Greetings from Director

Welcome to Summer Edition of the Automatic Controls and Robotics Division Newsletter. Thank you for your Interest in the ISA Automatic Controls and Robotics Division. During this COVID-19 season, I am hoping all are taking measures and are staying safe. I am sure all have been going through some interesting articles on how robotics and artificial Intelligence is helping us during this COVID season. Through ISA we invite all members of ISA to bring up open discussion of how Robotics is playing an important role during these tough times. We have some interesting technical articles featured in this Newsletter and hope all will enjoy reading them. Also we are looking forward to any who are willing to volunteer in contributing articles to our newsletter. Stay safe and enrich with the knowledge provided by ISA through different platforms.

Sandeep Raju
Director - Automatic Controls and Robotics Division

Greetings from Director (Elect)

Welcome to ACARD’ians Members of ISA - ACARD- Automation Control and Robotics Division

While most of us are still going though the COVID-19 Pandemic and consequent uncertainty, the brainstorming has already begun for ‘next normal’. You may like to read an article in this Newsletter viz. ‘Will your industry survive in the post Covid-19 world?’

Let me suggest you to please take this short survey to indicate your range of interests in the ACARD activities. https://forms.gle/Q65za3To5NXrTGzd7 We have also begun the process of formation of ‘Working Groups’ (WG) by voluntarily setting goals and targets with time lines. Detailed information of WG’s will follow soon, on the web page of ISA ACARD. I believe sprouting and shaping of WG’s can be visible in the balance part of the year 2020, leading to growth and sustainability during the next year 2021.

Prakash Bapat
Director Elect - Automatic Controls and Robotics Division
Greetings from Newsletter Editor

Let me cheer up and welcome you all as an ISA ACARD Editor offering my very first and warmth greetings !!

Covid-19 cannot put us down. We are here, progressing to uplift mankind by touching new horizons. The pace of life had not only drifted us away from nature, we took many things for granted that Covid-19 virus has shattered. The challenge is highly threatening that we are able to overcome only because of our technological achievements! Our this aspiration will soon bring our lives back to normal… may be a new normal !!

Taking the thread forward, ACARD Director Sandeep Raju has presented an article on IIOT Security, Vikas Anwekar tells us what vision guided robotics is all about in Part-I published here. If you think robotics has prospered human life only in the recent years then Dr. Jayesh Barve puts you wrong taking you back thousand odd years! Nitin Kirloskar trying to find answers whether your industry would survive post Covid-19 era. Mentor, Guide Anand Iyer shows you new world of robotics applications and throws open his ambitious FIEPER project to prosper by everybody’s and anybody's contribution. On the other hand, the reach of ISA ACARD on LinkedIn is gaining good reach and interests from global automation community which Nitin Kirloskar has explained well with the help of graphs.

Don’t miss reading appeal to join the “Vision Systems Working Group” and appeal for FIEPER Project. We have lot more to do together, come forward not alone but get your friends and colleagues along ! Wish you all a happy reading.

Satish Pathak
Newsletter Editor
Automatic Controls and Robotics Division
Email: ssvp.technocrat@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 - guidelines are being worked out in detail and shall be made available in subsequent newsletters.

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

Our Volunteer Leaders:
Welcome Aboard to all our Leaders!!
Automation and Technology

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Appeal To Join ISA ACARD "Vision Systems Working Group"

Machine Vision is a very interesting field related to robotics and advanced automation. Most of the industrial applications related to latest technologies like AI and ML/DL are linked to Computer Vision / Machine Vision. ACARD is seeking participation from ISA members to drive an initiative for this domain through the “Vision Systems Working Group”.

The purpose of this working group is to:

- Brainstorm and contribute ideas about bringing latest technology and trends to the table in the field of Computer Vision / Machine Vision.
- Connect with domain experts working in the field of CV/MV and bring them on board, seeking their cooperation to contribute towards the cause of the group.
- Coordinate and Cooperate to organize Webinars, Symposia, panel discussions, online events related to the topic
- Create content for the newsletters and social media to be published via ISA channels
- Cooperate with various sections globally and drive the initiatives of the working group.
- Help the team become the “Go-To” destination for all their queries related to Machine Vision.

We look forward to your active participation.

Please send your expression of interest to vikas.anwekar@gmail.com
Featured Article:
IIoT Security
Sandeep Raju

Industrial Internet of Things (IIoT) systems connect and integrate different types of instrumentation and control systems with enterprise systems, business processes, analytics and people. These systems are different from traditional industrial control systems by being connected extensively to other systems, increasing the variance of the systems. Historically, security in industrial systems counts on physical disconnection and network partitioning of vulnerable components, and on the oblivion of the design and access rules for critical control systems. Security is and will be enforced through physical locks, alarm systems and in some cases armed guards.

The potential for human error was primarily through direct access and concerns focused on disrupting the safety and reliability of the system, with those risks alleviated by good design, analysis and reviews through testing and training. Over the past few decades, increasingly affordable computing power, pervasive connectivity and maturing data analytical techniques have opened the door to convergence of control systems, business systems and the internet. This convergence started small, initially being used for management and remote monitoring of systems, but quickly enlarged to mining and analyzing operations to predict failures and perform software upgrades. This convergence has increased productivity, efficiency and performance of the existing operational processes and created new ways of leveraging operations data, thus delivering business value now and into the future.

But with these gains come with risks. Systems that were originally isolated from the rest of the world are now exposed to attacks of increasing sophistication. Hence, the existing design of operational technology (OT) systems is no longer valid. A successful assault on IIoT system has the potential as serious as the worst industrial accidents upto date for e.g. Chernobyl, resulting in destruction to the environment as well as loss of human life. There is also potential risk of exposing sensitive data, intervening of operations and damage of systems during such an attack. The results of assaults on IIoT systems may lead to large natural disasters. With a geographically distributed IIoT system, care must be taken to ensure that disruption of an isolated system does not lead to global effects. Organizations must consider these risks consequences; they must use their innate talent to make their IIoT systems trustworthy. The applications of sensors and actuators in an industrial environment, is not a typical Information Technology experience. IT and OT prioritize system characteristics differently. For example, resilience in IT is less needed than in OT, and security is less needed in OT than in IT. In IIoT systems, above system characteristics must mingle and be reconciled with each other into overall system trustworthiness. IIoT organizations must rely on increased importance of safety and resilience beyond the levels expected in many traditional IT environments. IIoT systems may also have analytical dataflow information that include go-betweens and involve multiple organizations, requiring more knowledgeable security approaches, for example link encryption. Unfortunately, IT wings rarely speak the similar language as those concerned with control systems and OT. The two perceive risk differently, and they cannot be mingled for positive gain without a balanced consideration of their differing motivations.

The highest priority of most Operational Technology systems is safety, which means not to cause injury or death. The next priorities are often quality and meeting production targets, which mostly depend on the reliability and resilience of the system. Reliability and resilience are needed to prevent the interference of society-critical processes such as the electric grid, and protect from idling machinery that represents large investments in physical infrastructure. Security features are considered in OT, but considering many systems are not connected it is mostly physical security. Key System Characteristics authorizing Trustworthiness includes assurance, security, safety, reliability, resilience and Privacy. Interactions among the potential system characteristics must be understood based on factors such as regulatory compliance, business process and industrial norms, not separately. Integration of IT and OT security requires understanding the gaps between them and the approaches to evaluate and protect systems. Security rules, regulations and standards must develop in both worlds and together should be effective. They can no longer focus narrowly. Though arguably not as transformational as the industrial revolution in the 1800’s, the Industrial Internet revolution will certainly bring about major improvements in the quality of our day-to-day lives. The world may have quicker affect of IIoT in emerging countries and thanks to more opportunity for new Greenfield deployments. But we need to be careful while implementing these cut-through technologies such that it does not cost us in the end.

About The Author:

Sandeep Raju is currently Instrumentation and Controls Project Engineering Manager working for Samsung Austin Semiconductor located in Austin, Texas. He is a Controls and Instrumentation Engineer by profession. He is currently the Director of Automatic Controls and Robotics Division and his area of expertise include Advanced Process Controls, Lean Six Sigma, RCA, Industrial robotics, UAVs. He likes to mentor kids in robotics programs like VEX.
The driver for digitalization is the growing demand for accuracy, enhanced quality and reliability. The market dynamics have compelled the manufacturing industry to bring in new products, modified designs to match changing consumer sentiments, customizations and faster deliveries. Robots have been the friends of manufacturing industry for decades now, and so is the Machine Vision per-se. Both the streams have independently reached stability and technological maturity already. The recent developments have been rather complementary to each other to make the processes more efficient. This article will enlighten some of the insights of Vision Guided Robotics (VGR) in the manufacturing segment. Though the VGR is equally relevant for other robot types such as mobile robots, humanoids, Cartesian and SCARA robots etc., we shall focus on the applications and challenges of articulated robots.

Before we go deep into our core topic it is important to understand some important concepts of machine vision and industrial robots.

**Machine Vision** can be termed as the atomization of human seeing. It needs not only the image capturing, (function of our eyes), but also processing these images and generate results (function of brain). Machine vision systems rely on digital sensors protected inside industrial cameras with specialized optics to acquire images, so that computer hardware and software can process, analyze, and measure various characteristics for decision making.

Typical machine vision applications can be broadly categorized into four types – namely:
- Guidance
- Identification
- Gauging
- Inspection

While the tasks like Identification, Gauging and Inspection systems comprising of robots have their own purposes where robots add value to the application, our focus in this article is on the Robot Guidance. Machine Vision (MV) Systems can locate the part and ensure that it is placed correctly in a particular assembly. On the other hand, MV systems can also help identify the location of a component in 2D or 3D space, and help robots precisely locate the coordinates of the components. The MV systems reduce the complexity of having fixtures required for this purpose.

To understand this, we need to first look into how a robot positions itself to locate the component -
High Speed robotic pick and place of objects using vision guidance

The TCP bears relation with the Wrist coordinate, Base coordinate, world coordinate and the object coordinate systems. Ideally it is expected that the object's coordinates match precisely with the set coordinates of the TCP. Meaning that the origin point of the object is taught to the robot via programming and the TCP coordinates are recorded. Therefore to achieve repeated accuracy the robot and the object have to come at the same point every time. The robot positioning is governed by servo mechanisms and therefore is pretty accurate. In case of fixed located components, their positioning accuracy is dependent upon number of factors such as machining tolerances, locating fixture tolerances, indexer table positioning accuracy and repeatability etc. Therefore the TCP of the robot may not match with the actual coordinates of the object due to the offset between its desired and actual coordinates and there will be a positioning error. If the robot is expected to pick up the object or perform any operation on it while the object comes randomly positioned over a conveyor then determining its origin becomes near to impossible if there is no system like machine vision to guide it. The machine vision systems if deployed identify the object’s real time coordinates and feed them to the robot, which then compensates the offset into the TCP and the tool positioning accuracy is ensured. This method is mostly used for applications such as welding, glue dispensing etc. for fixture components and robotic pick and place of randomly placed objects placed on a moving conveyor. The above examples hold good for objects having positioning inaccuracies along the 2D plane. Therefore a 2D machine vision system is deployed.

For applications such as robotic bin picking, where the robot is expected to pick up objects kept randomly in a bin, the 3D spatial analysis becomes evident. Here not only the X,Y and Z coordinates are important but the orientation angle along all the three axes are crucial for the robot to identify the most easiest object to pick without any collisions. It is but obvious that 3D machine vision systems are deployed. The most popular of these is the stereo vision using two cameras providing coordinates and the height map. The crucial task here is the camera calibration and machine vision algorithm to combine images from both the cameras and build a 3D image.

This image of the bin is analyzed to derive the TCP coordinates of the most easy component to pick. Some other 3D techniques are Laser triangulation and Time of Flight.

Robotic Bin Picking

About The Author:

Vikas has 19 years’ of experience in the Industrial Automation field. He has worked in different domains, which include PLC and CNC Automation, Robotics and Vision Systems. He has worked in different capacities handling project management, sales and product marketing management. He has wide experience of working in automation domain for industries like Automotive, Textile, Steel, F&B, Pharmaceuticals and FMCG etc.

He is currently working with Baumer India Pvt. Ltd. as Product Manager – Vision Technology.

He is an active member of ISA – Pune section and is currently holding the position of President in the section, and a committee member in the Advanced Control and Robotics (ACARD) Division.
Featured Articles
Automatic Control & Robotics: Quick Journey
Dr. Jayesh Barve

A) HUMAN BEHAVIOUR & PERSPECTIVES

Human Behavior: It is analyzed and proven biologically and psychologically, that humans always have an open (or hidden) tendency, desire or fantasy (not only in today’s era, but for ages since the human existence); to find or have “someone else” do tasks that are (or becomes) routine or unpleasant. For centuries, as is evident in epics & history, that humans with power &/or wealth, even tend to fulfill their such desires through (legal, illegal or sometime even inhuman) Animal, “Human-Slaves” or “Human-Servants” -- as EITHER forced labour/prisoner/slaves OR employed workers -- to help them in daily work, and/or to help fight for them during wars. On the other side, human is sensitive and kind. So, also looks for options to correct, improve such inhuman acts(of having kept/slavery/servants) by replacing “human-slaves/servants” by “non-human slaves/servants”; not only in science-fictions & storybooks, but also in real-life. Such replacements were earlier in the form of providing some aids/tools/dummies to “human-slaves/servants” to reduce sufferings and hazards during work, wars. Later, such aids/tools/dummies started moving up the ladder to make lives of such “human-servants” better by improving their work quality & efficiency. Today, known as “Automatic Control”, “Automation” or “Robots”.

The term “Robot” was probably 1st time coined by Czech play writer Karel Capek in 1921 science-fiction Czech play “R.U.R” (“Rossum’s Universal Robots”). Robota (Czech) means “A worker of forced labor”. This play begins in a factory that makes artificial people called robots, human-like creatures, like “androids”, “humanoids” we call today. These are artificial beings designed to resemble like a human, made by human, to help doing tasks previously/otherwise done by human either for day-to-day works or to fight in wars.

Ancient Mentions: RigVeda (old Indian book~1500 BC) mentions “Asura” as the one who has magical or phenomenal powers. One such Asura namely Sambarasura, used his powers to create 3 human-like slaves (robots) named dama, vyāla and kaTa. These 3 Robots were lifeless machines and so had no sentiments/emotions, hence were never defeated. Also, in another old Indian philosophical book “Yoga Vasishtha” (a discourse of sage Vasishtha to Prince Rama, authored by sage Valmiki centuries BC) mentions Robots & Artificial Intelligence (Maya). Also, another Indian epic book “Ramayana” (~500 BC), describes things like many software (Mantra) powered bow-arrows as war-aids & flying chariot (Pushpak Viman) for fast mobility.

Automatic Control & Automation represents something that is created by human to perform the tasks previously or otherwise performed by humans; but with a reduced, minimal or no human-intervention. It is Labor-Aiding, Labor-Saving means to perform process or procedure with reduced / minimal human assistance.

B) AUTOMATION – OLD HISTORY:

Heron can be named as one of the great ancient “automation engineer”, who devised and documented many automatic devices (~10-50AD in Greece) including famous automatic temple-doors using heat, pneumatics & mechanics; and Aioli-pile –1st steam-powered engine (Fig.2).

Also, Greeks and Arabs during ~300 BC-1200 AD were fascinated to invent ways to keep accurate track of time. In Egypt~270 BC, Ctesibius described a float regulator for a water clock (Fig.3), an earliest feedback controlled system.

The Persian brothers Banu-Musa, in their “Book of Ingenious Devices” (850 AD), described number of automatic controls e.g. 2-step fluid level control, form of discontinuous variable structure controls. They also described a feedback controller.
But, the Fly-ball governor speed-control mechanism (Fig.4) invented by Christian Huygens & Bunce (separately for different applications) and used by James Watt in his famous steam-engine, can be considered as 1st feedback proportional-controller of the revolutionary 18-19th century industrial era.

In 18th century, Swiss *mechanician* Henri Maillardet built an interesting non-industrial Automatic machine "Draughtsman-Writer" (Fig.5), is believed to be the one with largest mechanical "memory" (4 drawings, 3 poems) of any such mechanical automatic machine ever constructed.

Further, in 2nd half of 20th century, with the fast-growth & miniaturization of electronics, instrumentation, analog/digital communications, microprocessors, computers, and software; programmable, flexible, rigorous & complex mathematical forms of automatic controls became possible & viable (otherwise impossible or cumbersome just using mechanical/pneumatic/analog-electronic controllers). Hence came into existence the Digital/Embedded control-systems (with programmable, simple & complex digital controls); PLCs (flexible programmable logic & sequence controls), DCS, SCADA (plant-wide controls). Alongside, control theory advancements journey via state-space, adaptive, optimal, model-predictive, robust & stochastic control schemes etc. led to more feasible, viable real-life industrial & non-industrial controls applications. These automatic control advancements helped provide better performance, efficiency, reliability, robustness, flexibility, programmability.

**Automatic Control Platforms**: On the other side, after suitable control theory background laid-down, along with engineering & digital computing advancements, ON-OFF & PID controllers got implemented in various forms like Analog hydraulic-pneumatic-electronic; Digital microprocessor based computerized ON-OFF, Discrete PID, Sequence controllers.

**Automatic Control Applications**: With success & popularity of PID controllers, more & more applications enabled automation i.e. aid/replace humans, partially or fully, in various devices, equipment, subsystems, systems, unit and plant-wide operations in – 1) continuous manufacturing industry (like chemical, petrochemical, oil & gas, paper & pulp, mining, power-generation, etc.); 2) discrete manufacturing industry (like automobile, pharmaceutical, food-processing, dairy etc.); 3) non-industrial / hybrid systems/equipment/devices (like home-appliances, consumer goods, automobiles, locomotives, aircrafts, packaging, machinery, medical equipment, etc.). Without advances in automatic control, the most operations in such industry/non-industry applications would have been manual; making life of humans miserable and hazardous OR several applications would have been even impossible.

**Recent & Future trends**: Over last ~2 decades, with the availability of viable, powerful industrial computers, it has become possible to take automatic control beyond traditional single/multi-loop ON-OFF/PID controllers (deployed at field-control, PLC, DCS levels). Rather, the use of automation has penetrated now even at upper hierarchical layers of industrial plant-operations (Fig.6) like process control &optimization layer; production planning & scheduling layer; & even multi-plant coordination covering supply-chain.
Automatic Controls and Robotics Division

Future: Even, these traditional and advanced hierarchical automatic controls have still some gaps constraining the reach of automation to many other applications like fast industrial systems & operations (e.g. power grid, aircrafts). But many such operations are possible & are performed by human. Because, humankind have a special capability of vision sensing (images / video) and cognitive decision-making. However, with latest ongoing research advancements in sensing, microelectronics, communication, advanced powerful microprocessors/GPUs, and computing etc. have led to new interdisciplinary areas like IIOT, Edge-Fog-Cloud computing, distributed computing etc. These technologies can address these gaps and offer advanced solutions for such large-scale, fast multivariable systems. Additionally, increasing capability of intense image/video capturing & processing, artificial intelligence & learning algorithms (found promising in image/video information processing), have made it possible to develop & apply vision-based intelligent & cognitive decision making (controls) in such applications. These are sure to further take the goals & objectives of automatic control (automation) to help/reduce/replace human interventions in many remaining, laborious routine tasks e.g. monitoring, inspection, mobility, healthcare, etc. This automation journey is ongoing & will continue in future, due to fast evolving research to expand systems theory, controls and automation towards many new non-industrial applications like robotics, smart manufacturing, mobility, video surveillance, navigation & control, traffic management, home/building automation, grid power & energy management, logistics, supply chain, retail, mining, biologi-}

ROBOTICS – IN CENTURY:
As per Robot Institute of America, a robot is defined as a reprogrammable, multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks. Japan and Germany have been in the forefront of Robotics development, application revolution in 20th century. Japanese Industrial Robot Association (JIRA) simply defines Robot as “A device with degrees of freedom that can be controlled.”. JIRA classifies robots as -- Class-1:Manual handling device; Class-2: Fixed sequence robot; Class-3: Variable sequence robot; Class-4: Playback robot; Class-5: Numerical control robot; and Class-6: Intelligent robots.

Industrial Automation and Robotics revolution started along 2nd world-war and then grew fast. Various tasks where Robots have helped reduce/replace human tasks for betterment of humans are listed below. Though not exhaustive, this gives a quick glimpse to breadth of fascinating big world of Robotics:

a) Dangerous/Difficult for humans
- Space explorations
- Chemical spill cleanup
- Disarming bombs
- Disaster cleanup
- Nuclear waste handling
- Subsea Manufacturing/Assembly

b) Boring and/or very repetitive
- Welding car frames
- Part pick and place
- Manufacturing parts
c) High precision or high speed

- Electronics testing
- Surgery, Precision machining

d) Specific Task Machines

- Bottling machine
- Dishwasher, Paint sprayer

e) Multi-task Machines

- Pick & Place Arms
- CNC Machines
- Mobile Robots

f) Advanced Robots

- Mobility, Human Interfaces
- Haptics – tactile sensing
- Snake, Insect robots
- Humanoids, Soft-robots
- Aerials & Underwater AVs

g) Non-engineering Applications

- BOTS in e-Commerce, e-Business, e-Gov, PA Services

We will talk more about Robotics in future newsletter.

About The Author:

Dr. Jayesh J. Barve, PhD (Systems & Controls) from IIT Bombay is Principal (Controls & Optimization) at GE Research - Bangalore, India. He has 29-year experience ~15 in Industrial R&D and ~14 in Academia. He has published >15 patents and >45 papers in Journals/Conferences and >25 reports/whitepapers; contributed to ~8 next-gen products/technologies. His experience & interests spans across Controls, Optimization, IIOT, Automation, Autonomous/Guided Vehicles and Power, Energy, Microgrid, Oil & Gas, Appliances, Manufacturing, etc. He is a senior member with leadership roles & responsibilities in voluntary organizations like IEEE, ISA, and IFAC. He received several awards & certifications in GE Research. Recently, he received the 2019 ISA “Excellence in Technical Innovation” Award endowed by Honeywell UOP company for technology R&D leadership contributions. He is President, ISA Bangalore Section. He holds Conference Program Chair ISA ACARD.
Featured Article:
Will your industry survive in the post Covid-19 world?
Nitin Kirloskar

It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change. — Charles Darwin

There have been lots of discussions happening around about the post Covid-19 business situation. Lots of experts are giving advice to industry. It is not to criticize anyone, but we need to realize the fact that no one has experience to deal with this situation in the modern world. So, all the advice is based on individual's intelligence, imagination & expertise in the relevant field. It applies to this article as well!

Who will survive?

As per one of the most important rules of any business, it is the business that can sustain, can survive. This is true in nature too. Many of the great, giant species go wiped out, while many small, even microscopic species survived in the history of earth. These survivors were the ones that were most adaptable to change.

Can it be the MSME* sector in India?

It would be important to know that the Indian MSME sector has been facing lots of challenges even in the Pre Covid-19 and has survived every challenge. In 2019, the contribution of MSME sector was nearly 50% of India's exports (Source: Economic Times, PTI, Nov 14, 2019). It was despite the economic slowdown. Yet it is the second largest employer after agriculture in India. It also accounted for 45% of total industrial production and contributed very significantly to the GDP. MSMEs also contributed to 30.50% of services (Source: msme.gov.in).

How can MSMEs survive and even flourish?

We have been working with many MSME owners & could find some of the important traits in them that can make them winners in the post Covid-19 world.

1) They have learnt to deal with difficulties, as they were already facing challenges of economic slowdown and managing their companies
2) They are entrepreneurs & have the inherent habit of taking challenges
3) They know how to manage in limited resources & yet deliver best results
4) They are united on several forums where they freely interact & learn from each other
5) They are resilient to sudden changes
6) They do not shy away from experimenting
7) They welcome experts as advisors, as they are aware that people, who know better than them, will help them grow

How can MSMEs adapt to post Covid-19 world?

There are difficulties, but the opportunities outnumber the difficulties for MSMEs

1) Indian government has realized that it is MSME sector that will drive the next economic change for the country and not the large corporations

2) Indian government has launched lots of new schemes to boost this sector & is still announcing newer ones

3) While there is a challenge to win back the migrated manpower, there is opportunity for automation, process control, lean manufacturing and digital marketing – all this can substantially bring down employee cost & make the industries lesser dependent on people related issues.

4) MSMEs can now take a fresh look at – What they stand for, what they want to do now, what is giving them more profits, what products or services need to be discontinued & what products or services need to be introduced

5) Time is ripe for MSMEs to focus on exports, as more and more countries want to reduce their dependence on China. But this opportunity comes with a pre-condition – We need to act fast, deliver quality & ensure on time delivery. Else other countries may seize this opportunity, which is ‘Once in a century’ kind of opportunity.

It is a good time to get associated with an advisor who can be part of the top management team to implement this business change process, as we have a very limited time window available for this opportunity!

*MSME : Micro, Small and Medium Enterprise
You may like to visit https://msme.gov.in
About The Author:
Nitin Kirloskar is a consultant offering business solutions to Micro, Small and Medium Enterprises (MSME). He is a Mechanical Engineer by profession, with post graduation in Marketing and Business Management.

The areas of his expertise include Branding, Business strategy, Digital marketing, International Business, Business Process Improvement and Lean Manufacturing.

Nitin was involved in business strategy for various group companies of Forbes Marshall as Head of Corporate Marketing. He designed & implemented their Digital Media strategy. His articles have been published in magazines like Electrical India, International Petroleum Refining, Power Engineering International.

Nitin holds Marketing Chair of ISA ACARD

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Featured Article:
A Brief Introduction to the Fieper Project - Taking It Forward Through The Competition
Anand Iyer

The ISA ACARD division is proud to announce a first of its kind project, Fieper.

Fieper stands for Field Operator Robot. What is Fieper? Fieper is a robotic field operator. In all process industries (chemical, pharma, oil and gas, petrochemicals, metallurgical, power and utilities plants, petrochemicals and others), there are two chief types of operators - Board operators and Field operators.

Board operators sit in front of Automation system consoles (operator stations, SCADA terminals, Batch operator Interface, HMIs and the likes) in a control room and operate the valves and motors and other equipment of the plant. While the Field operator has to do a lot of operations in the field side (actual in the plant - valves, motors and other equipment). Watch and read gauges, open drains, open and close valves, start and stop motorized equipment and so on. In most optimized environments, a board operator may also do a field operators role. As compared to the automatic controls, the number of manual valves, gauges and other field elements that are not connected to the automatic control system are many.

Field Operations, various hazards:
While doing operations in the plant (field), the operator is exposed to many hazardous conditions that include inhaling various chemical fumes, exposure to acids, alkalis and other toxic items, fire and explosion possibilities, forcing field operators to face many hazards. While due to strict regulations and well-crafted operating procedures, such incidents are reduced to a minimum. There are always human errors that sometimes result in some minor incidents and occasionally a major incident. There are also long-term effects on field operators that need to be considered.

Fieper Purpose:
- Perform reliable field operations.
- Reduce operator’s exposure to process hazards.
- Provide solutions in the event of emergencies that are humanly not possible (for example, plug a leaking hot fluid line).
- Perform tasks that would otherwise be difficult or may need a large number of instrumentation.

Fieper Team:
We intend to have a Fieper model working in every ISA section with ACARD members. As such, there will be positions available for each section inclined to participate in the project.

A working committee is being formed by ACARD. Below positions are as for now and may change with time as the program progresses.

1. Program Sponsor: Sandeep Raju
2. Program Mentor: Prakash Bapat
6. SME Robot and mechatronics: TBD / Interim Sandeep Raju (using drones) / Jayesh Barve / Ajay Deshmukh
7. SME Cloud & Programming: TBD / Interim Anand Iyer / Satish Pathak / Ajay Deshmukh
8. SME cybersecurity: TBD
9. India lead: Prakash Bapat.
10. Media and relations: Nitin Kirloskar.
11. Program Funding: Sandeep Raju / Nitin Kirloskar, can be split/country/section wise later on.
12. Section lead: TBD per section
13. Section organization: TBD per section.
   a. Section Project manager
   b. Section Funding manager
   c. Section Expert (different subjects).

Actions- Team formation and path forward:
The program is at a preliminary stage and it excitingly provides opportunities to people across ISA to participate in the Fieper development activities.

Since the Fieper project is very broad based, it has to be broken down to easy to manage smaller projects. What is being suggested is to have a competition for each of the individual projects with some rewards to the participants. Further, organizations that are already in the robotics domain also have the opportunity and a head start in creating a Field operator robot. Section Fieper project leaders and teams can also liaise with local robotics companies and get sponsorship or do projects that can achieve the desired results.

A preliminary meeting was held with the Texas Section and there has been positive response. Based on the discussions:

1. Each section can have a working model, which will be showcased to young students and create interest and enthusiasm about automation and robotics as a career.
2. Students (engineering) can participate in the project competition and get laurels and also in the process create working model.
3. Local companies, sections, mechatronics groups can be brought into the project and accelerate the project.
The First Proposed Project for Competition

Identifying process industry objects:

The Fieper has to understand what is a valve and what type (gate, Ball). Look and understand what is a gauge and what is a transmitter.

The first project being proposed has to do with image classification and vision systems.

A simple camera will be used to look at the actual items and announce what they are.

Activities:

1. Collect images of ball Valves (flat handle), Transmitters (different shapes and sizes), gauges (different sizes).
2. Load it to a suitable program for image classification. Readymade Azure/AWS/Google cloud/ other functions are available and can be used. Below are a list of resources:
   - https://docs.microsoft.com/en-us/azure/architecture/example-scenario/ai/intelligent-apps-image-processing
   - https://docs.aws.amazon.com/sagemaker/latest/dg/image-classification.html
   - https://cloud.google.com/vision/
   - Custom python, c, java and other languages can be used to create custom programs.
3. Use a camera mounted on a suitable mobile vehicle (drone or remote control toy vehicle), and identify objects at a 5 feet height and classify them accurately.
4. Test setup will have valves of different types both in horizontal and vertical orientation, Gauges, transmitters and the camera will record the images and on the fly provide classification output.

It is proposed that each interested section can make their own setup. Discarded valves and gauges can be used. The items of the test setup will be within the 120mm to 180mm height (as standard is to keep instruments at 150mm from ground level).

Students may also use Raspberry Pi or other single board computer and a WiFi or HDMI input camera to create the project. Ranking will be based on the following criteria:

1. Classification accuracy.
2. Classification speed
3. Low cost
4. Ease of portability to any robot

Competition Start Date: 1st July 2020.
Competition End Date: 30th September 2020.
Expression of interest by email akiyer64@gmail.com

A Video of the test along with results certified by the local chapter and software-hardware, cost, participant, schedule details will be submitted to ACARD for evaluating the results.

The next project will be on Reading Gauges, meters, LCD, LED, Field Tags. Details will be published in the next issue.

About The Author:

Anand Iyer is an Instrumentation Engineer”, TUV CFSP, Ex-PMP with over 30 years of experience in Instrumentation, Control system technology.

In his words " I have an all round experience and have played roles in Maintenance. EPC, System Engineering, Construction and Commissioning. Have also worked in different industries like Oil & Gas, Petrochemicals, Chemicals, Biotech, Pharma, Bulk Drugs, Tank farms, Metallurgical, Mechanical factories. Have a robust interest in IIOT, Cybersecurity, Robotics and am actively promoting Fieper Project. Inspired by Star Trek (Where no Man has gone before). I try to do in Automation (Go where you have not before and bring others in automation to where automation has not gone before)...Happy reading...."

Appeal To Join ISA ACARD “FIEPER - Working Group”

FIEPER stands for – Field Operator Robot

Robotics by itself is very interesting field. Robotics is more closely connected to advance automation. Many industrial applications related to latest technologies are linked to Robotics

Industrial plant applications are usually from the Control Room operators. However those need be complemented by specific tasks to be executed manually at the plant e.g. Hand Valves, Locally controlled devices like Motors, Reading several Gauges to ensure readiness of plant equipments as enabler to the Control Room Operations.

ACARD is seeking participation from ISA members to drive an initiative for this domain through the "FIEPER Working Group".

The purpose of this working group is to:

- Brainstorm and contribute ideas about bringing various field operations required to be handled usually at the start of a Batch Operation as well as at the shutdown or completion of batch operation.
- Connect with domain experts working in the Process and allied Industry Sectors and bring them on board, seeking their cooperation to contribute towards the cause of the group.
- Coordinate and cooperate to organize Webinars, panel discussions, online events related to the topic
- Create content for the newsletters and social media to be published via ISA channels
- Cooperate with various sections globally and drive the initiatives of the working group.

We look forward to your active participation.
Please email your ‘expression of interest’ to akiyer64@gmail.com
ACARD LinkedIn Visitor Statistics

Mr. Nitin Kirloskar, who is managing our LinkedIn account has provided the below statistics of page visitors.

We are getting a good response to ISA ACARD LinkedIn page & many viewers are liking the posts shared by us. Here are some insights:

1. There is a good rise in page views (62% up) and the number of unique visitors has gone up by 75%. After June 13, there is a significant rise in the visitors.

2. New followers - Total followers so far are 493, out of which 86 are new additions in a month.

Here is the analysis of followers based on their job functions. Majority of our followers are from functional areas like Engineering, Operations, Sales, Business Development, and IT.

It is a good going & we would request all of you to invite all your friends & industry professionals to follow us on LinkedIn to get all the updates that can benefit you in your own profession.

Nitin Kirloskar
Marketing Chair ISA ACARD
Email: nitinkirloskar@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 Satish Pathak at svp.technocrat@gmail.com.

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.
Webinars
ISA’s webinars within the Process Control & Instrumentation Series provide attendees with insight into critical industry topics and challenges. Increase your knowledge of the latest trends and technologies from the comfort of your home or office.

Taking Action on Cybersecurity Risks in the Water Sector

28 July | 1 pm – 2 pm ET

This presentation will provide a specific industry example and identify a systematic approach for helping utilities navigate steps to address potential cyberattacks.

- Step One: Recognize that there is a credible and active cybersecurity system threat.
- Step Two: Understand that you have a fiduciary and statutory obligation to manage the risk.
- Step Three: Take action to assess the vulnerabilities that may expose your system to such threats.
- Step Four: Determine what actions will be taken to manage cyber risks.

Registration Link: https://register.gotowebinar.com/register/1854974380144836620

Webinars
Control System Cybersecurity for Water/ Energy Utilities

22 September | 1 pm – 2 pm ET

This presentation will build upon the various levels of ISA content provided in the area of cybersecurity, to identify the continued importance and need for cybersecurity as it relates to control systems. The roles played by IT/OT in cybersecurity, as well as the common practices that can be applied to mitigate control system risk will be covered.

Registration Link: https://register.gotowebinar.com/register/9168347384994763788

Virtual Conferences
ISA invites you to attend virtual sessions surrounding process control, safety systems, cybersecurity, and advanced technologies. Our live, online virtual conferences offer presentations, panel discussions, virtual exhibits, and networking/chat opportunities.

Virtual Process Industry Conference

17 November | Keep Checking For Registration
Webinars

ISA's IIoT & Smart Manufacturing webinar series provides attendees with insight into challenges in adoption, integration, and implementation of new technology globally. Increase your knowledge of the latest trends and technologies from the comfort and safety of your home or office.

**Leading the Energy Transition: People-Driven Value, Sustainability & Culture of Innovation**

23 July | 1 pm – 2 pm ET

In this presentation, discussion will surround how energy companies are leveraging AI and IIoT technology to unlock value, uncover unique potential and develop core competencies for the workforce of the future. It will highlight Microsoft’s energy industry point of view and illuminate the digital hot spots that drive returns on digital investments (i.e. Intelligent Supply Chain, Connected Operations, Energy Management, Regulatory Compliance, Productivity & Process Improvement).

**Presenter:** Jeffrey Monk, Senior Industry Executive - Energy Microsoft Corporation

**Registration Link:** [https://register.gotowebinar.com/register/3339889022207372559](https://register.gotowebinar.com/register/3339889022207372559)

Virtual Conference

Join ISA for a day to network and attend virtual learning sessions about topics regarding advances in connectivity, automation, and security within the operational context of hybrid manufacturing applications across multiple vertical industries. Our live events offer presentations, panel discussions, virtual exhibits, and networking/chat opportunities.

Virtual IIoT & Smart Manufacturing Conference

27 October | Keep Checking For Registration