## Debate2Create: Robot Co-design through Large Language Model Debates

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+1225.4

Round 2

Round 1

-42.8

**Round 3** 

**Debate Round** 

Round 4

**Round 5** 





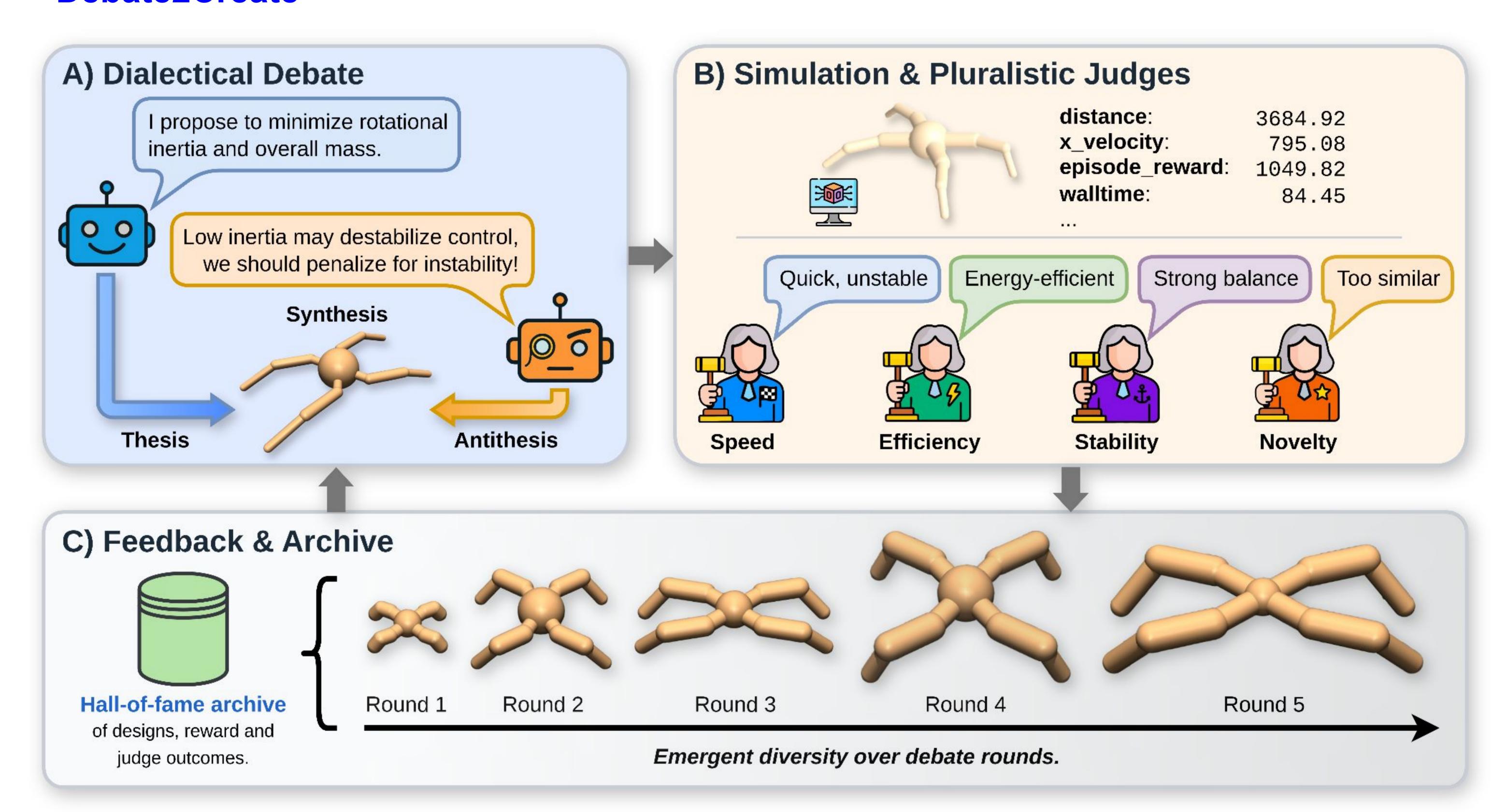


# Can robots co-evolve through debate and simulation?

### Overview

- 1. LLM debates: A design and control agent co-design robot morphologies via structured debate.
- 2. Sim-as-a-judge: Physics simulation scores each design—reward pair and guides evolution.
- 3. Emergent diversity: Repeated debates yield faster, more stable, and diverse robot morphologies.

### Debate2Create



#### Results Winning design + reward! **Thesis vs Synthesis Performance Across Debate Rounds** Original Ant Debate2Create 60000 Thesis Approach Synthesis Approach Thesis 95% CI 50000 Origin Synthesis 95% CI 40000 30000 Distar 20000 height pitch speed roll / yaw 10000 $(h-0.7)^2$ $(\mathbf{p} - 0.6)^2$ reward =0.02 Round 3 **Round 5** Round 1 Round 2 **Round 4 Debate Round** smoothness alive control Advantage Synthesis vs Thesis Performance Difference +36171.5 30000 Interested in learning more? 20000 We will release our preprint shortly:) Synthesis +5742.7 +4714.8 10000

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