The Quadrupedal Teammate: Workforce Augmentation Panel Projects

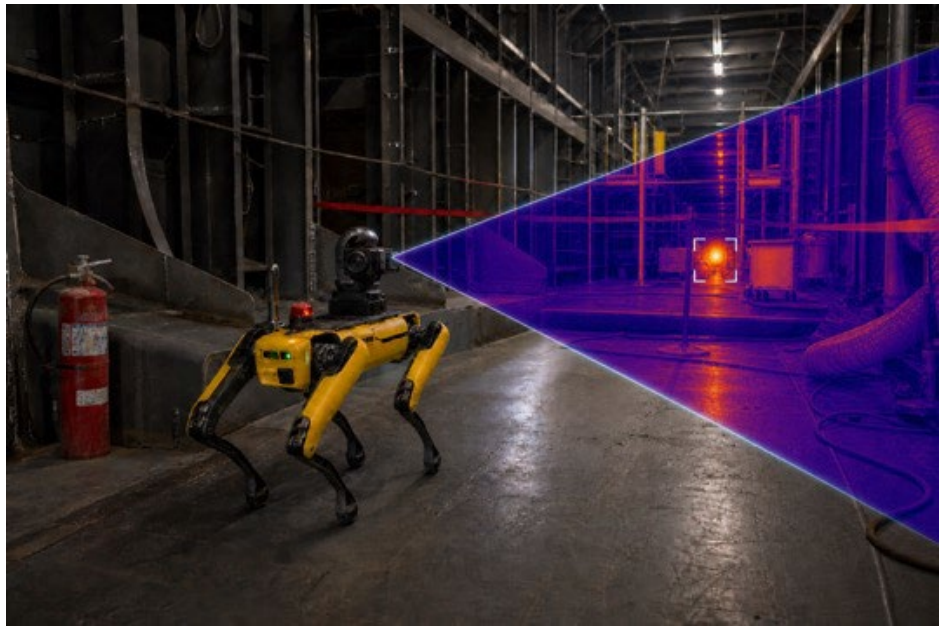
Jared Li (IHMC) – Research Scientist

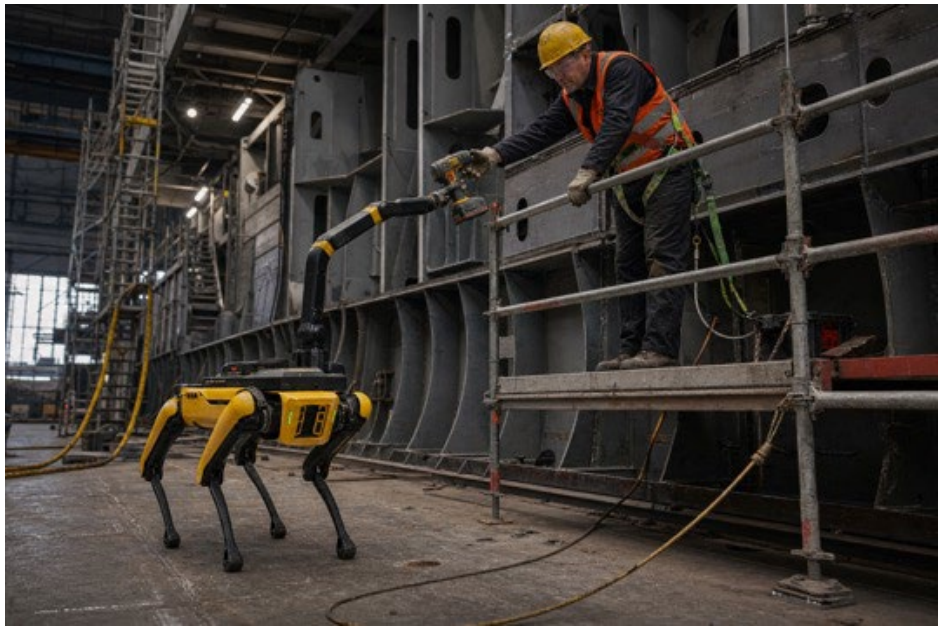
Erik Bjorkner (Austal USA)- Senior Manager Systems Engineering & Technology

Garry Shields (NAVSEA Carderock) – Director of the Disruptive Technologies Laboratory (DTL)

2 Panel Projects

- **WATCH** - **W**alking **A**utonomous **T**eammate for **C**ircuit navigation and **H**ot-work monitoring
- **HANDS** - **H**uman-**A**ware **N**avigation and **D**elivery **S**ystem
- TIP Relevance
  - 7.3.2.3.4, Infrastructure, Logistics and Sustainment.
    7.2.2.4.3, Ship Production Technologies, the implementation of collaborative robots in manufacturing.



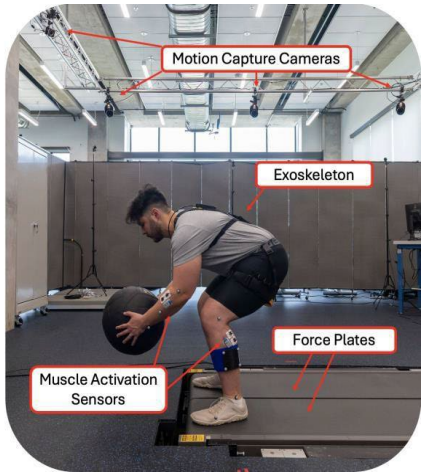


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Relevance to Current Work

- EASE – PP26-35 (ongoing)
  - Explore injury prevention potential of commercial exoskeleton devices
  - Test commercial exoskeletons in shipyard environments
  - Figure out gaps in usefulness, design new device
- WATCH and HANDS
  - Worker augmentation
  - Autonomous robot acts as extension of worker capability
  - Increased individual and site safety
  - **Improve efficiency of labor hours**









The Boston Dynamics Spot Quadruped

- Core to all 3 projects
- Field-tested system (TRL 9)
- Deployed in numerous industries for autonomous inspection tasks
  - Oil and gas
  - Nuclear decommissioning
  - Logistics and warehousing
  - Mining
  - etc.
- Not largely used at shipyards
  - Some research work ongoing
- IHMC owns 2, NSWCCD owns 1



WATCH - Walking **A**utonomous **T**eammate for **C**ircuit navigation and **H**ot-work monitoring

PROJECT INFORMATION

Prime/Lead:
Florida Institute for Human and Machine Cognition (IHMC)
Team Members:
Austal USA; NSWC Carderock Division (Government participant)
Duration:
12 months
End TRL:
4-6 (Spot robot currently TRL 9 in other industries)

OBJECTIVE

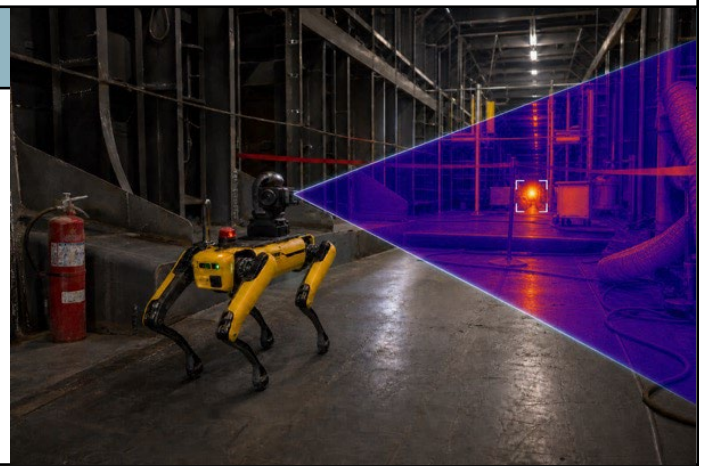
- Extend thermal monitoring of hot-work areas past the 30-minute fire watch into the 2-to-12 hour delayed-ignition window or during times the area is unmanned, with no added watch labor.
- Establish how many how many hot work areas one platform can cover per route at a representative shipyard, and measure detection performance against seeded thermal anomalies of known magnitude.
- Produce a shipyard navigability map documenting which routes, gangways, and ladder types are traversable/not traversable by an autonomous quadruped, and under which weather and clutter conditions.

DELIVERABLES/BENEFITS/ROI

- Deliverables: Kickoff and quarterly reports, Report on integration of IR and strobe patrol payload with circuit autonomy software, shipyard route map and hot-work circuit procedure, Final report for public distribution.
- Early identification of a potential fire.
- Navigability map to help ground robot.

FINANCIAL

Program Funds:
$199.9K
Cost Share:
$0



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HANDS - **H**uman-**A**ware **N**avigation and **D**elivery **S**ystem

PROJECT INFORMATION

Prime/Lead:
Florida Institute for Human and Machine Cognition (IHMC)
Team Members:
Austal USA; NSWC Carderock Division (Government participant)
Duration:
12 months
End TRL:
4-5 (Spot robot currently TRL 9 in other industries)

OBJECTIVE

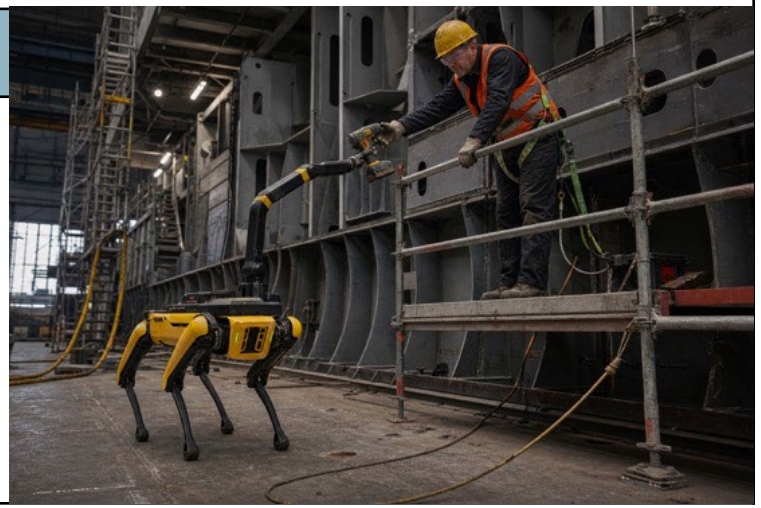
- Demonstrate robot following, where Spot tracks its assigned tradesperson through representative shipyard routes at a set distance and executes commanded start, stop, and hold behaviors, with reliability measured over repeated circuits.
- Demonstrate co-working with tool/material handover driven by fused vision and wearable kinematics, measuring handover success rate and exchange time against the walking-fetch and human-helper baselines recorded on the same tasks.
- Document which work areas, tasks, and conditions support human-quadruped co-working (e.g. clutter, footing, lighting, PPE interference), and quantify the handling time recovered per shift.

DELIVERABLES/BENEFITS/ROI

- Deliverables: Kick off and quarterly reports, Report on wearable sensing and handover strategies, Human-quadruped co-working procedure and suitability map, Final report for public distribution.
- Measure of recovered direct-work time.
- Reduced physical strain for workforce.

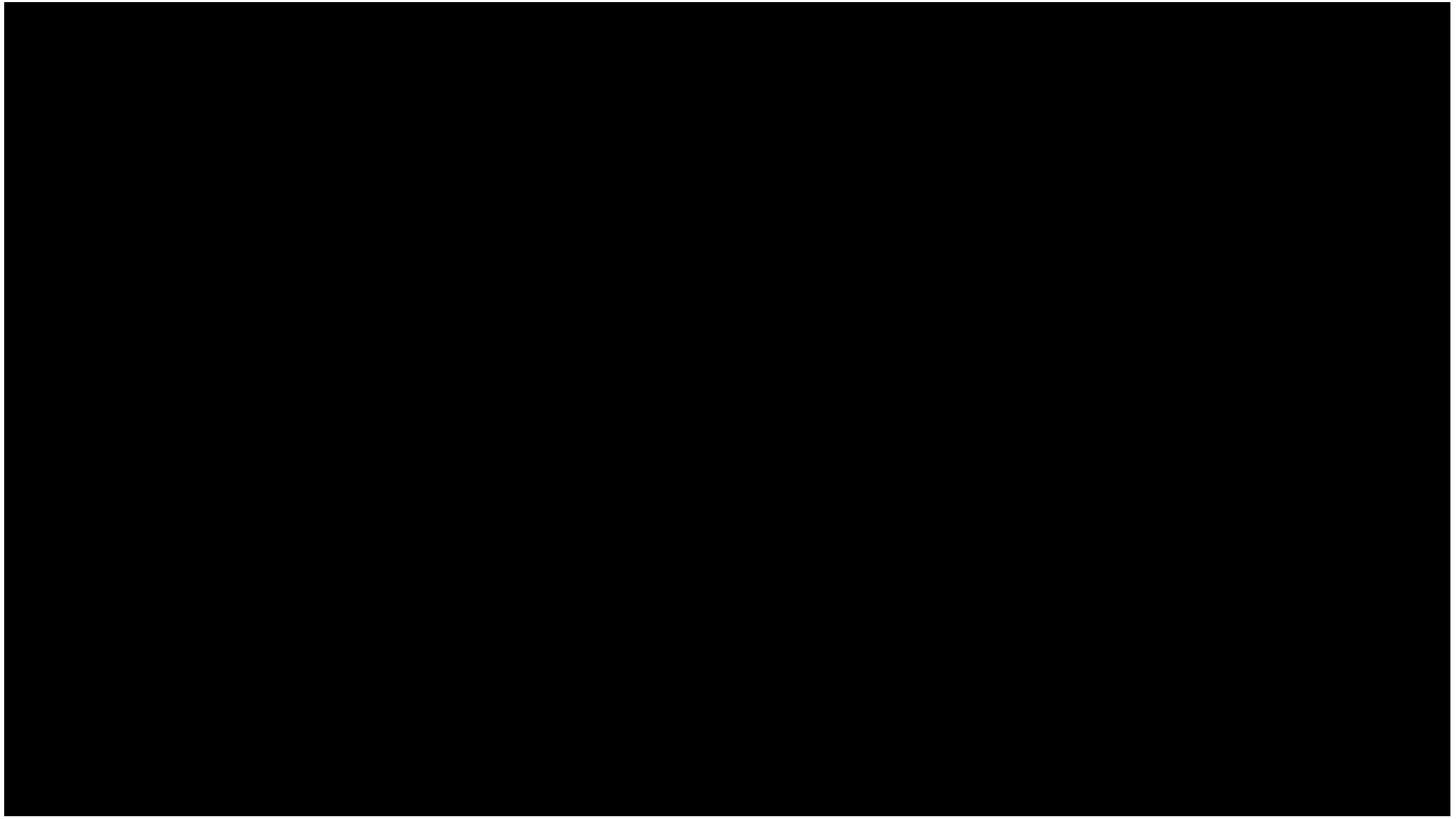
FINANCIAL

Program Funds:
$200K
Cost Share:
$0



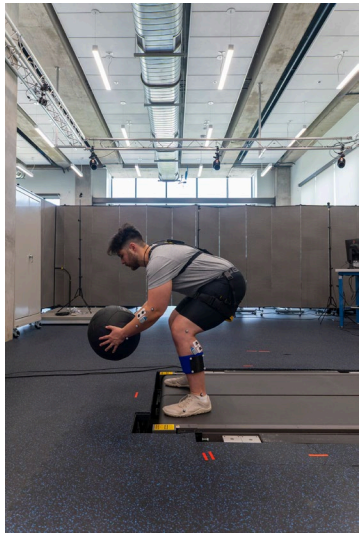
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IHMC’s Recent Work: Quadruped Co-Working

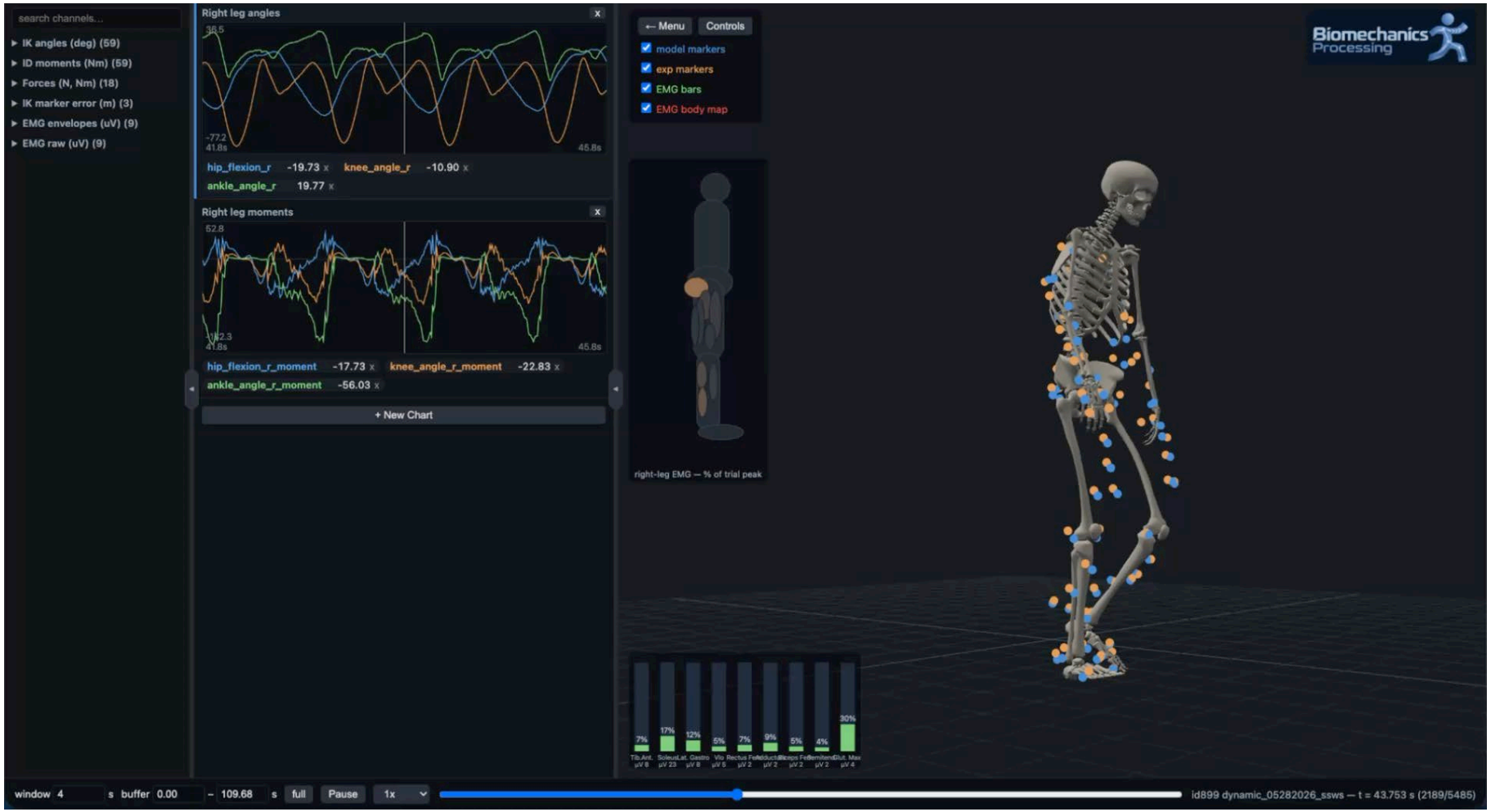


IHMC's Recent Work: Human Sensing and Biomechanics









The Quadruped Teammate



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Thank you for listening! Questions?