

Dynamical Characterization and Stabilization of Gravity Tractor Designs for NEO Impact Risk Mitigation

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Motivation & Key Questions

- Numerous advantages to gravity tractor (GT) concept, but also some disadvantages
- We address the disadvantage of complex dynamical interaction between the GT and asteroid (NEO) bodies
- To date: Nice concepts...



... but



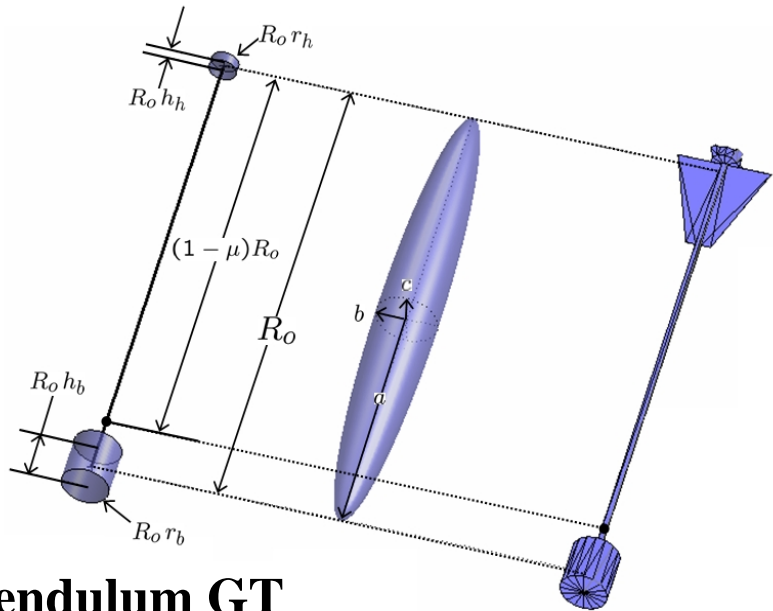
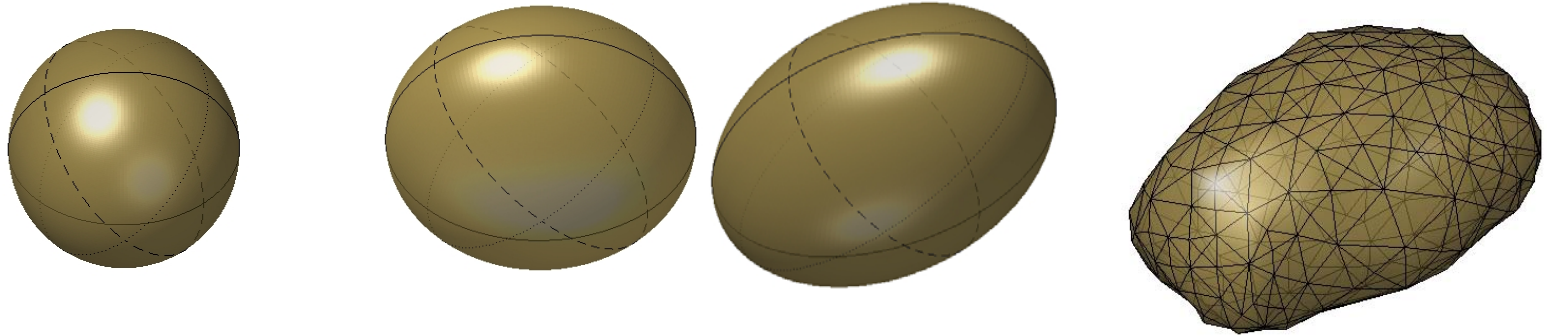
Motivation & Key Questions

- Numerous advantages to gravity tractor (GT) concept, but also some disadvantages
- We address the disadvantage of complex dynamical interaction between the GT and asteroid (NEO) bodies
- The problem:
 - Rotational and translational dynamics are fully coupled
 - Uncertainty of target shape, mass distribution, rotation state before arrival
 - These issues not properly investigated to date
- How do we hover and control GT to align it with desired towing direction?
- What additional cost, performance loss, or design impact does implementing the actual control scheme entail?
- Are certain geometries / configurations for GT better?

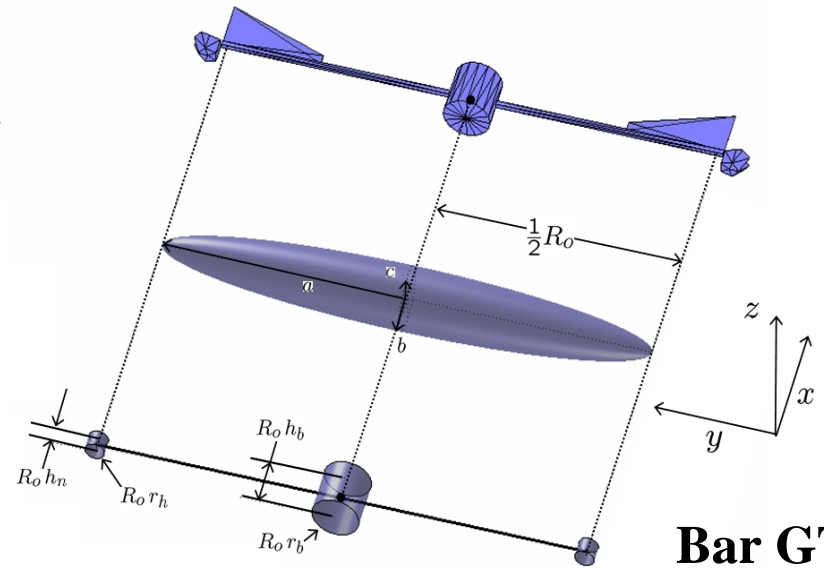


Overview / Concept of Paper

NEO representations examined



Pendulum GT



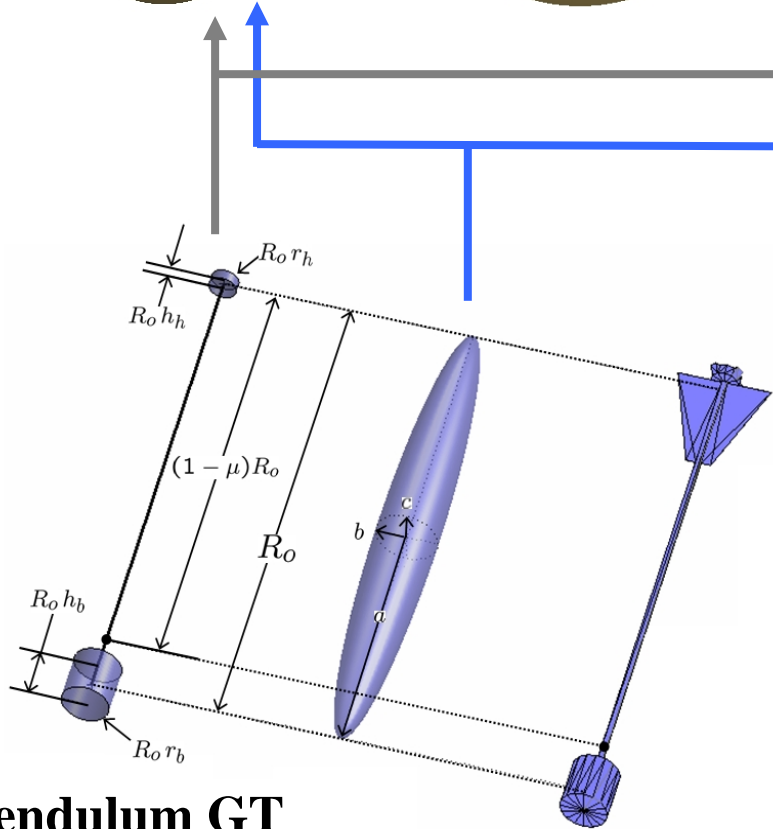
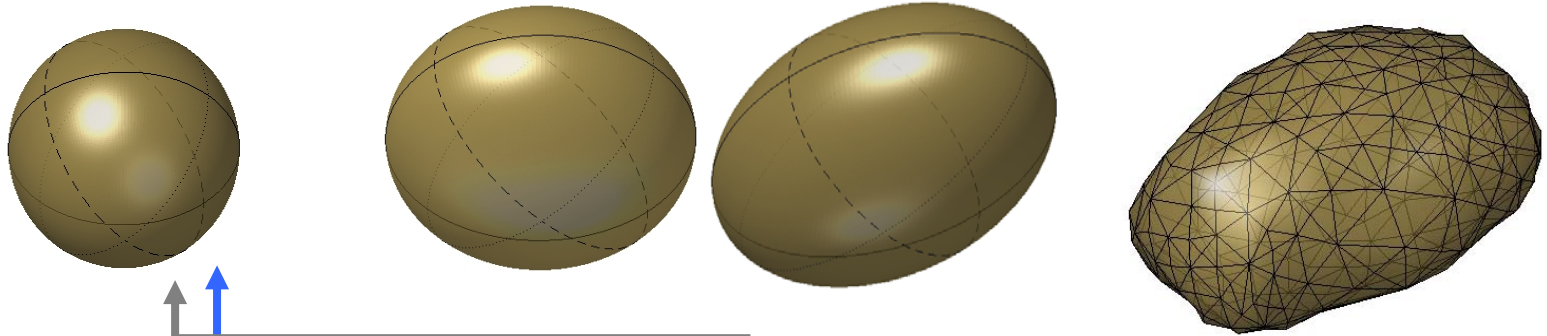
Bar GT

GT representations examined

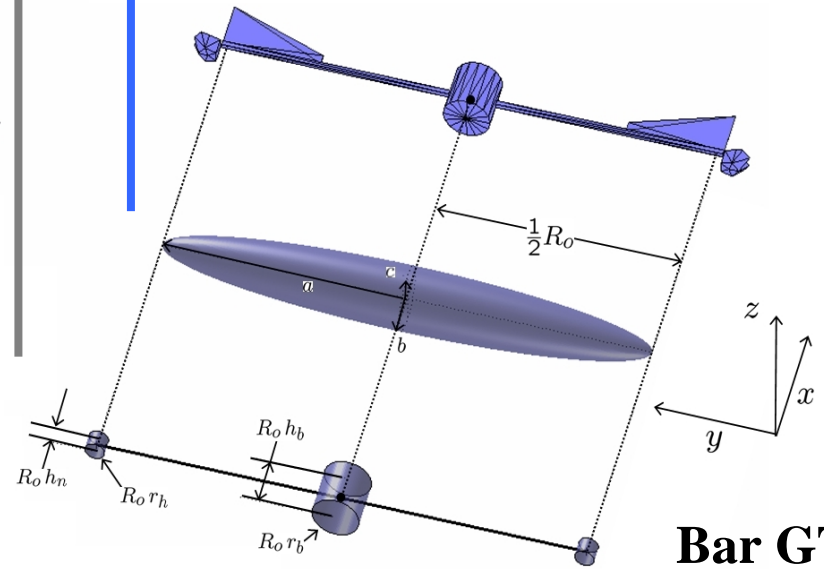


Overview / Concept of Paper

NEO representations examined



Pendulum GT



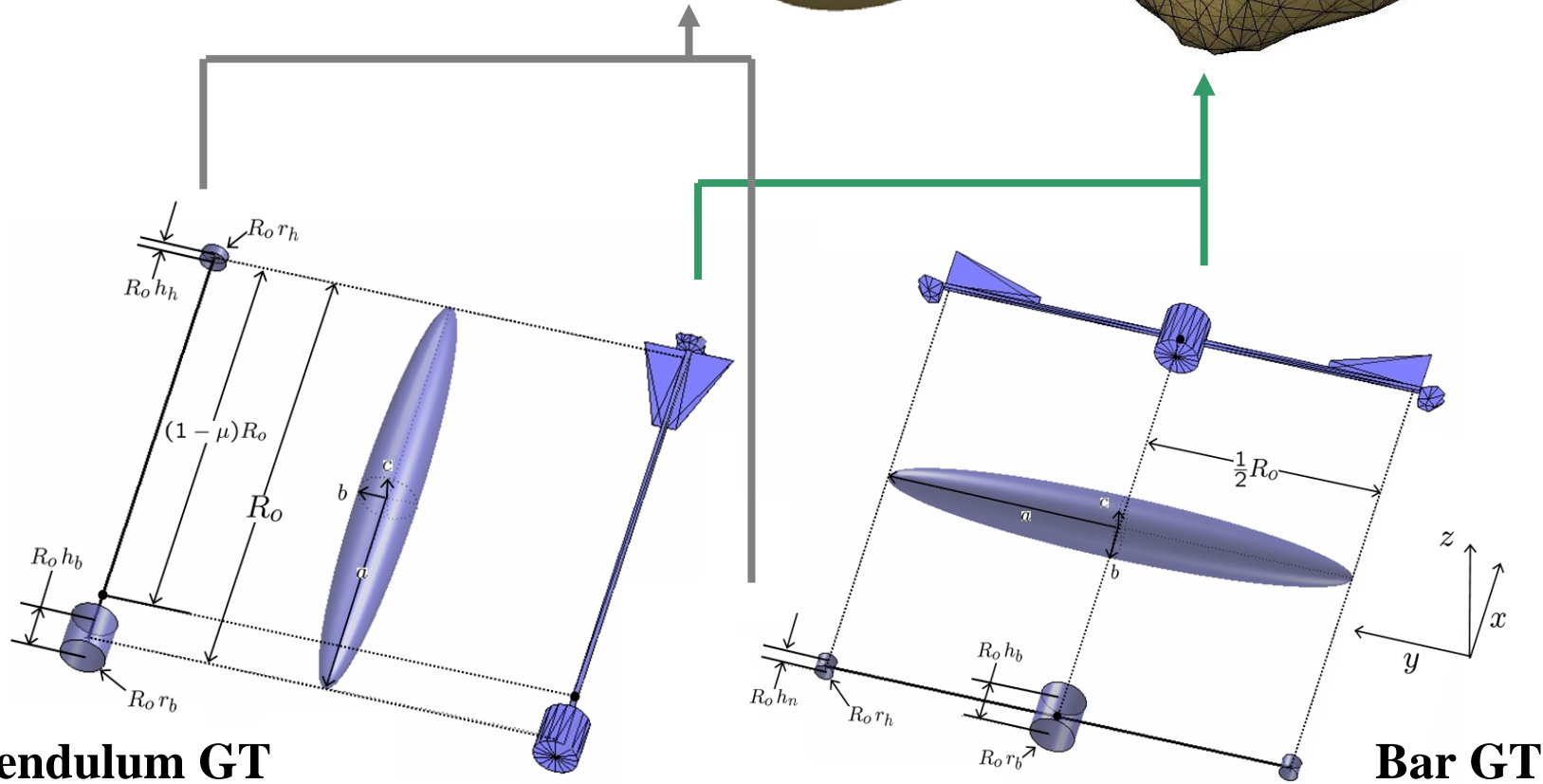
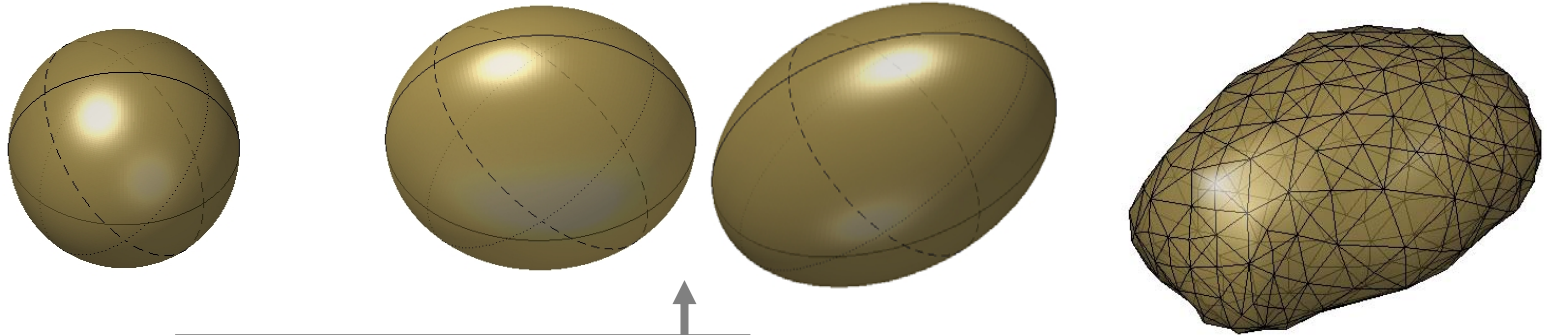
Bar GT

GT representations examined



Overview / Concept of Paper

NEO representations examined



GT representations examined

Apophis & Pendulum GT

Propagated with full detail
(polyhedra) model

Apophis & Bar GT

Propagated with analytical model

Apophis & Pendulum GT

Propagated with analytical model