ISR is a permanent, interdisciplinary research unit of the A. James Clark School of Engineering at the University of Maryland.

FOR MORE INFORMATION
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"My company successfully teamed with the Robotics Center to win a number of R&D programs that would not have come about without their unique blend of research capabilities."
—Robert Kavetsky, President and Executive Director, Energetics Technology Center

ISR AND THE MARYLAND ROBOTICS CENTER

The Maryland Robotics Center is an interdisciplinary research center headquartered in the Institute for Systems Research within the A. James Clark School of Engineering. The center’s mission is to advance robotic systems, underlying component technologies, and applications of robotics through research and educational programs that are interdisciplinary in nature and based on a systems approach. More than 30 faculty from eight departments direct some 20 affiliated research labs focusing on different facets of robotics. Current research areas include:

- **Collaborative, Cooperative, Networked Robotics.** This area is focused on developing a fundamental understanding of how a collection of robotic systems can cooperate and collaborate to perform complex missions. Research directions include bio-inspired robotics concepts, time delayed robotics, robotic swarms, cooperation under limited communication, task assignment and operation of distributed robot teams.

- **Medical Robotics.** This area is focused on developing robotics solutions for improving diagnostic, therapeutic, drug-delivery, surgical, and rehabilitation procedures. Current representative activities include development of magnetic resonance imaging-compatible surgical robots, surgical simulation, haptics-enabled atomic force microscopy for cell and tissue characterization, exoskeletons for rehabilitation, and magnetic micromanipulation for drug delivery.

- **Miniature Robotics.** Within this thrust, researchers are engaged in research ranging from the design and manufacture of ant-scale robotic insects to the rapid manipulation of nanoparticles for medical research. Current activities include development of microscale and mesoscale robots, bio-inspired sensing, actuation, and locomotion, cell manipulation, and micro and nano manipulation.

- **Robotics for Extreme Environments.** This area is focused on developing rugged robotic systems to work in extreme environments such as space and deep water. Activities in this area are focused on development of a wide variety of robotic systems for space applications and autonomous deep-submergence sampling systems.

- **Unmanned Vehicles.** This area is focused on developing a wide variety of unmanned vehicle platforms, including micro air vehicles, ground vehicles, sea surface vehicles, under-water vehicles, and planetary surface rovers. Current research in this area ranges from developing autonomy solutions for unmanned vehicles to using bio-inspiration for improving vehicle performance.

PROGRAM DUES
Dues are $10,000 per year. A portion of the dues may be tax deductible.

ASSOCIATE PARTNERS PROGRAM

ROBOTICS FOCUS

THE INSTITUTE FOR SYSTEMS RESEARCH

Robot for breast biopsy and radio-frequency ablation of breast tumors under continuous MRI

A robotic drummer
THE ASSOCIATE PARTNERS PROGRAM

The Institute for Systems Research’s Associate Partners Program grants a level of preferred access to our faculty and students. Associate partners receive priority for research and recruiting opportunities.

ISR provides our associate partners with up-to-date information on our activities, and actively facilitates direct relationships among associate partners, faculty and students. ISR also seeks out and guides associate partners toward mutually beneficial opportunities for research collaborations with our faculty.

BENEFITS

The benefits in the Associate Partners Program:

- Priority access to the services of our external relations director, who:
  - Provides one-stop access to the ISR research community
  - Establishes ISR knowledge of the partner’s organization and research interests
  - Rapidly identifies collaboration and teaming opportunities
  - Quickly facilitates connections with best-match ISR faculty and catalyzes discussions to provide assessments of opportunities
  - Arranges in-person and virtual collaboration development meetings
  - Guides the associate partner through University of Maryland processes and procedures
  - Organization name included in Associate Partners list in ISR’s print and electronic literature
  - Partners receive faculty’s priority consideration for research teaming opportunities
  - Bidirectional, short-term researcher exchanges
  - Priority and timely access to students for internships and permanent hiring
  - Annual ISR-sponsored associate and strategic partners-only workshop
  - Distribution of pre-publication research results
  - Associate and strategic partners-only website
  - Networking opportunities among associate partners

A PATH TO RESEARCH COLLABORATIONS

While valuable in themselves, Associate Partner benefits also provide a natural path to specific collaborations in ISR. These are made possible through additional partnership opportunities, including:

- Membership in ISR’s Strategic Partners Program (www.isr.umd.edu/industry/strategic_partners_program.htm) Benefits include:
  - A specific percentage of dues is allocated to ISR research and education programs of high interest to the partner.
  - The “Visiting Scientist” benefit allows strategic partner employees to work on campus, conducting research with ISR faculty for extended periods of time.
  - Any of the following partnership vehicles:
    - Research collaborations, including industry-sponsored research
    - Teaming to win agency-sponsored programs including Maryland Industrial Partnerships for local, small, and start-up companies
    - Intellectual property licensing
    - Systems engineering courses, workshops and events
    - International research agreements
    - Sponsorship of graduate student fellowships and postdoctoral researchers
    - Gifts to ISR, including chair endowments, scholarships, gifts of cash, hardware and software, and lab sponsorships

COLLABORATION EXAMPLES

ISR researchers collaborate with both large and smaller companies. Here are a few examples of what can be accomplished when you team with us.

- **L3 Communications** awarded graduate research fellowships to two Maryland Robotics Center Ph.D. students for work in unmanned vehicles and robot control.
- **Energetics Technology Center (ETC)** partnered with us to win two Office of Naval Research awards for autonomous USVs using virtual environments and automated generation of autonomy software for unmanned ground vehicles.
- **Qualcomm Innovation Fellowships (QInF) awarded for “Robots need language: A computational model for the integration of vision, language and action.”**
- **iRobot** donated several robotics platforms which are being used in our labs for a variety of research projects.
- **Intelligent Automation, Inc.** uses MDLe robotic motion control language in products and services.

ISR AT A GLANCE

ISR’s research program provides associate partners with cross-disciplinary solutions to complex problems.

- **38** joint appointment faculty, **27** affiliate faculty, and **6** research scientists from **4** colleges and **14** units across the University of Maryland:
  - A. James Clark School of Engineering
  - Aerospace Engineering
  - Chemical and Biomolecular Engineering
  - Civil and Environmental Engineering
  - Electrical and Computer Engineering
  - Fischell Department of Bioengineering
  - Materials Science and Engineering
  - Mechanical Engineering
  - College of Behavioral and Social Sciences
  - Neuroscience and Cognitive Science Program
  - College of Computer, Mathematical and Natural Sciences
  - Biology
  - Computer Science
  - UMIACS (Institute for Advanced Computer Studies)
  - Mathematics
  - Robert H. Smith School of Business
  - Decision, Operations and Information Technologies
  - Logistics, Business and Public Policy

- **8** major research areas
  - Communication systems and networks; including green communications
  - Control systems and methodologies
  - Neuroscience and biology-based technology
  - Micro and nano devices and systems
  - Robotics
  - Design, operations and supply chain management
  - Systems engineering methodologies
  - Computing, speech, artificial intelligence

- Annual research expenditures **$19 million.**