American Nuclear Society
Robotics & Remote Systems Division

RRSD Newsletter
Summer 2022

Your RRSD Leadership Team

We all thank you for being a member of the ANS RRSD and we look forward to meeting and working with you. Please don't hesitate to reach out to us with suggestions or if you would like to get involved.

Officers

Young Soo Park - Chair
Adam J. Carroll - Vice Chair
Anthony Abrahao - Secretary
Jean Plummer - Treasurer
Brian E. O'Neal - Ex-Officio

Executive Committee

[Terms Expiring]

Taskin Padir	(2023)
Kevin Richard Hera	(2023)
Chris Eason	[2024]
Rustam Stolkin	[2024]
Sungmoon Joo	[2024]
Venugopal Varma	[2025]
Wendell Chun	[2025]

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rrsd.ans.org

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A Message from the Chair

Welcome to the 2022 RRSD newsletter.

It has been a while since our last newsletter. The COVID days are finally getting over, and we are ready to get more active with face-to-face engagements. Our RRSD community started from the need for remote handling systems for hot cell applications and later to innovations in robotics technology for broader unstructured hazardous environments. Even during the COVID years, our RRSD tradition of technical innovation and deployment applications has been carried on with some significant milestone activities. We have successfully revived the R&RS topical meeting, opened a new RRSD -RAIN joint workshop, and our members are getting involved in renewed interest activities in DOE-EM and international communities. Now we hope to look forward to ever vibrant RRSD activities.

Thanks to everyone who participated in the last DESD/RRSD joint topical meeting in December 2021, the event, the first time it has been held in 6 years, was a big success. It drew participation from around the world with 15 sessions, and 52 contributing papers and panel sessions, and showcased the notable R&RS activities around the world in the recent years. The next topical meeting is scheduled for 2024.

There was a RRSD-RAIN joint workshop on robotic digital twin in February this year. The R&RS community is imbued with greater opportunity to amplify and accelerate the innovation and application with the new digital transformations. Taking advantage of lower robot price and capabilities, accessible talents, easy integration, and digital infrastructure, development of one-of-a-kind robot systems, which used to take years, has now become achievable in months with lower costs. The workshop may set the first step in our destined direction toward the digital transformation of R&RS.

There is renewed interest in robotic applications in nuclear decommissioning and legacy nuclear waste management. DOE-EM has recently engaged in technical workshop and task-force group to set path forward and promote collaboration in robotics program in conjunction to various site needs across agencies. Interest in robotics technology also increased in broader nuclear industry and government agencies, e.g. nuclear reactors, waste management, and manufacturing. There are also significant R&RS activities internationally; opportunity for our members to participate and exchange information with R&RS communities in the UK, EU, and Japan.

The increased interest, technology readiness, and resulting activities are a net positive for the broader robotics and remote systems community. The Executive Committee (EC) has committed to raising awareness of these and other opportunities to the members, as well as using these collaborative opportunities to bring broader awareness to our own activities, like our technical sessions in annual meetings, workshops, and topical meetings.

Regards,

Young Soo Park

Chair, RRSD

In this Issue

2021 ANS DESD/RRSD Joint Topical Meeting

Robotics and remote systems (R&RS) topical meeting was held in six years jointly with decommissioning and environmental science division (DESD) during the 2021 ANS Winter annual meeting (Dec. 2-3). The topics included R&RS development and applications for broad applications including remote surveillance, materials handling, nuclear facility operation and maintenance, nuclear waste and spent fuel management, and radiation hardening. It also included special topics on digital twin, and international activities in UK and South Koreas. It drew broad participations internationally with thirty papers in six technical sessions and two panel sessions. The next topical meeting is planned in 2024.

During the topical, RRSD has awarded a Ray Goertz award to Dr. Mark Noakes for his long time contribution in the R&RS community. Ray Goertz award was established in 1985 it recognize outstanding contribution to the field of remote technology in hazardous environments. The RRSD topical had broad participations internationally with thirty papers in six technical sessions and two panel sessions.

ANS RRSD-UKAEA RACE Joint Workshop on Robotic Digital Twin for Nuclear Applications

ANS Robotics and Remote Systems Division (RRSD) and UK Robotics and AI in Nuclear (RAIN) has organized a joint workshop on Robotic Digital Twin for Nuclear Applications on April 7, 2022.

The recent advances in digital technologies has brought about important opportunities for innovations in robotics and remote systems. In particular, robotics is transforming into digital twin, a new hardware-in-the-loop simulation capabilities, with the integration of multitude of emerging technologies as advanced sensors, telerobotics, modeling and simulation, virtual-/ augmented-reality, and human-robot interface under networked environment and big data. Digital transformation of robotics has also democratized the development of robotic applications at a very rapid pace. While robotic digital twin technology is expected to have significant potential for improving various nuclear mission-related tasks, there is relatively little communication channel between the robotics community and nuclear industry. The objective of this workshop was to bring together the technology innovators and the stakeholders in the nuclear industry to identify the potential R&D direction to meet the industry's needs.

The event was help virtually. Speakers were invited from the leadership of US RRSD communities in the US and UK, as well as government organizations, including DOE-EM, NE, and UKAEA. The event was participated by over 100 participants and there is a plan to follow up with a regular meetings.

OTHER EVENTS

D&D Technology Development (TD) Workshop

The U.S. Department of Energy Office of Environmental Management (DOE-EM) sponsored the Decontamination and Decommissioning (D&D) Technology Development (TD) Workshop, which was organized and hosted by the Savannah River National Laboratory (SRNL). The meeting was held at the Georgia Cyber Center in Augusta, GA from April 25-27, 2022. The primary goal of the workshop was to create an updated complex-wide summary of near to mid-term D&D needs, identify challenges and technology development opportunities, and discuss lessons learned that could facilitate expedited closure.

The workshop focused on the following topical areas: Decontamination/dismantlement, Characterization, Mercury, Lessons learned, AI/robotics, and Teaching/knowledge sharing.

The format featured opening comments by Nancy Bushman, Connie Herman, and Jen Wohlwend; 25 presentations; and roundtable discussions, including Emerging Issues, Future TD Priorities, and a Path Forward. Approximately 20 people attended in-person with 65+ virtual participants using the Teams platform. Attendees and presenters included people from the DOE, national laboratories, universities, and industry. Meeting participants suggested establishing meetings twice a year at different locations to continue D&D related discussions. Establishing a means of information sharing was also recommended. Five key takeaways identified the need for:

- A transition from "push" to "pull." The "push" comes from emerging technologies such as AI, robotics, etc. An example of a "pull" would be the development of a requirements driven document by DOE for the community.
- The development of a hot demo test bed.
- The strategic integration of consensus-based standards to facilitate complex-wide technology.
- The re-assessment of relevant handbooks/directives/regulations to consider application of new technologies.
- A complex-wide repository for community, knowledge sharing, etc.

Small groups are being formed in order to execute each of these takeaways. The proceedings (SRNL-RP-2022-00426, Rev. 0) were distributed in July 2022.

(Jennifer Wohlwend)

Technological Advancements within the DOE IAA

Department of Energy's Office of Environmental (EM) Management's mission is to address the environmental legacy that is the result of decades of nuclear weapons production and government sponsored nuclear research. The caveat is that the cleanup and remediation work must be safe for human workers, cost-effective, and can be accomplished more efficiently. After the "EM Science of Safety: Robotics Challenge" at Portsmouth in 2016, this event served to educate EM workforce on the use and benefits of robotics and related enabling technologies. As a part of this effort, EM – 3.2, Technology Development, has pursued technology development with a partnership with other government entities through a formal mechanism using an Inter-Agency Agreement (IAA). Members of the IAA include the Department of Energy HQ, DOE National Laboratories (Sandia National Lab, Los Alamos, Savanah River National Lab, Oakridge National Lab, Hanford National Lab, Argonne National Lab, Waste Isolation Pilot Plant), and key government entities (Army Research Lab, Department of Homeland Security, and the Army Corp of Engineers). The IAA is fostered to improve communications and enable technology transfer to solve robot-related problems in other domains.

There are several notable collaboration projects established through the IAA including: 1) using an Army Corp. of Engineer's quadcopters to map mercury content over potentially-contaminated streams (outdoors) at Oak Ridge National Lab, 2) mapping radiation with a ground mobile robot developed through the Department of Homeland Security at Savanah River National Lab with a goal to develop a MARSSIM map, 3) conducting an extensive study on wearables to support the DOE workforce with human testing at Hanford National Lab, Los Alamos National Lab, Savannah River National Lab, and led by Sandia National Lab, and 4) autonomous inspection of underground tunnels at the WIPP site with a ground robot with a team of Sandia National Lab, Army Research Lab, and the University of Denver. There are other robotic projects in work such as a mobile hot cell with dual manipulators to process and package mercury-contaminated waste. Robotic technologies of interest to the IAA are not limited to and include Augmented-Reality/Virtual-Reality/Mixed-Reality, autonomous navigation, manipulation, mobile robots, robotic inspection, robotic mapping, radiation sensors, obstacle avoidance, autonomy, and augmenting the DOE worker in the field with exoskeletons.

(Wendell Chun)

UPCOMING EVENTS

2022 ANS Winter Meeting Session: RRSD

This year at the ANS Winter Annual Meeting scheduled for November 13-17, 2022, the RRSD will open a technical session: Robotics and remote systems. In this session, we have six papers covering R&RS technology development and applications across broad nuclear sectors.

Nominations and Elections

Welcome to Our New Executive Officers!

Wendell Chun
(Inspection Experts, Inc.)

Venugopal Verma
(Oak Ridge National Laboratory)

Out-going Members of the Executive Committee

Vaibhav Sinha (EC Member)
Joseph E. Kowalczyk (EC Member)

Thank you for your service!

Collecting Nominations and Elections

The RRSD Nominations Committee is accepting nominations to join the RRSD Executive Committee in the 2023 election. The nomination committee must submits its slate of candidates to ANS in early October, 2021 so please send your personal interest or nominations to the chair of the election committee, Brian O'Neil (oneil@lanl.gov) no later than September 29, 2022. The nomination committee strives to keep a balanced committee between academia, industry, and the national labs. Nominees must be in good standing with ANS and willing to actively support the division's mission to use robotics and remote systems to reduce the hazardous exposure of individuals, reduce environmental hazards, and reduce the cost of performing work in hazardous environments.

14 October, 2022: A slate of candidates must be identified by the Division Nomination Committee for the 2023 ballot.

11 November, 2022: Division Nominating Chair must report election slate to ANS HQ

31 December, 2022: All biographical information and candidate photos must be received by ANS HQ

RRSD Mission

The Mission of the Robotics and Remote Systems Division is to promote the development and application of robotic and remote systems for hazardous environments for the purpose of reducing hazardous exposure to individuals, reducing environmental hazards and reducing the cost of performing work.