



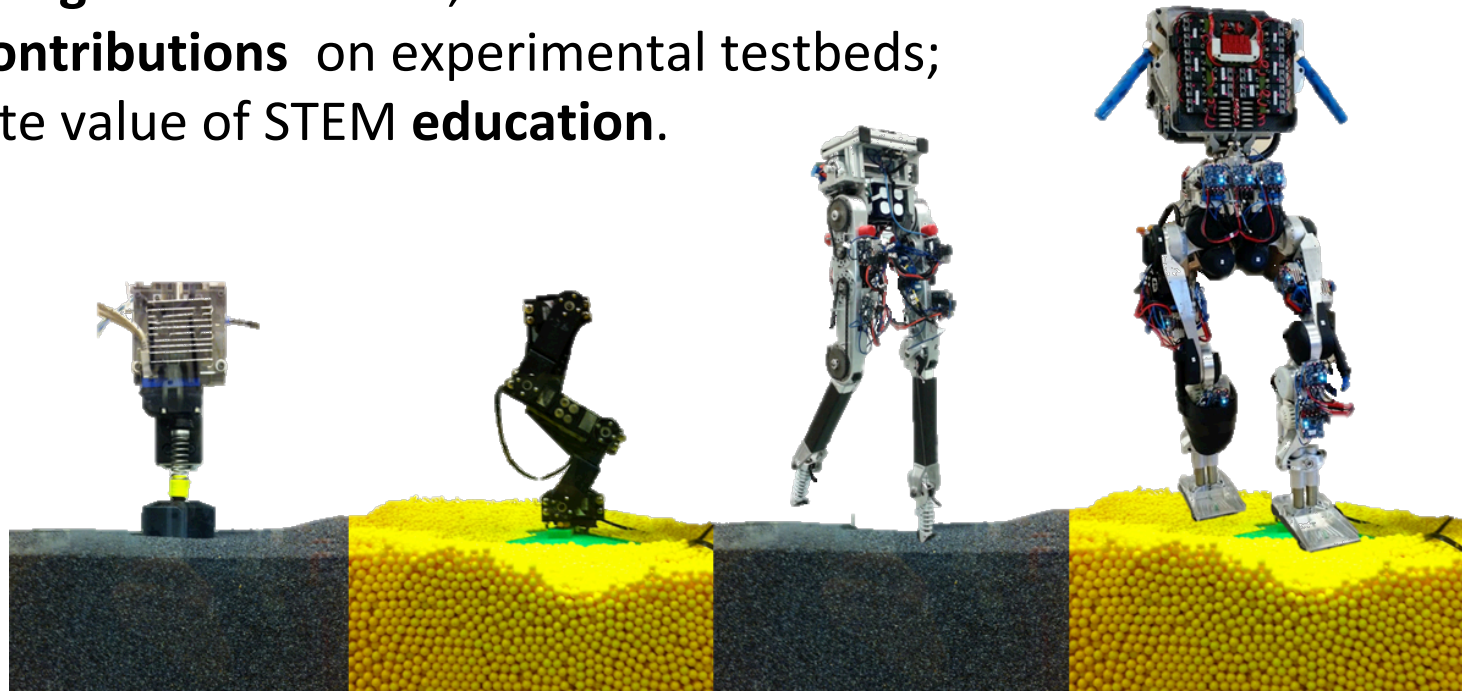
# CPS : Synergy : Learning to Walk - Optimal Gait Synthesis and Online Learning for Terrain-Aware Legged Locomotion

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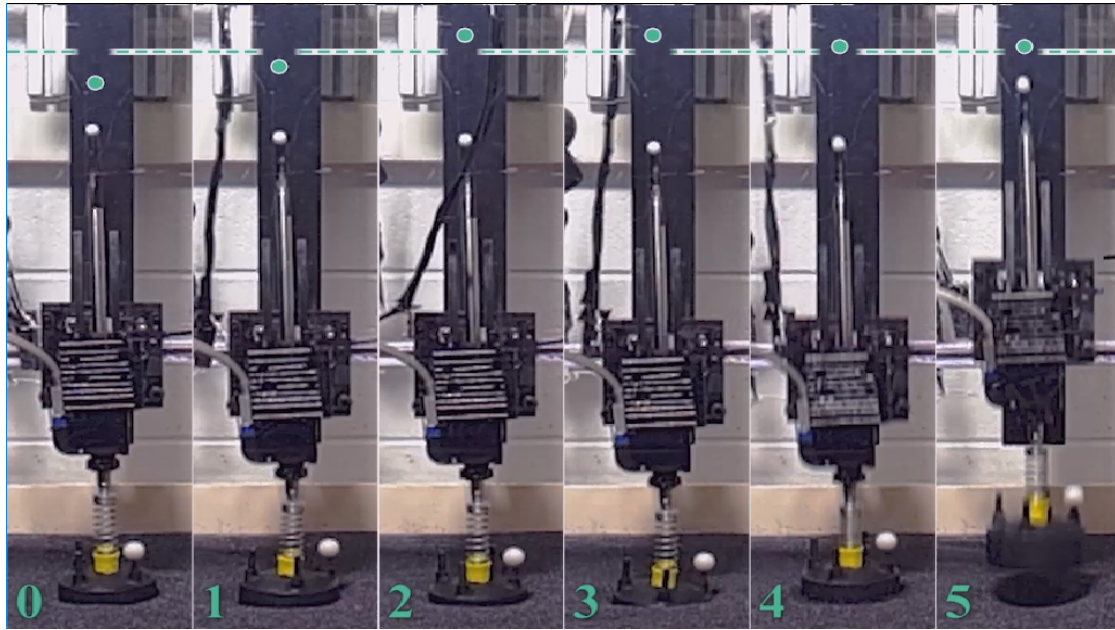
# Description

advance abilities of cyber-physical systems by tying sensing, perception, and computing to the optimization and control of physical systems whose properties are variable and uncertain.

1. **Model interactions** (robot-environment);
2. **Stable gait generation and transition strategies;**
3. **Online learning** of interactions;
4. **Validated contributions** on experimental testbeds;
5. Communicate value of **STEM education.**



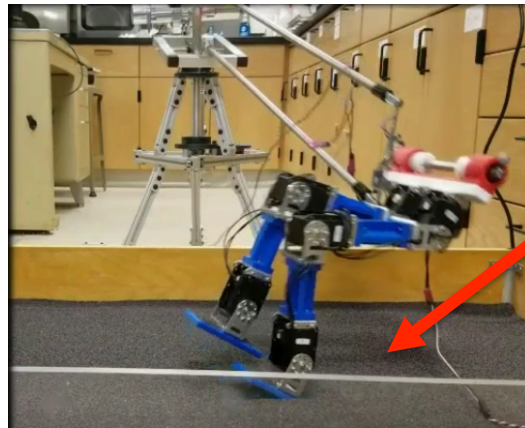
# Findings



when modeled properly,  
online learning can be fast

learns in 5 trials;  
mostly gets it within 2

robust walking  
on granular terrain



wrong model, falls immediately!  
no footprints

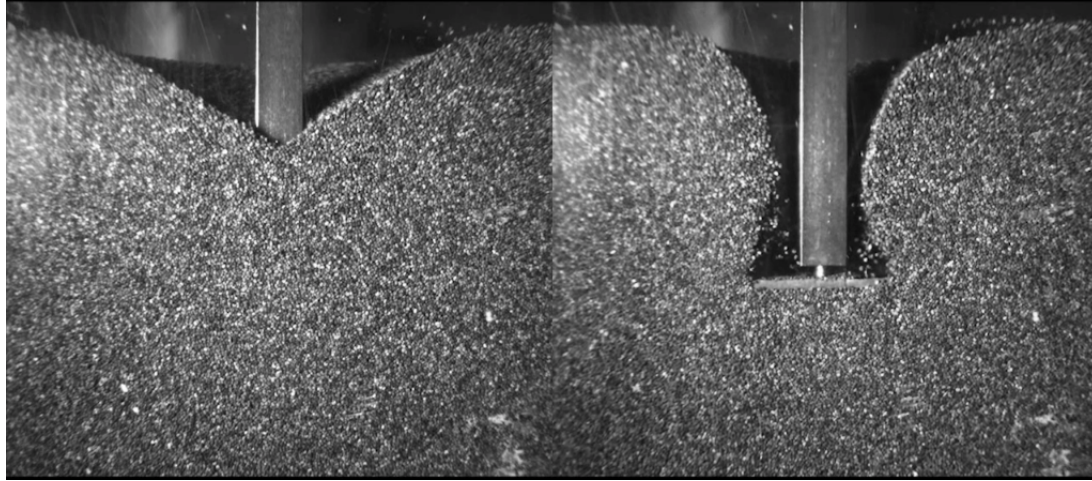
with robot-terrain model, walks!  
yes footprints



# Additional Findings

75 mm/s

750 mm/s



foot-terrain interaction  
has speed dependence

force overshoot implies  
interesting terradynamics

optimal orbit transitions  
have nice fiber bundle  
structure

