Setting the Standard for Automation™

Automatic Controls and Robotics Division

SPRING 2020

Director
Sandeep Raju

Director-Elect
Prakash Bapat

Newsletter Editor
Anand Iyer

Greetings from Director

Welcome to Spring Edition of the Automatic Controls and Robotics Division Newsletter. Thank you for your Interest in the ISA Automatic Controls and Robotics Division. Today in this tech savvy world, Robotics is playing a major role in shaping and improvising Process Automation. Through ISA we invite all members of ISA to bring up open discussion of how Robotics is playing an important role nowadays and helping in advancing towards Automation**.** Do participate in the upcoming 'Give &Take' Survey planned by ACARD enthusiastic Leadership Team

The technical articles featured in the Newsletter will help give an insight where we are moving with technology. During 2020 we expect to develop seminars and pushing the Division to be a global forum to participate in various interesting activities like IIoT Symposium, Process Industry Conference as well as several other events coming up. Cheers and Welcome Aboard!!

Sandeep Raju
Director - Automatic Controls and Robotics Division

Greetings from Director (Elect)

Greeting to ACARD'ians! Welcome to Members of Automatic Controls and Robotics Division of ISA.

In this Tech Savvy world, collaborative effort will lead us to exponential growth. We intend to reach out to many of you to get to know your views, likings for involvement in ACARD. Welcome to the ISA student members too. Many of you are eager to learn the stretch of Industry 4.0 with more clarity in IOT, 3D Print, AI, Data Analytics and of course the 'Robotics'. ACARD leadership team likes to motivate you to get involved in ACARD. Your response would be most welcome!

Watch the Video clip: https://youtu.be/iLXMusdQ2Z8 . Provide your ideas feedback by visiting recently created LinkedIn group: https://www.linkedin.com/groups/13828146 and of course don't miss the ISA Division Web page: https://www.isa.org/participate-in-a-technical-division/automatic-controls-and-robotics-division/

Prakash Bapat
Director Elect - Automatic Controls and Robotics Division

Automatic Controls and Robotics Division

Greetings from Newsletter Editor

Stay safe against the invincible enemy, A virus that we cannot see, feel and yet threatens the way we live our lives. Some of the future generations of ACARD researchers could do projects that could perhaps electronically scan a surface and identify virus presence… Greetings and Welcome to the Third edition of the Automatic Controls and Robotics Division Newsletter.

We have many interesting articles in this newsletter from Our Division director **Sandeep Raju** presents an article on "**investment in robotics**",**Dr. Ajay Deshmukh** who talks about **the expanding horizon of conventional Automation, process controls and robotics technologies** & **Vinod Joshi** who talks about **Need finding and Data communications in process industries.** In case you are in a lockdown, this newsletter will give several pointers to study in the net and get more insights to what is happening in the ACARD world!

Anand Iyer
Newsletter Editor - Automatic Controls and Robotics Division

Our Volunteer Leaders:

Welcome Aboard to all our Leaders !!
Automation and Technology

Director	Sandeep Raju
Director-elect	Prakash Bapat
A&T Department VP	Yogesh Balajee
Secretary	Pankaj Goel
Symposium Chair	Rohit Kadam
	Dr. Jayesh Barve
Education Chair	Dr. Ajay Deshmukh
Marketing Chair	Nitin Kirloskar
Scholarship Chair	Rohit Kadam
Committee (Advanced Communication)	Vinod Joshi
Committee (Vision Systems)	Mr. Vikas Anwekar

Featured Articles

Investment Into Robotics
Sandeep Raju

The popularity of Robotics and Advanced Controls used in automation world has never been higher than today as we see a tremendous growth in Robotics in all the fields we are aware of. Robotics is certainly showing its impact in today's medical field too. Through Robotics assisted surgery, doctors are able to operate remotely on soldiers in battlefields or even astronauts in space. Through robotics, easy access is being provided to top surgeons without traveling. In September 2001, Surgeons in New York performed 45 min Gall bladder operation on a 68 year old woman in Strasbourg, France using Telecommunications and sophisticated surgical robotics tools. Prosthetic limbs are now able to be directly controlled by the brain. This is one application where biology and electronics are steadily coming together. Rodney Brooks, Director of MIT Artificial Intelligence Laboratory and Chairman of IRobot Corp in his latest In book "Flesh and Machines" explores themes related to life with robots. US Defense Contract spent millions of dollars in creating more than 2000 Packbots which are being used in Iraq and Afghanistan for multi-missions. 20 years ago almost 90% of the robots were being used in car manufacturing facilities doing repetitive tasks. But now almost 50% of the robots are being used in automobile plants and rest 50% are spread out among other factories such as laboratories, warehouses, energy plants, hospitals, Research and Defense. After 9/11 anthrax scares, US Postal services has over 1000 robots installed to sort parcels and now has an estimated use of 80000 robots being used. U.S. Defense advanced Research Project Agency funded $13 million dollars in application of autonomous robots in reconnaissance vehicles. They were able to develop unmanned vehicles to travel 10 hours from LA to LV. Us was able to build first mechanical garage (developed by Klaus Parking Systems) that can accommodate 400 cars parking using elevator system throughout 24 floors.

MIT was able to develop Cell-Sized Roots which were the size of the human egg cell that can sense environment, store data, carry out computational; tasks. They consist of tiny electronic circuits made of two dimensional materials, piggybacking on colloids. By coupling these tiny objects to complex circuitry, researchers hope to lay the groundwork for devices that could be dispersed to carry out diagnostic journeys through anything from human digestive system to oil and gas pipelines, or perhaps to waft through air to measure compounds inside chemical processor or refinery.

In welding Technology, Using six axis robots as a positioner is one of the factors that's driving improved quality, reduced costs, access to real time data about

equipment and processes. These robotic arms have similar capabilities as a human to rotate, bend and move in an arc shape. The flexibility of the arm allows the six axis robot to grip parts at different angles, rotate and tilt parts to weld more quickly, consistently and safely. Now we reached to a level where we can use deep learning machine vision technology for Automated Inspection and Robot Guidance. IIoT is playing a major role in making these robotics operations possible. IIoT is boosting the efficiency, scalability and time savings for industrial companies. Improved Safety Measures and Predictive Maintenance data, which provide transparency into company performance, yield cost savings for business owners who adopt IIoT.

Robotics is also advancing in the realm of Subsea Activities. Work Boat ROVs consist of a frame which supports hydraulic pumps, thrusters, cameras, sonar etc is fitted with a five –function grabber arm, which is used to hold OV steadily in one position and a seven function manipulator which is used to perform robotic tasks. In Subsea activities Robotic sis moving forward in performing tasks remotely in inhospitable places. Autonomous Underwater Vehicles are now under development that could undoubtedly perform tasks in Offshore Hydrocarbon Industry.

Robots, Artificial Intelligence and Big Data are the three distinct drivers of investment and performance. Those that are utilizing automation can find themselves with a distinct competitive advantage over companies take in a wait and see approach. From Integrated Vision Capabilities to mimicking human kinematics to the utilization of simple teach pendants, today's cobots are equipped to help fill labor gaps, maximize a smaller footprint and mitigate worker safety and project contamination risks. Cobots' use is expected to jump tenfold to 34% of all industrial robot sales by 2025 according to International Federation of Robotics. What we need to do is advance our robots, so they are easier to install, more flexible in making them, readily applied and redeployed where needed. They shouldn't need all the time consuming integration or customization. It's an area to invest in as robotics is a field that can bring quick ROI (Return on Investment) by minimizing implementation costs and maximizing equipment utilization.

For contact information, please contact the ACARD newsletter editor Anand Iyer, akiyer64@gmail.com

Expanding the Horizons of Instrumentation, Robotics and Automation
Dr. Ajay Deshmukh

KEYWORDS

Robotics, Automation, Instrumentation.

ABSTRACT

Today in the era of Industry 4.0, the manufacturing and process industry is going to derive benefits using newer technologies and business drivers. Instrumentation world is going to expand due to the industrial IOTs, cloud analytics and where user industry would like to go without cloud it is the edge analytics solution. Ultimately the horizons of instrumentation, automation, and robotics are getting expanded for better solutions to process and manufacturing industry. Process monitoring is possible on real time basis in addition to plant analytics. Plant-wide controls shall be in reality due to the advancements in communication and computing tools. The focus is shifting from information technology to data analytics which is more meaningful as far as the big picture of a factory is concerned. Collaborative work culture is extremely important while implementing Industry 4.0 approaches. Through several visits it was found that process and manufacturing industries needs to define the customer requirement as far as Industry 4.0 is concerned. This article therefore addresses the effect of newer technologies on the thought process of manufacturing and process industries and subsequently new directions have been proposed.

Robotics, Automation and Instrumentation

Robotics and Automation for process and manufacturing industry has something common, and that is running process without human intervention. Therefore, the user industries would like to know more information on how these terms are different and in what sense. Automation certainly deals with a process control problem, whereas robotics is specific to certain pick and place or similar tasks which are not possible easily by human operator due to the inability to perform repetitive tasks or to that accuracy or due to working constraints. Therefore, the context of robotics and automation is fundamentally different. Instrumentation and control certainly plays a vital role in process and manufacturing industries. For user industries the concepts, context and relevance are important in addition to the technology and cost involved. The basic purpose needs to be clear while providing a solution. It is to be noted that Industry 4.0 is going to exploit the power of instrumentation, robotics, automation & control so as to provide appropriate solution using industrial internet of things (IIoTs) data analytics.

Automatic Controls and Robotics Division

What is changing?

Fundamental process, process equipment and operational technologies and automation are going to be there at core physical layer. It is the cyber layer that is going to make it a SMART factory as shown in the figure.
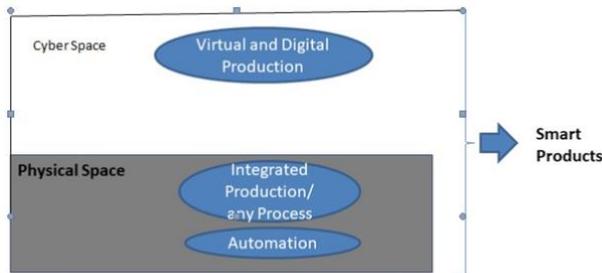

Figure 1: SMART Factory

Figure 1: SMART Factory

Robotics and Vision based Systems

Robotics has to do very different things in Industry 4.0, in addition to the way in which it is used in present applications. In current industry applications robots have been deployed to perform certain tasks for which those are programmed. Built in Intelligence has to be elaborate now using artificial intelligence (AI), machine learning (ML) and Deep learning (DL) for further expanding the scope of robotics for SMART production. Applications like quality control of finished products or process monitoring and maintenance and diagnostics would be demanding using vision based systems and augmented reality.

Newer Directions for Robotics and Automation in Industry 4.0

Operability, safety and security are on higher priorities in addition to productivity and efficiency and norms of regulating bodies. Technologies in future automation and robotics must accommodate these requirements. Effect of work culture as well as the costs involved in robotics and automation for Industry 4.0 like environment is also equally important to any user industry. Users of such technologies, requires that the exact benefits of deploying such technologies be made clear. Further, updates in the technologies and its compatibility with present processes have to be a major consideration.

About the Author: Dr. Ajay V. Deshmukh is the former Professor of Instrumentation Engineering and Principal of Engineering institutes and the past secretary of ISA Pune section. He has offered several training courses to multinational industries and public sector units and conducted several faculty and student development programs. He is associated with robotics industry. For

contact information, please contact the ACARD newsletter editor Anand Iyer, akiyer64@gmail.com

Need Finding: Data communication in Process Plants
Vinod Joshi

Abstract:

This paper gives the user need in modern process plants and offers solutions to those needs.

Brief History:

In earlier times, till 80's industry used pneumatic instruments and process data communication was normally 3 to 15 psi pressure. The evolution of semiconductor technology brought the popular current communication such as 4 – 20 mA where instrument can use up to 4 mA for its own power consumption and passive measurements. The basic aspect of these standards for measurement is safety. These signals does not create hazard to plant if used safety instruments like zener barriers. In India, still 4-20 mA is most popularly used considering its flexibility and ease of use.

User Need Finding:

Since 1990, digital communication development has been started considering following basic needs of the industry:
- Safety
- Ease of installation
- Reliability
- Interoperability

Solutions to user needs:
Safety:
Intrinsic safety technique can be employed to the instrument in case instrument and its digital communication is designed for low power and low temperature rise of the electronic components of the circuit. HART communication became very popular as HART modem is using very low power and works on low frequency.
Now wireless instruments are gaining popularity because of availability of system on chip (SoC) solution works on low power excellent receiver sensitivity of the order of -92dBm and output power up to 3 dBm. These wireless instruments works on duty cycle basis for example it wakes up for 50 milliseconds senses and sends data after every 2 seconds and instrument goes to sleep mode for next approx. 2 seconds.

Ease of Installation:
There are many requirements such as two wire transmission i.e. giving power and signal on the same cable

and better battery life for wireless instruments, easy to connect and form the network. HART and fieldbus physical layers are designed such that they will use the same cable for power and digital communication. The software is designed such that it produces diagnostics features and configure it easily using remote work stations. Batteries with high energy density chemistry such as Lithium Thionyl Chloride are used. The wireless sensor software is designed in such a way that it forms ad hoc network and finds alternate path in case of breaking a path. Device description language is developed for hassle free commissioning of instruments.

Reliability:
To achieve high reliability required for process control, communication protocols used task priority based on severity of data communication, fault reporting. In wireless networks, protocols are designed for time deterministic communication by using techniques such as beacon enabled communication where a fixed time slot is allocated to every instrument in the network, so that there is no collision in the air.

Interoperability:
To enable end user to form a network of instruments from different vendors different foundations are formed who gives compliance certificates by vigorously testing the instruments for different use cases. HART communication foundation, Fieldbus Foundation, ISA100 Wireless Compliance Institute are making efforts in this direction.

For contact information, please contact the ACARD newsletter editor Anand Iyer, akiyer64@gmail.com

Call for Newsletter Articles

The ACARD newsletter is published quarterly and reaches the ACARD's over 2200 members. Each issue is electronically printed in color PDF format. A notification email goes out to all ACARD members and it is available for public download at https://www.isa.org/acard/

We are always on the lookout for good articles, and we welcome both solicited and unsolicited submissions.

Article submissions should be 500-2000 words in length and be written for a general audience. While it is understood that the articles are technical in nature, the use of technical jargon and/or unexplained acronyms should be avoided. We actively encourage authors to include several photos and/or figures to go along with their article.

We actively welcome articles from all of our members. However, we do ask that articles be non-commercial in nature wherever possible. One or two mentions of company and/or product names for the purposes of identification are acceptable, but the focus of the article should be technical content and not just sales literature. If you are unsure of whether your article idea is workable, please contact our newsletter editor for more information – we are here to help.

Some examples of the types of articles we are looking for include:

- Explanatory/teaching articles that are meant to introduce or explain a technical aspect of automation and/or instrumentation in the water/wastewater sector.
- Biographical stories about personalities and/or leaders in the water/wastewater sector.
- Case Studies about plant upgrades and/or the application of new technologies and techniques. This type of article must include at least two photos along with the article text.
- Pictorial Case Studies about a plant upgrade consisting of 4-6 photos plus a brief 200-500 word description of the project undertaken. The article should ideally include one to two paragraphs about lessons learned and/or advice for other automation professionals.
- Historical reflections on changes in technology pertaining to specific aspects of instrumentation or automation, and how these changes point to the future.
- Discussions about changes in the water/wastewater sector and how these affect automation professionals.

Once we receive a submission, we will work with you to edit it so it is suitable for publication in the newsletter.
Article submissions can be sent to the ACARD newsletter editor Anand Iyer at akiyer64@gmail.com

Automatic Controls and Robotics Division

ACARD Newsletter Advertising

The ACARD newsletter is an excellent way to announce new products and services to the Automatic Controls and Robotics automation community. With a distribution of 2,000+ professionals in the automation, instrumentation and Robotics fields, the ACARD newsletter is an effective targeted advertising tool.

The ACARD newsletter is published quarterly, on the following approximate publication schedule:

- Winter Issue – published in January/February
- Spring Issue – published in May/June
- Summer Issue – published in August/September
- Fall Issue – published in October/November

Advertising in the newsletter is offered in full page and quarter page formats. Advertisements can be purchased on a per issue basis or for four issues at a time. The newsletter itself is distributed as a full-color PDF, so both color and black/white artwork is acceptable.

The current advertising rates are as follows:

Per Issue:
- Full page, full color (7" x 9"): $500
- Full page, full color, (8.5x11") , with bleed $600
- Half page horizontal, full color (7"x4.5"): $350
- Half page vertical, full color (3.5"x9"): $350
- Quarter page, full color (3.5" W x 4.5" H): $250

Per Year: Apply 20% discount if purchasing 4 ads at a time

Other sizes of advertisements are available, but are priced on an individual basis. Contact us for more information. Please book advertising space as early as possible before the intended publication date. Artwork for advertisements should be submitted a minimum of two weeks prior to the publication date; earlier is always better than later. Artwork for advertisements can be submitted in EPS, PDF, PNG, JPG or GIF formats. EPS, PDF and PNG formats are preferred. Images should be at least 300dpi resolution if possible.

The ISA Automatic Controls and Robotics Division is run on a non-profit basis for the benefit of its members. Money raised from the sale of advertising in the newsletter are used to help offset the cost of division programming and events. Like its parent organization, the ISA, the ACARD is a non-profit member-driven organization.

For more information, or to discuss other advertisement sizes not outlined above, please contact the ACARD newsletter editor Anand Iyer at akiyer64@gmail.com

ISA ACARD SCHOLARSHIPS

ISA ACARD encourages successful candidates enrolled in an undergraduate or a graduate engineering program related to automation, control & robotics for 2021/2022 school year at an accredited college or university to participate in ISA's educational scholarship program https://www.isa.org/students/scholarships/. ISA ACARD is also currently in process of setting up its own endowment fund for division scholarships - detail guidelines are being worked out and shall be made available in subsequent newsletters.

For questions, please contact the **Scholarships chair, Mr. Rohit Kadam, ro16102003@gmail.com**

ACARD Linked in Visitor Statistics

Mr. Nitin Kirloskar, who is managing our Linked in account has provided the below statistics of page visitors…
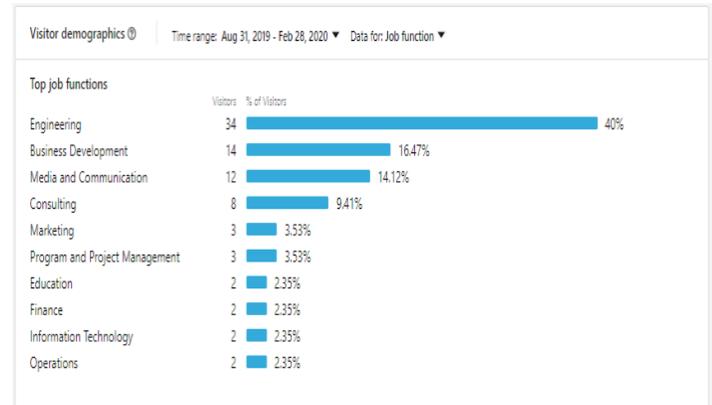
For questions, please contact the **LinkedIn chair, Mr. Nitin Kirloskar, nitinkirloskar@gmail.com**

Automatic Controls and Robotics Division

Fieper Project
Anand Iyer

We are starting a project named Fieper.
Fieper or Field operator is a conceptual robot field operator and often talks on a first person basis.

Fieper is the culmination of the thought process that initially led to the paper on Mentoring Operators (moving from SOP's to online mentoring), and a subsequent novel PTA-44 (will put the same in Amazon soon), which talked about remote control rooms (Control rooms similar to backoffice operations in BFSI segments with some changes).

The Field operator robot would do all operations that a field operator in a conventional process plant would do plus many more things. Walk around and take readings from gauges, open and close valves, drain equipment, start equipment locally when commanded to and many other things.
At present the Fieper project would give a higher level details of tasks, technologies and some brief, and automation enthusiasts and students can take individual projects and submit papers.

The Fieper would describe in brief a task and the existing technologies that could be used and start a thread. And users could then spawn and create their own versions or even better ones….

More to follow in the next issue….

ISA Process Industry Conference

Conference: 18-19 November 2020
Training: 17 November 2020
Houston, TX USA

This year's event has been expanded to deliver more comprehensive technical content to a broader range of professionals in the energy processing and process manufacturing industries.

ISA PIC 2020—Process Industry Conference combines the technical expertise, knowledge, and experience of ISA—the global leader in process automation standards, training, and education—along with leading experts across critical areas covering: process instrumentation/control, cybersecurity & safety systems, open architecture &

infrastructure, and operational excellence as well as robotics and subsea automation.

Program Benefits
By offering a leading-edge technical program for addressing the demands of a changing world, **ISA PIC 2020—Process Industry Conference** is the process industry event that engineers and automation professionals can't afford to miss.

- **Keynote presenters** will reflect on the imagination of today's thought leaders and innovators and provide perspective on the latest advances and trends in manufacturing technologies and applications.

- **Comprehensive technical tracks** will cover the crucial issues facing today's manufacturing decision-makers—and those expected to determine both success and failure in the years ahead.

- **Expert-led training courses** will provide an added advantage for professional development on topics related to industrial cybersecurity, alarm management, and safety instrumented system criticalities.

- **An exhibitor showcase** of networking and promotional opportunities providing prime access to key industry products, services, and solutions.

Proposed Conference Topics:
Critical Industry Trends & Challenges:
Reducing Lifecycle Costs
Relationship Management
New Hire Training
Business Case for Automation
Digital Oilfield Development
Equipment Certification Standards

Cybersecurity:
Cybersecurity and Functional Safety Lifecycle Supply Chain Cybersecurity
Best Practices in Cybersecurity Assessment

Process Control:
Alarm Management
Automation Projects (PLCS, DCS & SCADA) Human Machine Interface (HMI)
Intelligent Device Management
Maintenance
Model Predictive Control
Operator Training
Pipeline Automation
Procedural Control Applications
Process Optimization
Smart Manufacturing with MES/MOM Applications
Smart Sensors & IIOT

Automatic Controls and Robotics Division

Safety Systems:
Functional Safety Lifecycle
Risk Analysis
SIL Determination/Verification
Operation and Maintenance
Proven In Use Justification
Product Certification

Advanced Technologies:
Open Architecture &&Infrastructure
Operator Performance/Operational Excellence
Robotics & Intelligent Systems
Industrial Robots & Robot System Safety Computing
&Visualization

For More information and registration, submission of abstracts, visit https://isaautomation.isa.org/pic-2020/

IIoT&SMART MANUFACTURING CONFERENCE

https://isaautomation.isa.org/2020-iiot-smart-manufacturing-conference/#what

- As COVID-19 (Coronavirus) diagnoses continue to increase worldwide, ISA is committed to providing a safe and healthy environment for our members and customers.

- The World Health Organization (WHO), the US Centers for Disease Control (CDC), and other global health organizations have universally recommended the cancellation or postponement of gatherings, including conferences, to slow the spread of the virus.

- We are complying with those recommendations, as a result, this conference has been rescheduled to 19-21 October 2020.

- ISA will rollover all current registrations and exhibit payments to the rescheduled event, OR you may request a refund by emailing info@isa.org.

Keynote/Panel Discussion Highlights
IIoT–From Technology Hype to Sustainable and Scalable Solutions

As with most potentially disruptive or transformative technical trends, much of the emphasis is often placed on the nature and capability of the component and contributing technologies. While this may be adequate for raising initial awareness and promoting potential opportunities it is not sufficient for delivering solutions that provide business value and are sustainable over the long term. Asset owners must have clear business objectives and a comprehensive strategy that describes not only suitable technologies, but also the implications for organizational models, roles and responsibilities, and business processes. This keynote panel will present the elements of this strategy followed by a discussion of the potential of various technologies.

- Featuring key representatives from: Microsoft, Unilever, HP Technologies, and AT&T. Panel discussion moderated by ISA 2020 President Eric Cosman.

Stay tuned for further details as they become available!

Conference Topics
- Navigating the IIoT Landscape
- System Design & Architecture Cybersecurity & Safety
  Implementation & Management
  Smart Manufacturing
- Digital Transformation
- AI/Edge Computing
- Industrial Communications/Network Technologies

Register at link provided below:
https://www.isa.org/events-conferences/events-calendar/event-details/?productId=67221265&utm_source=leadpages&utm_medium=referral&utm_campaign=iiot_2020

Automatic Controls and Robotics Division

ACARD Board Member Contacts

Director
Sandeep Raju
Samsung Austin Semiconductor
vskraju61@gmail.com

Director-elect
Prakash Bapat
Pizo Consulting
jgbapat16@gmail.com

2020 Symposium Contact
Rohit Kadam
Mitsubishi Hitachi Power Systems Americas
ro16102003@gmail.com

2020 Symposium Contact
Dr.Jayesh Barve
GE Global Researh
Jayeshkumar.barve@ge.com

Secretary
Pankaj Goel
Texas A&M University
pankaj.5363@gmail.com

Education Chair
Dr. Ajay Deshmukh
Affordable Robotics
ajay.deshmukh@rediffmail.com

Newsletter Editor
Anand Iyer
Nesma Trading Company
akiyer64@gmail.com

Scholarship Committee Chair
Rohit Kadam
Mitsubishi Hitachi Power Systems Americas
ro16102003@gmail.com

Marketing Chair
Nitin Kirloskar
Zebrain Media& Entertainment LLP
nitinkirloskar@gmail.com

Committee Member
Vinod Joshi
Advanced Communications
vinodvjoshi@gmail.com

Committee Member
Vikas Anwekar
Vision Systems
vikas.anwekar@gmail.com

ISA Staff Contacts – Division Services
Andrea Holovach, Rachael McGuffin,
Karen Modrow, MaChelle Beason
ISA Headquarters, 67 T.W. Alexander Drive, PO Box 12277, Research Triangle Park, North Carolina, 27709, USA
Tel: 1 (919) 990-9404
Fax: (919) 549-8288
divisions@isa.org