

Robot Embodiment: TIAGo



SPECS

Height	110–145 cm
Footprint	ø 54 cm
Arm Payload	3 Kg (without end-effector)
Battery autonomy	4–5h (1 battery)/8–10h (2 batteries)
Mounting points	On head, laptop tray and mobile base
OS	Ubuntu LTS, Real Time OS

Sensors:

- Force-torque sensor on wrist.
- Customizable laser and sonar sensors
- inertial measurement unit (IMU)
- RGB-D camera
- two microphone arrays.

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Prior Work: Robot Teleoperation

Understanding Whole-body Robot Teleoperation Strategies Under Diverse Task Objectives and Constraints



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Improving Real-Time Robustness for Human-Robot Communication In-The-Wild

Motivation:

- Deploying robots in the real world introduces a dynamic environment; systems will encounter varying lighting conditions, background noise, groups of humans, etc.
- To best support robot systems for human-robot interaction in the real world, it is crucial for the robot's understand of the human's communication attempts to be robust
- Ongoing research problems include knowing when someone is done speaking, performing speaker diarisation, and handling noisy environments, etc.
- What multi-modal approaches can be used to more strongly enhance the TIAGo's ability to understand humans in its environment in real-time for close-proximity interactions?
 - o Available sensors on the TIAGo robot include:
 - RGB-D camera
 - two microphone arrays.

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Improving Real-Time Robustness for Human-Robot Communication In-The-Wild

What Students Will Do:

- Students will implement and test 3-5 different multi-modal approaches to explore solutions for noisy and complex environments. Options include vision-based, audio-signal processing, depth-sensing, etc.
- **Deliverables:**
 - Literature review with a short report on existing methods and their positives/negatives
 - Selection of 3-5 approaches with a test-plan for each, including defined metrics
 - Implement each approach for the TIAGo robotic system
 - Test each approach in real-time on the TIAGo system and report findings
- **Size group:** 1-3 (3 preferred)
- **Skills:** ROS, programming(Python), deep learning, signal analysis. Most appropriate for CS, EE or Robotics majors (current or past)
- **Mentors:** Kaitlynn Pineda (kpineda3@jhu.edu)

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