ICRA 2015 Workshop

Autonomous Industrial Vehicles: From the Laboratory to the Factory Floor

Organizers

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Abstract

Mobile (rolling) robots have been around since about 1945 with the first automated guided vehicle in industrial use in the 1950's. Since then, advances in the industry and safety standards have been developed with no standardization for the performance of these machines. Mobile robots have been a part of the research community in most technical universities who have made tremendous strides in applying computer control to mobile platforms for use in many industries, including manufacturing, healthcare, and others. These implementations have helped drive the industry and safety standards such as ANSI/ITSDF B56.5 in the US and BS/EN1525 in Europe among others. As vehicles have become more capable with onboard sensing, large facilities have adapted to these machines to move materials in lights out conditions. However, adapting the vehicles to facilities has only minimally occurred, for example floor cleaning in open areas and delivering medications to nursing stations and patients in hospitals. For manufacturing in small to medium sized facilities, AGVs in their current form have not adapted well and therefore, may not be used.

A compilation of mobile robot challenge events, relative standards (such as search and rescue robots), and other research sparked a new standards thrust in performance of driverless vehicles applied to industrial use. As such, the new ASTM Committee F45 on "Driverless Automatic Guided Industrial Vehicles" (http://www.astm.org/COMMITTEE/F45.htm), was recently formed and now includes preliminary mobile robot or AGV user, manufacturer and research members from the US, Europe, and Asia, currently from 35 organizations. The new technical committee is scoped to include standardized nomenclature and definitions of terms, recommended practices, guides, test methods, specifications, and performance standards for automated guided vehicles towards advancing AGV capabilities for the manufacturing industry and others. The committee will address all of the areas that are important for potential AGV users to understand when making purchase and task application decisions. These areas, therefore, divided into five technical subcommittees:

F45-01 Environmental Effects
F45-02 Docking & Navigation
F45-03 Object Detection & Protection
F45-04 Communication & Integration
F45-91 Terminology

Real world situations have driven these categories and have uncovered generic performance test methods for simple comparison of vehicle performance that is expected to "set the performance bar" and improve the AGV industry as a whole. For example, improvements in tolerance (accuracy and repeatability), sensor integration, controls, and interoperability are just a few areas that may improve when performance is measured and analyzed through standard test methods. Committee F45 will provide information and guidance for AGV manufacturers and users through standard test methods that may also support the safety standards. For example, documenting how well the safety system measures an obstacle to be avoided, not just simply stop at the obstacle and wait potentially causing slower production.

This workshop is supported by the IEEE Technical Committee on Performance Evaluation and Benchmarking of Robotic and Automation Systems.

Call For Papers

This important workshop will describe the preliminary activities that led to the new F45 technical committee, draft documents being considered within the subcommittee, and planned and expected developments for each subcommittee. We are pleased to invite speakers to this workshop that is intended to form a link to the researchers who have accomplished such advancements in autonomous vehicle capabilities, to accelerate transition of their research results into commercial applications.

The half-day workshop will be divided into one overarching paper that forms the basis and outline for the workshop followed by research papers that address performance metrics/test methods in the areas of F45 subcommittees above

to accelerate transition from the lab to industry targeting "real world" needs." This workshop seeks to create a bridge between the advanced research community that has produced ground-breaking results in autonomous vehicle navigation and the industrial organizations that seek to apply these results within their enterprises.

Some industry driving questions for workshop presenters and attendees to consider are:

- what various lighting, dust, and floor conditions are evident in industry to consider?;
- what associated vehicle speeds, tolerances, and equipment access conditions are required?;
- what communications speeds, integration issues, and control strategies are useful on today's typically closed industrial AGV controllers versus tomorrow's, potentially more open controllers?
- what minimal mobile robot knowledge of its environments is required, but can perhaps adapt to it versus current AGVs that only have path information, navigation knowledge, and less intelligence?
- what onboard or interactive equipment for AGVs should be considered, such as robots that access AGVs or are onboard AGVs as advanced mobile manipulation systems?
- etc.

Submissions

Submissions for full papers are due on **Monday, February 23, 2015**. Send your paper to roger.bostelman-at-nist.gov (change '-at-' to '@') with the subject [ICRA2014 WS: Autonomous Industrial Vehicles].

Paper submissions are being solicited, up to 6 pages in length, and formatted according to the ICRA style Accepted papers will require a 20 minute presentation at the workshop with 5 minutes questions and transition time. Organizers will also pursue the publication of workshop contributions through ASTM International or as a special journal issue. The half day workshop will allow a maximum of 10 slots with one beginning paper providing ASTM F45 background and performance test developments by the organizers and one slot allowing open forum discussion of presented papers towards a joint workshop summary paper moderated by the organizers. The organizers will appoint a note-taker to capture for the final discussions.

Formatting

All papers for the workshop must be submitted in PDF format and conform to ICRA 2015 Proceedings specifications (see http://ras.papercept.net/conferences/support/support.php).

- Use ICRA Word and Latex templates.
- 4-6 pages including figures and references.
- All papers must be submitted in a single PDF.
- 20 min talk including 5 min question time will be provided for accepted papers.

Important Dates

- Full paper submission deadline: February 23, 2015
- Notification of acceptance: March 20, 2015
- Final paper submission deadline: April 3, 2015
- Workshop date: TBD - either May 26 (Tuesday) OR May 30 (Saturday)