

Summary of the October 2020 Terminology Harmonization Meeting

Craig Schlenoff

Associate Vice President of Standardization, IEEE Robotics and Automation Society

On October 26, 2020, the Industrial Activities Board (IAB) of the IEEE Robotics and Automation Society (RAS) organized a virtual Terminology Harmonization Meeting in conjunction with the Intelligent Robots and Systems (IROS) Conference. The goal of the meeting was to begin the process of developing a shared robot terminology document. This document will identify relations and mappings between similar terms and definitions in robot-related standards documents developed by the various robot standard development organizations. The mappings in this document will help to identify synergies between the standardization efforts, with the hope of facilitating future collaborations.

Thirty-two attendees were present, included many of the IEEE RAS Working Group Chairs, representatives from the International Organization for Standardization (ISO), the Robotics Industries Association (RIA), the American Society of Mechanical Engineers (ASME), the American Society for Testing and Materials (ASTM) and experts in various robotics fields including autonomous vehicles and industrial robotics. The meeting started with a set of presentation by the participants to provide context, and then moved on to a more open discussion. A summary of the presentations (in the order they were presented) is included below:

- IEEE RAS Overview
 - Presenter: Craig Schlenoff, Associate VP of Standardization in IEEE RAS
 - Summary: This presentation gave a summary of the previous and new standards efforts with IEEE RAS. These efforts include:
 - Standards
 - Core Ontologies for Robotics and Automation (published 2015)
 - Robot Map Data Representation for Navigation (published 2015)
 - Active Working Groups
 - Ethically-Driven Robotics (standard expected 2021)
 - Robot Task Representation (standard expected 2021-2022)
 - Autonomous Robotics (standard expected 2021-2022)
 - 3D Map Representation
 - Ethically-Driven Nudging
 - Guidelines for Verification of Autonomous Systems (NEW - formed this year)
 - Robot Agility (NEW - formed this year)
 - Active Study Groups
 - Metrology for Human-Robot Interaction (NEW - formed this year)
 - Robotic Hand Grasping and Manipulation (NEW - formed this year)
- RIA Overview
 - Presenter: Carole Franklin
 - Summary:

- RIA is in the final stages of publishing R15-08 (Industrial Mobile Robot Safety) (comment stage ends next week)
 - Hoping R15-08 Part 2 will come out within a year or two of Part 1
 - Waiting on ISO to update the base standard in which R15-06 (Industrial Robot and Robot Systems – Safety Requirements) is based on
- ASTM Overview
 - Presenter: Carole Franklin
 - Summary: Relevant standards efforts include:
 - E54.09 Response Robots
 - E57 3D Imaging Systems
 - F45 Driverless Automated Guided Industrial Vehicles
 - F48 Exo-skeletons/Exo-suits
 - All efforts are developing test methods rather than specifications of activities/behaviors
- ASME Overview
 - Presenter: Angel Guzman
 - Summary: Relevant standards efforts include:
 - Manufacturing and Advanced Manufacturing (MAM) Subcommittee on Robotic Arms
 - Registration and Calibration Performance Test Methodology for Manipulators
- ISO Overview
 - Presenter: Roberta Nelson Shea
 - Summary: Relevant standards efforts include:
 - ISO TC299 Working Group (WG) 3 for Industrial Robotics Safety
 - ISO 10218 (Collaborative Industrial Robots) Part 1 & 2 still under revision (originally expected Summer 2021, slipped to Spring 2022, slipped further due to COVID stopping in person meetings)
 - Collaborative Robots Technical Specification being rolled into ISO 10218
 - Tech Reports on end effectors and manual load/unload stations being rolled into ISO 10218
 - Study Group 1 – Common Safety Standard for WG2 & WG3 (non-medical robot domains and sectors)

After the presentations, the group began discussing the three terms that we planned on focusing on for the harmonization effort, namely, *action*, *task*, and *environment*. Only *environment* and *action* were discussed. Initial analysis of a handful of standards within ISO indicated that these terms were not formally defined in any of the standards explored, even though these terms were used in definitions of other terms. Roberta Nelson Shea noted that any term that is used in the standard which does not deviate from a typical dictionary definition is not formally defined in the standard. However, other robot standards, such as some of the ASTM standards, do define these terms in detail. Specific discussions about each of these terms is described below.

- Environment
 - Within IEEE, some working groups see the concept of environment as the ground truth (what is actually true about the world), while others see it as the state of the

world from the robot's perspective, which could be only represent a segment of the world or only the aspects that are relevant to the task at hand. Adam Norton from ASTM thought that environment is the "real" environment. "Map" or "layout" would be the robot's representation.

- Jeremy Marvel stated that ASME is not looking at environment yet, but might use an ASTM E57 (3D Imaging) definition to document the environment in terms of how it will affect data collection
- Craig took the action item to look into ASTM E57 standard on environmental conditions and see if it might be useful.
- Action
 - Craig wasn't able to find anything like action in the other standards in his limited search (mostly through ISO).
 - Adam Norton noted that ASTM has repetitions and activities (which are the closest to this term).
 - It was noted that "operation" might be another synonym to look for in the standards.

After the discussion of the terms, the group explored the next steps. Meetings will be planned at the International Conference for Robotics and Automation (ICRA) conference in China (likely virtual) and Intelligent Robots and Systems (IROS) in Prague. Craig Schlenoff took the action items to do the following before these subsequent meetings:

- Look through a wider array of standards, including those from ASTM, ASME, and RIA, to identify standards that define the terms *activity*, *task*, and *environment*.
- Roberta Nelson Shea noted that ISO has a web-based glossary of all terms in their standards (<https://www.iso.org/obp/ui/>). Craig will review this site for the three terms of interest.
- Once relevant terms in the various standards are identified, Craig will assign small groups of representatives from the respective standards organizations to begin to reconcile the definitions of these terms. In this sense, reconciliation could include mappings definitions between term, or at the minimum noting the differences in the definitions of these terms.