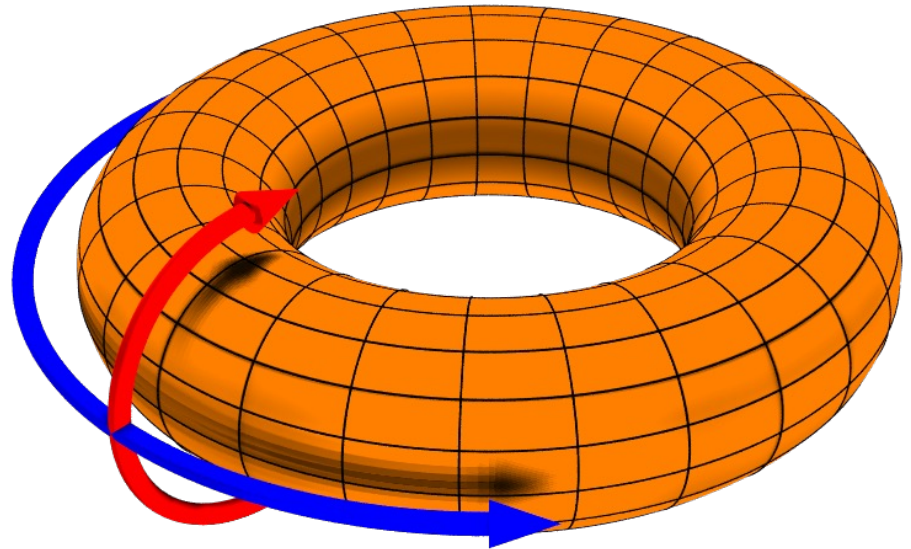
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**Mathematical
Methods of
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Second Edition

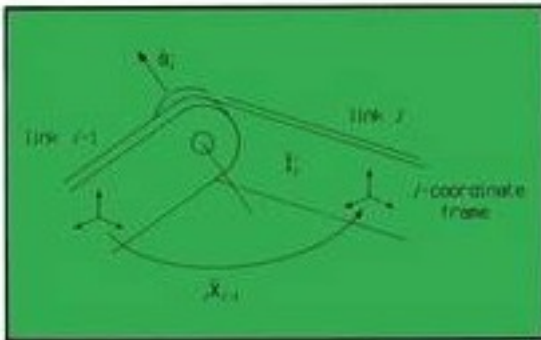
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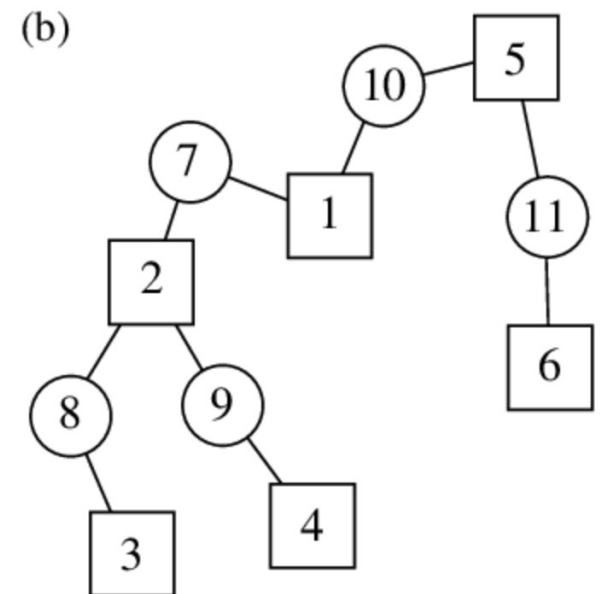
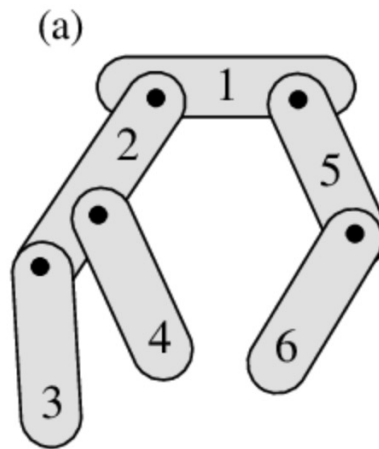
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Robot Dynamics Algorithms

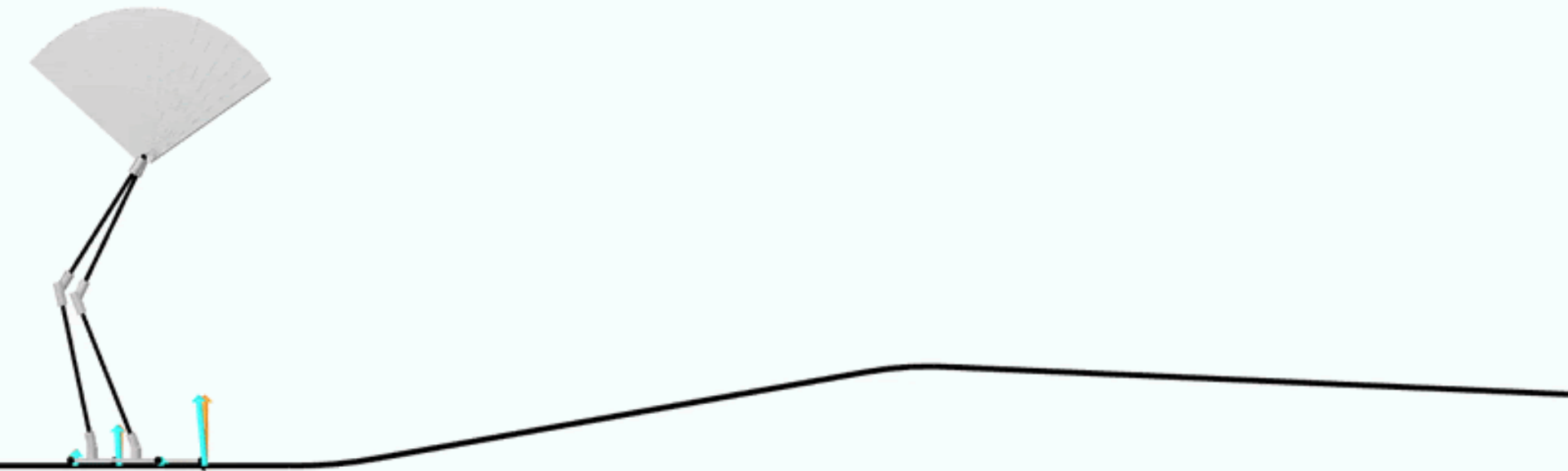
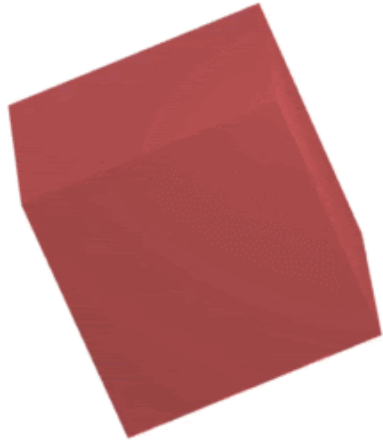
Roy Featherstone



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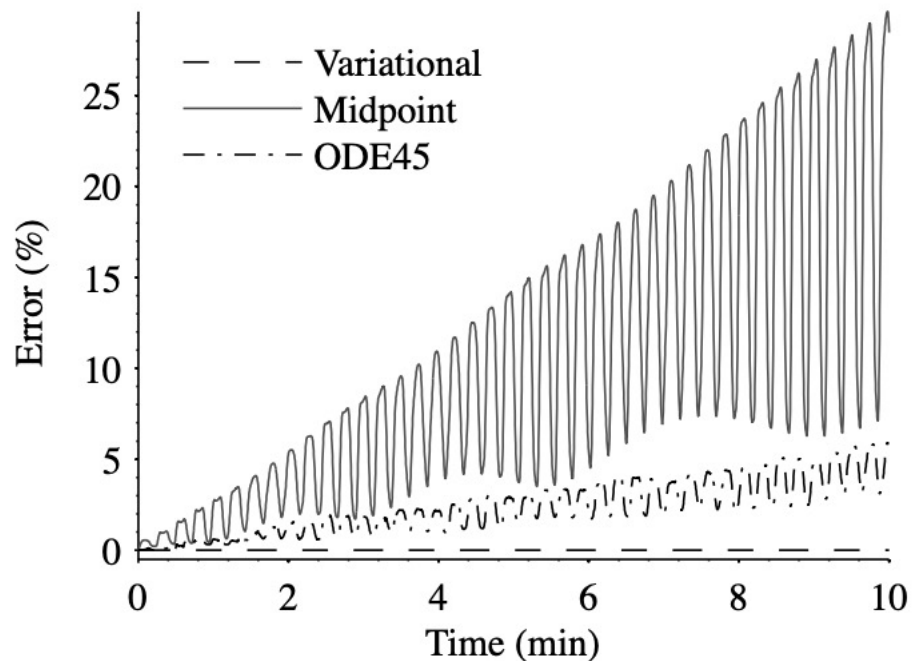
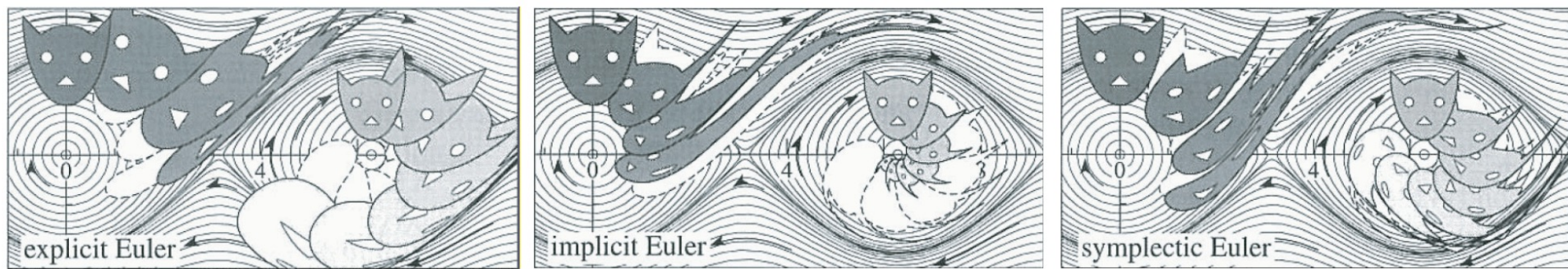


Figure 1. Momentum error for a free rigid body

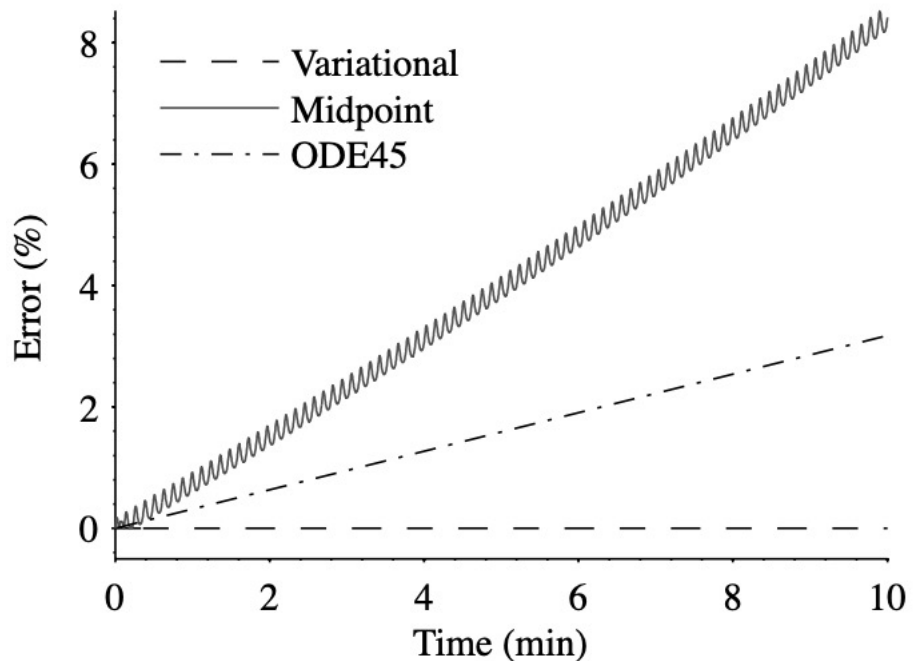
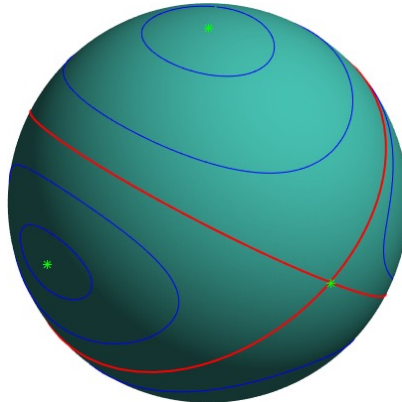


Figure 2. Energy error for a free rigid body

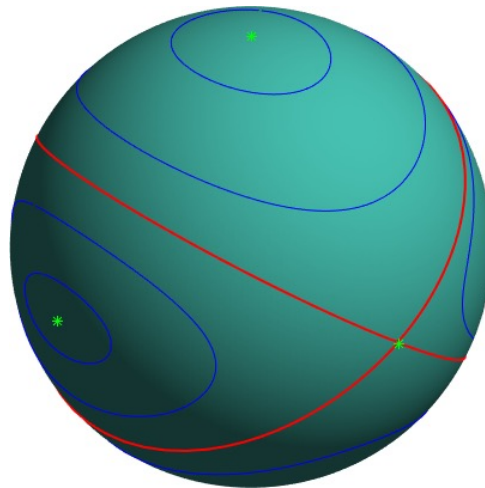
What Are We Doing Here?

- Rigid and multi-body dynamics with constraints & contact
- Classical analytical methods (Lagrange, Hamilton, etc.)
- Modern algorithmic approaches (Discrete Mechanics, Linear-Time Algorithms, Time-Stepping Methods)
- Focus on numerical implementation and robotics applications
- Homeworks (~4) + course project in groups of 1-4



Logistics

- Lectures in NSH 1305 and on Zoom (recordings will be posted)
- Notes from lectures will be posted
- Slack for course communication
- Homework will be distributed/collected through GitHub
- Office hours TBD



Assignment Zero:

Fill out course survey:

<https://forms.gle/8oz9M7mwwSusSnE8A>

Join course Slack:

<https://robot-dynamics-fall22.slack.com/>