SNJB's

LATE SAU. K. B. JAIN COLLEGE OF ENGINEERING

NEMINAGAR, CHANDWAD, DIST- NASHIK

NAAC ACCREDITED WITH "A" GRADE

ESTD - 1928

SNJB

Founder

Poojya kakaji

Department of Mechanical Engineering

Yantra Veda

Year 2018-19

Shri. Dineshji Lodha

Shri. Zumbarlalji Bhandari

Shri. Sunilji Chopda

Message from Honourable Management

We feel delighted to observe that yearly Technical Magazine "YANTRAVEDA" from department of Mechanical Engineering is to coming out in this year (A.Y.2018-19), thanks to efforts of the faculty and the students of the department. The "YANTRAVEDA" is truly the reflection of the interest of the students, involved in technical endeavors.

As a parting message to students of Mechanical Engineering, We wish them a pleasant and prosperous future and advise them to develop deep in their career and come out with the pearl of name and fame ,both for themselves and their future.

Message from Principal

I am proud to announce the release of 'YANTRAVEDA' magazine's third issue. The magazine signifies the writer's penmanship and also allows them to share their ideas. I acknowledge the efforts of students and staff of Mechanical department who have taken the initiative to promote the writing and publishing skills of the students. This helps the students to share and express their ideas in an articulate manner. Students and staff achievements have also been presented which will be a motivational factor for the other students to achieve the standard of excellence. Glad to say that we have achieved our aim of turning this into reality. I would like to congratulate all the students, teachers, alumni and everyone involved in bringing out its 3rd edition.
Wishing everyone loads of success and bright future.

Dr. Mahadeo Kokate

Message from Head of Department

I am pleased to know that our students are successful in bringing their third issue of magazine 'YANTRAVEDA' for this academic year 2018-19. YANTRAVEDA, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down innovative ideas.

This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them.

I congratulate and thank all the students and faculty coordinator who have made untiring efforts to bring out this magazine. I wish them all the very best for releasing more such magazines in future.

Dr. Santosh Sancheti

LATE SAU. KANTABAI BHAVARLALJI JAIN

COLLEGE OF ENGINEERING

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DEPARTMENT OF MECHANICAL ENGINEERING

VISION

- To impart quality technical education in the field of Mechanical Engineering for the benefits of society

MISSION

- To provide quality education among the students through the curriculum and industrial exposure.
- To develop a learning environment leading to innovations, skill development and professional ethics through curricular and extracurricular activities for societal growth.

PEO'S AND PSO'S

Program Educational Objectives (PEOs):

After industrial experience of 4 to 5 years, Mechanical Engineering graduates will be able to

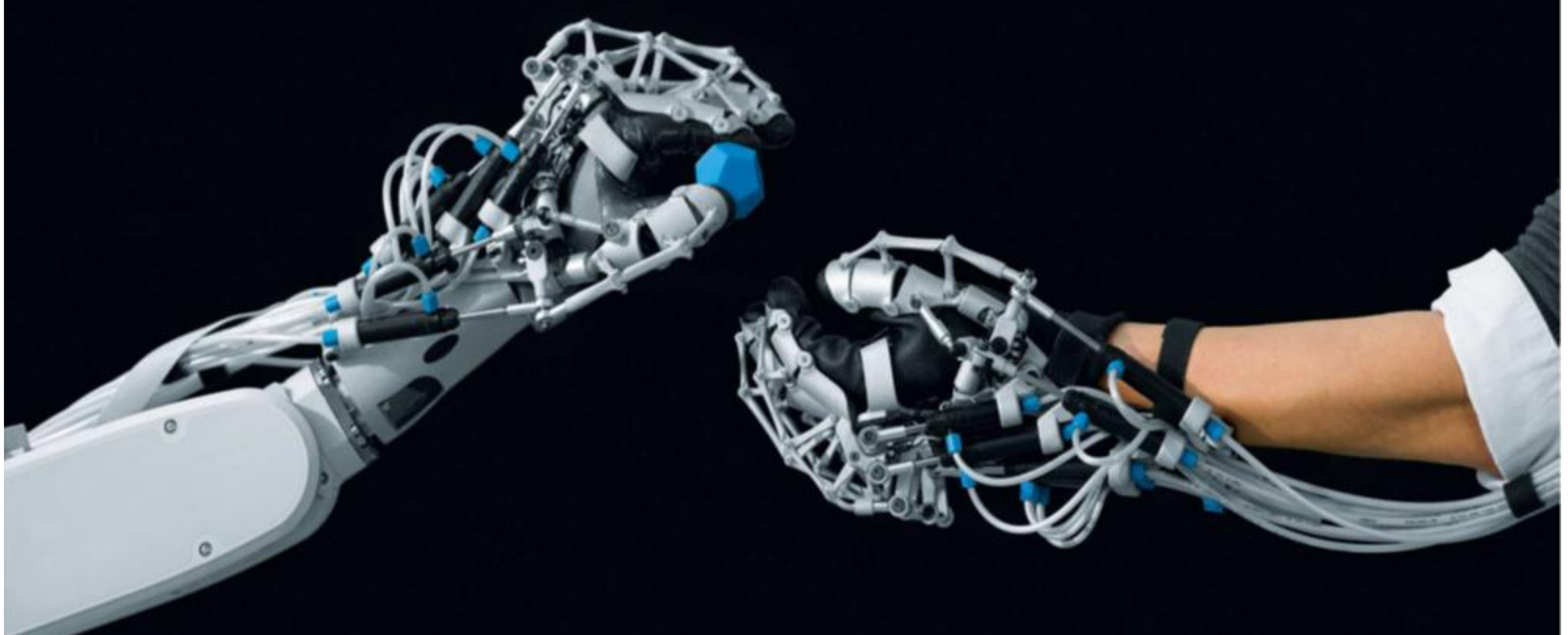
1. **Graduates will possess essential professional Mechanical Engineering skills to develop solutions for industrial and societal problems.**
2. **Graduates will engage and succeed in their professional careers through teamwork, professional ethics and effective communication.**
3. **Graduates will engage in lifelong learning, career enhancement and adapt to emerging technologies for the benefits of society.**

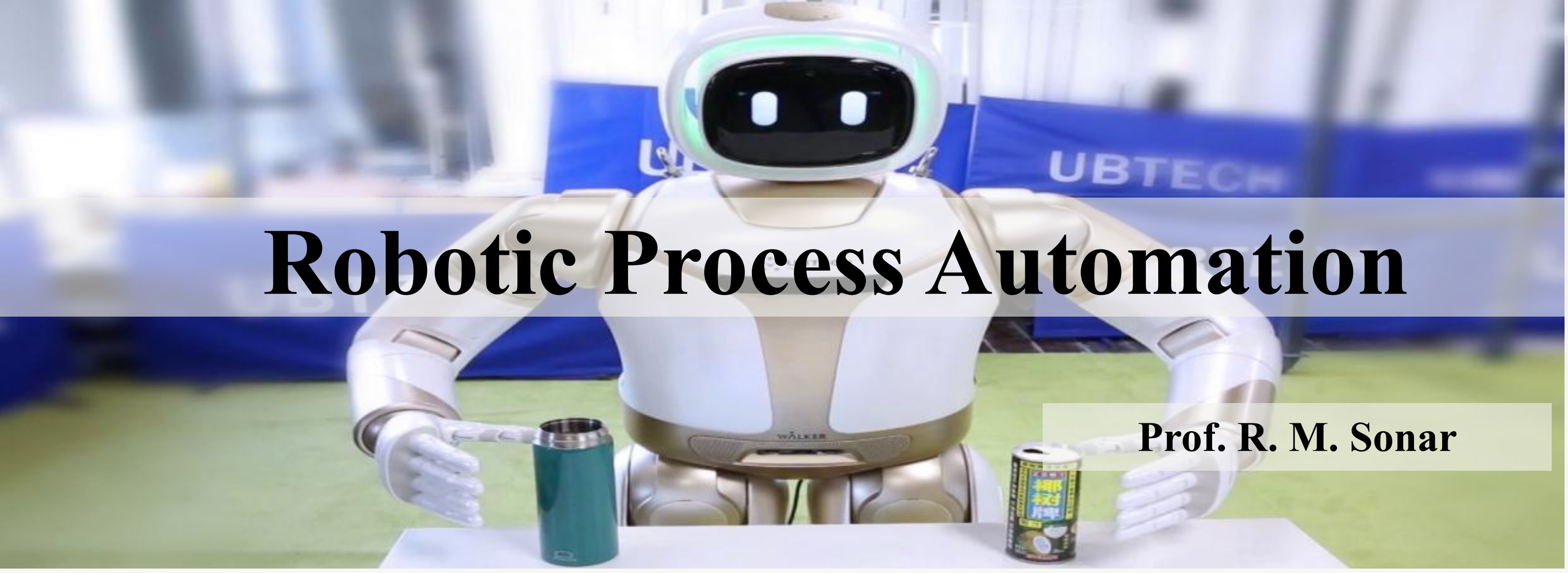
Program Specific Outcomes (PSOs):

After graduation, Mechanical Engineering graduates will be able to

1. **Graduates will have an ability to identify, analyse, and develop appropriate solution(s) to Mechanical Engineering Problems.**
2. **Graduates will be able to use modern engineering tools for analysing and solving practical problems of industry and society.**
3. **Graduates will be able to learn and grow constantly, with good technical, spiritual, and ethical values with a zeal for life-long learning.**

Faculty Articles





Robotic Process Automation

Prof. R. M. Sonar

Robotic process automation (or RPA) is a form of business process automation technology based on metaphorical software robots (bots) or on artificial intelligence (AI)/digital workers. It is sometimes referred to as *software robotics* (not to be confused with robot software).

In traditional workflow automation tools, a software developer produces a list of actions to automate a task and interface to the back-end system using internal application programming interfaces (APIs) or dedicated scripting language. In contrast, RPA systems develop the action list by watching the user perform that task in the application's graphical user interface (GUI), and then perform the automation by repeating those tasks directly in the GUI. This can lower the barrier to use of automation in products that might not otherwise feature APIs for this purpose.

RPA tools have strong technical similarities to graphical user interface testing tools. These tools also automate interactions with the GUI, and often do so by repeating a set of demonstration actions performed by a user. RPA tools differ from such systems in that they allow data to be handled in and between multiple applications, for instance, receiving email containing an invoice, extracting the data, and then typing that into a bookkeeping system.

Robotic Process Automation

Prof. R. M. Sonar

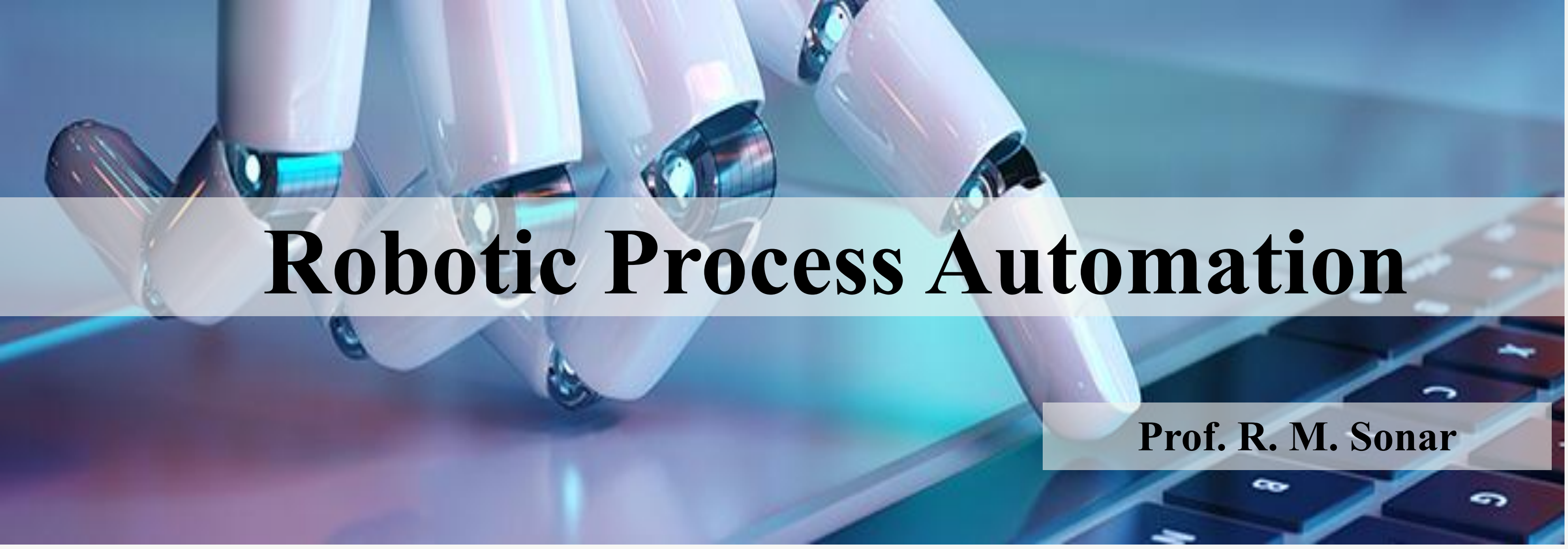
Use:

The hosting of RPA services also aligns with the metaphor of a software robot, with each robotic instance having its own virtual workstation, much like a human worker. The robot uses keyboard and mouse controls to take actions and execute automations. Normally all of these actions take place in a virtual environment and not on screen; the robot does not need a physical screen to operate, rather it interprets the screen display electronically. The scalability of modern solutions based on architectures such as these owes much to the advent of virtualization technology, without which the scalability of large deployments would be limited by available capacity to manage physical hardware and by the associated costs. The implementation of RPA in business enterprises has shown dramatic cost savings when compared to traditional non-RPA solutions.

There are however several risks with RPA. Criticism include risks of stifling innovation and creating a more complex maintenance environment of existing software that now needs to consider the use of graphical user interfaces in a way they weren't intended to be used.

RPA actual use

- Banking and Finance Process Automation
- Mortgage and Lending Process
- Customer Care Automation
- Data Extraction Process
- Fixed automation process



Robotic Process Automation

Prof. R. M. Sonar

Examples

- Voice recognition and digital dictation software linked to join up business processes for straight through processing without manual intervention
- Specialized Remote Infrastructure Management software featuring automated investigation and resolution of problems, using robots for first line IT support
- Chat bots used by internet retailers and service providers to service customer requests for information. Also used by companies to service employee requests for information from internal databases
- Presentation layer automation software, increasingly used by Business Process Outsourcers to displace human labor
- IVR systems incorporating intelligent interaction with callers

Robotic Data Automation (or RDA) is a form of business process automation which helps users to realize value from data faster by simplifying and automating the repetitive process with respect to data (not to be confused with robotic process automation).

The traditional method to perform any task with the data involves various functions including data integration, data preparation, and data transformation from multiple sources. This resulted in manually spending hours to obtain data from and finally creating a database for different sources to do analysis. It is now possible to perform all these steps using Robotic Data Automation by creating no-code pipelines.

Robotic Process Automation

Prof. R. M. Sonar

Robotic Data Automation (RDA) vs Robotic Process Automation (RPA)

Robotic Process Automation automates business processes and user tasks, whereas Robotic Data Automation automates data tasks. Generally, it is about automating the manual, cumbersome, expensive data pipeline process with bots. In summary, Robotic Data Automation automates DataOps and associated MLOps, similar to what robotic process automation did to automate business processes. Robotic Data Automation perfectly complements Robotic Process Automation by automating complex data workflows and integrations

Robotic Data Automation actual deployment:

- IT Service Management
- Data Center Management
- 5G/Edge
- DevOps
- Configuration Management Database

Friction Stir Welding

Prof. J. S. Pagar

Friction Stir Welding

Friction stir welding (FSW) is a relatively new solid-state joining process. This joining technique is energy efficient, environment friendly, and versatile. In particular, it can be used to join high-strength aerospace aluminum alloys and other metallic alloys that are hard to weld by conventional fusion welding. FSW is considered to be the most significant development in metal joining in a decade. Recently, friction stir processing (FSP) was developed for micro structural modification of metallic materials. In this review article, the current state of understanding and development of the FSW and FSP are addressed. Particular emphasis has been given to: (a) mechanisms responsible for the formation of welds and micro structural refinement, and (b) effects of FSW/FSP parameters on resultant microstructure and final mechanical properties. While the bulk of the information is related to aluminum alloys, important results are now available for other metals and alloys. At this stage, the technology diffusion has significantly outpaced the fundamental understanding of micro structural evolution and microstructure–property relationships.

Principle of operation

The FSW is performed with a rotating cylindrical tool which has profiled pin (also known a probe) having diameter smaller than the diameter of shoulder. During welding the tool is fed into a butt joint between two clamped work pieces, until the probe pierces into the work piece and shoulder touches the surface of the work pieces. The probe is slightly shorter than the weld depth required, with the tool shoulder riding atop the work surface. After a short dwell time, the tool is moved forward along the joint line at the pre-set welding speed.

Friction Stir Welding

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Frictional heat is generated between the wear-resistant tool and the work pieces. This heat, along with that generated by the mechanical mixing process and the adiabatic heat within the material, cause the stirred materials to soften without melting. As the tool is moved forward, a special profile on the probe forces plasticized material from the leading face to the rear, where the high forces assist in a forged consolidation of the weld.

This process of the tool traversing along the weld line in a plasticized tubular shaft of metal results in severe solid-state deformation involving dynamic recrystallization of the base material.

During welding, a number of forces will act on the tool

- A downwards force is necessary to maintain the position of the tool at or below the material surface. Some friction-stir welding machines operate under load control, but in many cases the vertical position of the tool is preset, and so the load will vary during welding.
- The traverse force acts parallel to the tool motion and is positive in the traverse direction. Since this force arises as a result of the resistance of the material to the motion of the tool, it might be expected that this force will decrease as the temperature of the material around the tool is increased.
- The lateral force may act perpendicular to the tool traverse direction and is defined here as positive towards the advancing side of the weld.
- Torque is required to rotate the tool, the amount of which will depend on the down force and friction coefficient (sliding friction) and/or the flow strength of the material in the surrounding region (stiction).

In order to prevent tool fracture and to minimize excessive wear and tear on the tool and associated machinery, the welding cycle is modified so that the forces acting on the tool are as low as possible and abrupt changes are avoided. In order to find the best combination of welding parameters, it is likely that a compromise must be reached, since the conditions that favor low forces (e.g. high heat input, low travel speeds) may be undesirable from the point of view of productivity and weld properties.

Friction Stir Welding

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Generation and flow of heat

For any welding process, it is, in general, desirable to increase the travel speed and minimize the heat input, as this will increase productivity and possibly reduce the impact of welding on the mechanical properties of the weld. At the same time, it is necessary to ensure that the temperature around the tool is sufficiently high to permit adequate material flow and prevent flaws or tool damage.

When the traverse speed is increased, for a given heat input, there is less time for heat to conduct ahead of the tool, and the thermal gradients are larger. At some point the speed will be so high that the material ahead of the tool will be too cold, and the flow stress too high, to permit adequate material movement, resulting in flaws or tool fracture. If the "hot zone" is too large, then there is scope to increase the traverse speed and hence productivity.

The welding cycle can be split into several stages, during which the heat flow and thermal profile will be different:

- *Dwell*. The material is preheated by a stationary, rotating tool to achieve a sufficient temperature ahead of the tool to allow the traverse. This period may also include the plunge of the tool into the work piece.
- *Transient heating*. When the tool begins to move, there will be a transient period where the heat production and temperature around the tool will alter in a complex manner until an essentially steady state is reached.
- *Pseudo steady state*. Although fluctuations in heat generation will occur, the thermal field around the tool remains effectively constant, at least on the macroscopic scale.
- *Post steady state*. Near the end of the weld, heat may "reflect" from the end of the plate, leading to additional heating around the tool.

Friction Stir Welding

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Heat generation during friction-stir welding arises from two main sources: friction at the surface of the tool and the deformation of the material around the tool.[40] The heat generation is often assumed to occur predominantly under the shoulder, due to its greater surface area, and to be equal to the power required to overcome the contact forces between the tool and the work piece. The contact condition under the shoulder can be described by sliding friction, using a friction coefficient μ and interfacial pressure P, or sticking friction, based on the interfacial shear strength at an appropriate temperature and strain rate.

Applications

The FSW process has initially been patented by TWI in most industrialized countries and licensed for over 183 users. Friction stir welding and its variants – friction stir spot welding and friction stir processing – are used for the following industrial applications: shipbuilding and offshore, aerospace, automotive, rolling stock for railways, general fabrication, robotics, and computers

Automotive Battery Management System

Prof. M. A. Ahire

Automotive Battery Management Systems (BMS)

Automotive Battery Management Systems (BMS) must be able to meet critical features such as voltage, temperature and current monitoring, battery state of charge (SoC) and cell balancing of lithium-ion (Li-ion) batteries.

Electric vehicles run on rechargeable battery packs that are made of multiple cell modules arranged in a series and parallel. These battery packs produce several hundred volts of electricity. Various functions inside the car are dependent on them. That is why it becomes a critical component of the vehicle that requires constant monitoring and control.

Battery-driven electric power trains are gaining importance in various industries. Electric cars, electric aircraft, e-bikes, and automated guided vehicles all rely on battery packs. As battery packs require battery management systems to operate safely and reliably, it is important to test safety features and robustness of algorithms for the state of charge (SOC) and state of health (SOH) at an early stage to reduce both costs and development time. Therefore, leveraging automated HIL testing and a Model-Based Design workflow allows engineers to identify design flaws in an early development phase of the BMS.

Battery cell emulators that use various industrial protocols and interfaces allow performing automated HIL testing without having access to physical batteries. They also can be employed to test critical scenarios in a fully automated manner safely.

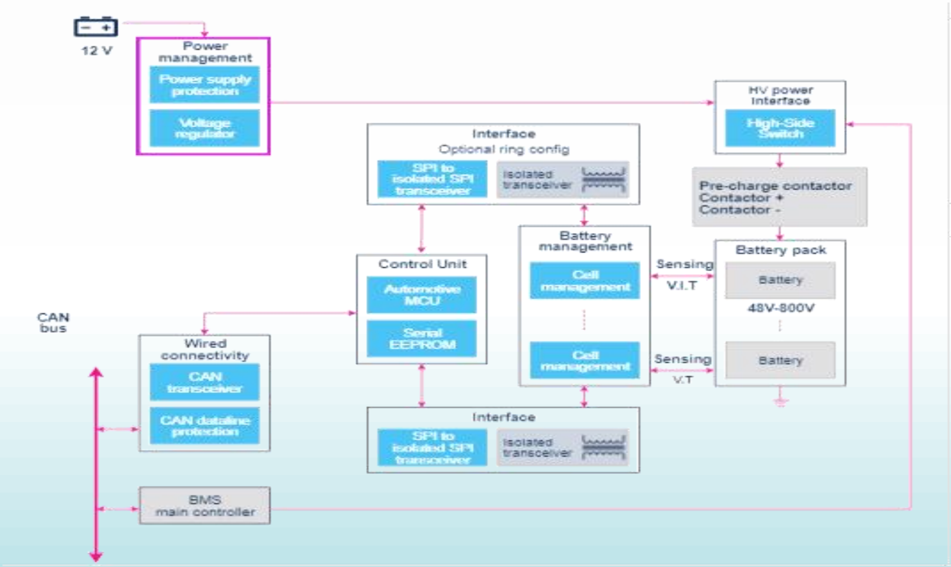
The same workflow can then be leveraged for large-scale automated production .This requires Battery Management System (BMS), an embedded system, which monitors the components closer to the battery cell, as each cell needs to be closely monitored so that there are no voltage fluctuations or imbalance in voltage conditions. The BMS consists of different components that ensure that the battery runs efficiently without chances of possible failures.

Automotive Battery Management System

Prof. M. A. Ahire

What is the need for BMS?

The main function of BMS is to ensure that the battery is protected and any operation out of its safety limit is prevented. It monitors the battery pack's state of charge (SOC) along with the state of health. BMS also manages the battery optimization via cell balancing that improves the life of the battery in the long run. The BMS will also monitor voltage, different temperature parameters, and coolant flow. Lithium-ion batteries that possess high charge density, power most electric cars. These battery packs even though are not very big; can be highly unstable. Therefore, these batteries should never be overcharged or be allowed to reach a state of deep discharge at any point. Thermal Runaway is a condition where the current flowing through the battery on charging or overcharging causes the cell temperature to rise. Conditions like these can harm the lifespan or the capacity of the battery. To ensure this does not happen, we require BMS to monitor its voltage and current.



Automotive Battery Management System

Automotive Battery Management System

Prof. M. A. Ahire

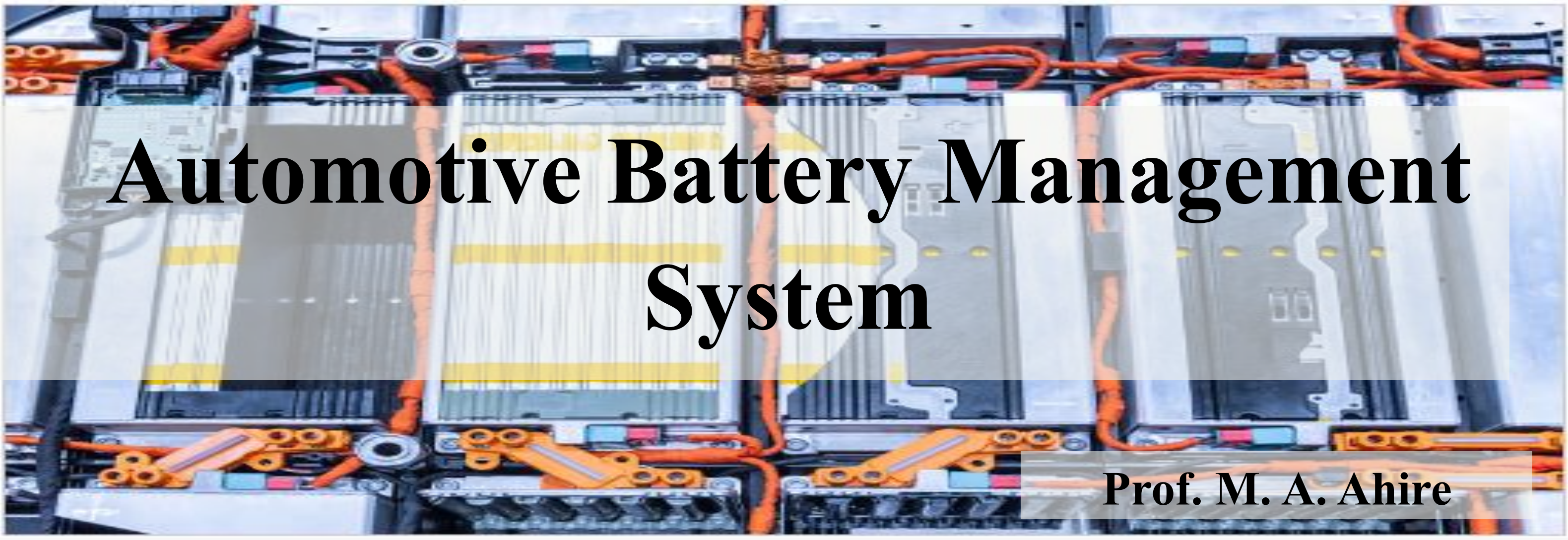
This process is very challenging as many cells are put together to form a battery pack in an electric vehicle and every cell needs to be individually monitored for its safety and efficient operation, which requires a specially dedicated system called the **Battery Management System** (BMS).

Figure 1. Highly-integrated solution for your Automotive BMS design.

ST's Battery Management System solution for automotive applications is specifically conceived to meet demanding design requirements.

Based on the new highly-integrated Battery Management IC L9963E and its companion isolated transceiver L9963T, our solution is able to provide the highest accuracy measurements of up to 14 cells in series, on mono or bi-directional daisy-chain configuration, embedding sophisticated cell monitoring & diagnostic features. It also meets the stringent Automotive Safety Integrity Level (ASIL) D compliance.

Together with our 32-bit Automotive MCU family, Power Management & System Basis ICs, VIPower Smart Switches, a wide offer of Protection Devices and automotive EEPROM for datalog, ST comes with a comprehensive and flexible solution to support your automotive-grade Battery Management System design.



Automotive Battery Management System

Prof. M. A. Ahire

What are the main functions of a BMS?

The main functions of a Battery Management System for electric vehicles are:

- Battery protection in order to prevent operations outside its safe operating area.
- Battery monitoring by estimating the battery pack state of charge (SoC) and state of health (SoH) during charging and discharging.

Battery optimization thanks to cell balancing that improves the battery life and capacity, thus optimizing the driving range for hybrid (HEV), plug-in (PHEV) and full electric vehicles (BEV).

How Does it Aid Battery Charging?

Various factors must be taken into consideration while designing a BMS as a lot of its functionalities depend on the end application it would be used for. Let us take a look at some of these functionalities in a little more detail.

- As seen earlier, the main function of the BMS is to ensure that the battery operates within the safety parameters. Since a battery pack is made up of cells with a voltage rating of 3V, the BMS will have to ensure that the cells in the pack are not discharged beyond the 3V mark.
- Charging control is another area that requires BMS monitoring. The charging is done in two stages. The first stage is Constant Current (CC) where the charger gives constant current to charge the battery. The second stage called the Constant Voltage (CV) comes into play where a constant voltage is supplied to the battery at a very low current. The BMS ensures that these functions operate seamlessly.
- All vehicles have a fuel indicator, in the same way, EVs also have a battery state of charge (SOC) indicator. BMS helps in indicating and showing the driver the actual state of charge in the battery.

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The voltage and current are measurements are made using various algorithms that calculate the SOC of the battery pack. One of the methods used is called Coulomb Counting, which measures the discharging of the battery and integrates the discharging current over time to estimate SOC.

Apart from the state of current, BMS is also responsible to monitor the state of health (SOH). The capacity of the battery may recede over time. The BMS helps in determining the state of health by measuring the **age and expected life cycle of the battery** based on the usage. This will help in determining the mileage on each charge.

BATTERY MANAGEMENT SYSTEMS ARE KEY IN EV & PHEV VEHICLES

The battery management system can be thought of as the “brains” of a battery pack, primarily responsible for protecting the battery cells from operating out of safe conditions. Today’s leading electrical energy storage technology for electric vehicles are batteries with lithium ion cells. Portability, high energy density, low self-discharge and memory effect has placed this technology as the ideal solution for EV & PHEV. However they face two critical design issues.

Two design issues of battery management systems:

- Overcharging produces overheating
- Discharging them below a certain threshold can reduce their capacity permanently; that threshold is, typically, around 5 percent of their total capacity.

Batteries are a small explosive charge that needs to be carefully managed to be safe and reliable for its users. Since batteries work through chemical reactions, they operate in a “gray zone” of being under or over charged, where heat plays a fundamental role; as it’s known that when heat increases conductors tend to increase their resistance while conversely, insulators decrease theirs.

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Think of electricity as water, it can be still and unharmful when contained, but upon finding an opening, it will flow recklessly through the path that offers the fewest obstacles.

Using the same water analogy, think of battery cells as water reservoirs that feed a city's water supply network. The gates regulate water flow in and out of each reservoir to keep its level high enough to maintain minimum water pressure but not too high that it will burst a pipe and drain all the water reservoirs.

To regulate energy flow a Battery Management System usually has two MOSFETS per battery cell that serve as gates to charge or discharge them according to the state of charge, voltage and temperature conditions of the cell. The BMS generates the pulses that turn on and off those MOSFETS. However, high isolation transformers, such as our PH9185.XXXNL series, protect the control circuit from the batteries power.

3 WAYS BATTERY MANAGMENT SYSTEMS POWER EV & PHEV VEHICLES

1. VOLTAGE

Battery management systems are responsible for measuring the voltage of each battery cell because over or under voltage conditions can also lead to thermal runaways that might cause a battery failure. Since keeping the voltage uniform along the battery cells is critical, this system applies an "equalizing charge" that favors the compromised battery cell. To accomplish this, power electronic components, such as the Pulse Electronics PA4334 series inductor, can act as sensors to help identify a drop or increase in cell voltage, thus allowing the system to determine if a cell is over or under driven.

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2. TEMPERATURE

Battery management systems are also in charge of measuring temperature along the battery packs. If an overheating condition is detected, the control system might stop regenerative charging or reduce the power draw from a pack to return individual cell temperatures to a safe range of operation.

3. STATE OF CHARGE (SOC)

Another important energy management function of a BMS is to determine the state of charge (SoC) to ensure all cells are discharged equally and safeguard them from going below the threshold that permanently reduces their total capacity. For that, a BMS performs a task known as "Coulomb counting," which determines the amount of electric power that is left in each battery cell and communicates it to the controls through a low EMI susceptible interface, such as our HM1188NL, which through a stackable architecture can support hundreds of cells.

Lithium ion cells store energy by steadily moving lithium from the cathode to the anode in exchange to an opposite electron flow through the electrolyte. Their ideal charging algorithm is through a constant current and then constant voltage phase, for which a BMS uses high current inductors, such as our PA434xNL series, to limit the rate of change in current flow and eliminate ripple on the charging current.

Student Articles

Alternative Fuels For Cars

Mr. Swaroop Sonawane, BE

Gasoline and diesel may be the reigning champs, but it looks like they've got some competition. With growing concerns of the automotive industry's impact on the environment through carbon emissions, car owners are seeking alternative energy solutions that offer greater sustainability. Here are six alternative fuel sources that can guide us towards becoming a more energy independent nation.

1. HYDROGEN

Hydrogen is abundant in our environment and therefore greatly accessible – it's in water, hydrocarbons, and other organic matter – and is used to power fuel cell electric vehicles (FCEVs). The appeal of FCEVs rest on their efficiency, rapid filling times, and above all, emissions of only water and warm air.

Extracting hydrogen particles, however, is a rigorous process and as a result, hydrogen contains less energy content in comparison to gasoline or diesel fuel. In part because of this production bottleneck, FCEVs have yet to reach the mass market.

Developing a substantial fueling infrastructure can be difficult and costly, but that doesn't mean it's not feasible. In fact, LGM is a proud sponsor of Canada's first retail hydrogen station, opening in Vancouver this month. The station will be the first in a six-station network that is a result of the partnership between HTEC (Hydrogen Technology & Energy Corporation) and Shell Canada.

2. ELECTRICITY

Sourced directly from the electrical grid and other off-board electric power sources, electricity is a highly efficient energy source that's readily available to us through an already developed infrastructure. Electricity is stored in the rechargeable batteries of all-electric and plug-in hybrid electric vehicles (PHEVs), releasing considerably fewer emissions than gasoline- or diesel-powered vehicles when in operation.

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In gas-electric hybrids, electricity replaces gasoline at lower speeds, and for starting and stopping motions. Similarly, PHEVs use electricity to power the vehicle over longer distances, releasing zero emissions when the car is running purely on battery power.

Although electricity may have a lower fuel cost, the purchase price of an actual electric vehicle (EV) can be significantly higher compared to conventional gasoline-powered cars. Also, much of the electricity today comes from burning coal or natural gas, which introduces the debate about its overall carbon footprint.

3. BIODIESEL

Biodiesel is independent of what we know as conventional petroleum diesel. A byproduct of biodegradable, non-toxic resources like vegetable oils, animal fats, and even recycled restaurant grease, it is exceptionally clean-burning and renewable. Biodiesel comes in a variety of blends (for instance, B5 which is 5% biodiesel and 95% standard diesel), and in its pure form (B100).

Unlike all-electric zero emissions vehicles, biodiesel-powered vehicles do emit carbon dioxide (CO_2), but there's a silver lining. Any CO_2 that's emitted is offset by the CO_2 absorbed by the feedstock crops that produce biodiesel (like soybeans), making it a cleaner substitute to gasoline or diesel. The distribution network for biodiesel is lacking due to limited production, which is why biodiesel, particularly in its pure form, can be more costly than conventional diesel – but this is also dependent on the market and geographic location. On top of that, biodiesel has 10% less energy content, which means biodiesel-powered vehicles require more fuel than standard diesel cars.

4. ETHANOL

Ethanol, an alcohol-based fuel, is made of renewable materials – think crops like corn, barley, and wheat. Several blends of ethanol are used today but E10 is most common (10% ethanol and 90% gasoline). Other blends include E15, used in models manufactured in 2001 onwards, and E85, a 'flex fuel' that's used in vehicles that can operate on gasoline alone, or a blend of up to 85% ethanol and 15% gasoline.

Alternative Fuels For Cars

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Like biodiesel, crops that are used to produce ethanol offset any CO_2 that's emitted in the combustion process. As a result, ethanol can improve our energy security and air quality by reducing the amount of pollutants that enter the atmosphere. Producing ethanol, however, is energy-intensive. Resources are depleted in the process, which negatively impacts food prices and availability, and more opportunities for CO_2 emissions arise. In terms of fuel economy (the relationship between distance traveled and fuel consumed by a vehicle), ethanol contains about one third less energy than gasoline, meaning a vehicle will typically run fewer miles per litre than if it was 100% gasoline-powered.

5. NATURAL GAS

Natural gas, as a transportation fuel source, comes in two forms – CNG and LNG (compressed and liquefied natural gas, respectively). CNG is natural gas that's compressed to less than 1% of its volume at standard atmospheric pressure, and has a fuel economy that's comparable to gasoline. On the other hand, LNG is natural gas in its liquid form, typically used to power medium- to heavy-duty vehicles that travel long distances. Natural gas is widely available across the world as part of utilities for domestic use, and burns cleanly. However, the vast majority of natural gas is a fossil fuel – a product of many resources that take millions of years to form. This extensive process, matched with the rapid rate at which natural gas combustion occurs in vehicles, limits its opportunities for commercial applications and usage. Natural gas also releases harmful methane emissions into the atmosphere – a detrimental greenhouse gas that's supposedly 21 times worse than CO_2.Storing natural gas can also be inconvenient and costly. With a boiling point that's well below room temperature, it has to be stored in vacuum-like cryogenic tanks.

6. PROPANE

Propane, also known as liquefied petroleum gas, is a byproduct of natural gas processing and crude oil refining. When stored, it resembles a colourless liquid and only vaporizes into a gas during the combustion process. Like electricity, propane is domestically available through a well-established infrastructure built around usage, transportation, storage, and distribution –

Alternative Fuels For Cars

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we use propane gas in our homes and water heating systems, refrigeration, and to power industrial equipment. Its clean-burning qualities present no threat to soil, surface water, or groundwater, which makes it a sustainable alternative fuel source. What's more appealing is its relatively low fuel cost and energy-dense composition.

As with EVs, propane-powered vehicles may be more expensive despite being affordable as a fuel source. And while propane does have a lower carbon content than gasoline or diesel, like natural gas, it's a contributor of methane emissions.

Self-reconfiguring Modular Robots

Mr. Vrushabh Pophali, BE

Modular self-reconfigurable (MSR) robots are robots composed of a large number of repeated modules that can rearrange their connectednessto form a large variety of structures. An MSR system can change its shape to suit the task, whether it is climbing through a hole, rolling like hoop, or assembling a complex structure with many arms.

These systems have three promises:

Modular self-reconfiguring robotic systems or self-reconfigurable modular robots are autonomous kinematic machines with variable morphology. Beyond conventional actuation, sensing and control typically found in fixed-morphology robots, self-reconfiguring robots are also able to deliberately change their own shape by rearranging the connectivity of their parts, in order to adapt to new circumstances, perform new tasks, or recover from damage.

For example, a robot made of such components could assume a worm-like shape to move through a narrow pipe, reassemble into something with spider-like legs to cross uneven terrain, then form a third arbitrary object (like a ball or wheel that can spin itself) to move quickly over a fairly flat terrain; it can also be used for making "fixed" objects, such as walls, shelters, or buildings.

In some cases this involves each module having 2 or more connectors for connecting several together. They can contain electronics, sensors, computer processors, memory and power supplies; they can also contain actuators that are used for manipulating their location in the environment and in relation with each other. A feature found in some cases is the ability of the modules to automatically connect and disconnect themselves to and from each other, and to form into many objects or perform many tasks moving or manipulating the environment.

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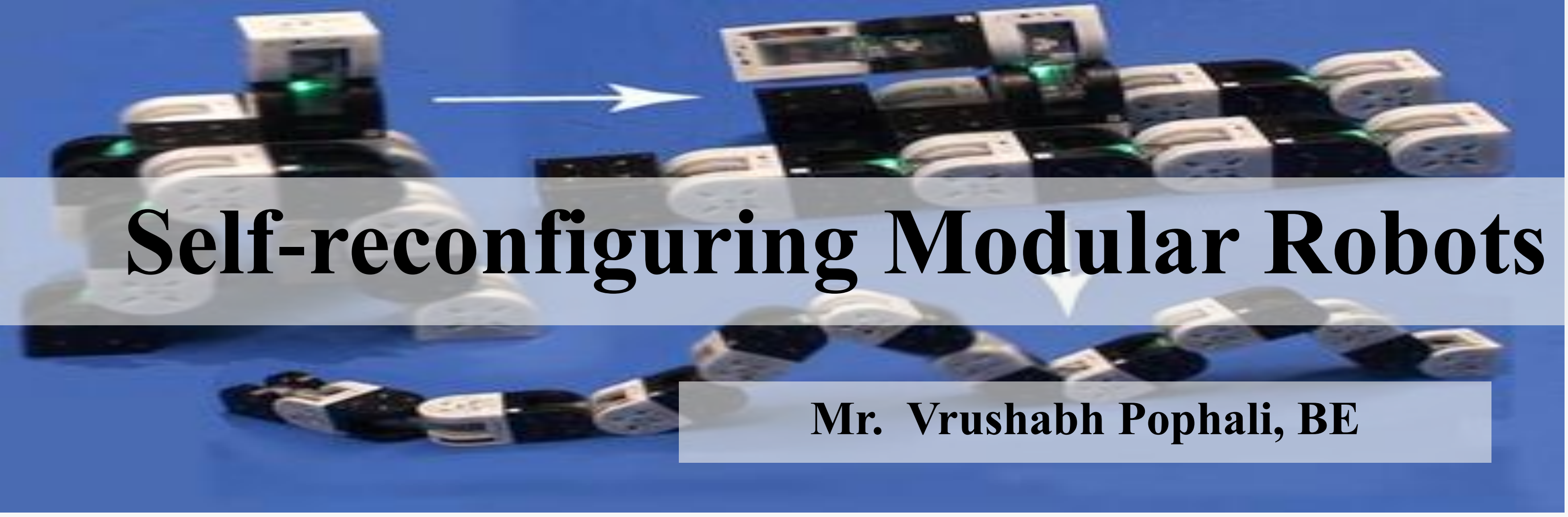

Self-reconfiguring Modular Robots

Mr. Vrushabh Pophali, BE

By saying "self-reconfiguring" or "self-reconfigurable" it means that the mechanism or device is capable of utilizing its own system of control such as with actuators or stochastic means to change its overall structural shape. Having the quality of being "modular" in "self-reconfiguring modular robotics" is to say that the same module or set of modules can be added to or removed from the system, as opposed to being generically "modularized" in the broader sense. The underlying intent is to have an indefinite number of identical modules, or a finite and relatively small set of identical modules, in a mesh or matrix structure of self-reconfigurable modules

Self-reconfiguration is different from the concept of self-replication, which is not a quality that a self-reconfigurable module or collection of modules needs to possess. A matrix of modules does not need to be able to increase the quantity of modules in its matrix to be considered self-reconfigurable. It is sufficient for self-reconfigurable modules to be produced at a conventional factory, where dedicated machines stamp or mold components that are then assembled into a module, and added to an existing matrix in order to supplement it to increase the quantity or to replace worn out modules.

Some current systems

PolyBot G3 (2002)

A chain self-reconfiguration system. Each module is about 50 mm on a side, and has 1 rotational DOF. It is part of the PolyBot modular robot family that has demonstrated many modes of locomotion including walking: biped, 14 legged, slinky-like, snake-like: concertina in a gopher hole, inchworm gaits, rectilinear undulation and sidewinding gaits, rolling like a tread at up to 1.4 m/s, riding a tricycle, climbing: stairs, poles pipes, ramps etc. More information can be found at the polybot webpage at PARC.

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M-TRAN III (2005)

A hybrid type self-reconfigurable system. Each module is two cube size (65 mm side), and has 2 rotational DOF and 6 flat surfaces for connection. It is the 3rd M-TRAN prototypes. Compared with the former (M-TRAN II), speed and reliability of connection is largely improved. As a chain type system, locomotion by CPG (Central Pattern Generator) controller in various shapes has been demonstrated by M-TRAN II. As a lattice type system, it can change its configuration, e.g., between a 4 legged walker to a caterpillar like robot. See the M-TRAN webpage at AIST.

AMOEBA-I (2005)

AMOEBA-I, a three-module reconfigurable mobile robot was developed in Shenyang Institute of Automation (SIA), Chinese Academy of Sciences (CAS) by Liu J G et al..AMOEBA-I has nine kinds of non-isomorphic configurations and high mobility under unstructured environments. Four generations of its platform have been developed and a series of researches have been carried out on their reconfiguration mechanism, non-isomorphic configurations, tipover stability, and reconfiguration planning. Experiments have demonstrated that such kind structure permits good mobility and high flexibility to uneven terrain. Being hyper-redundant, modularized and reconfigurable, AMOEBA-I has many possible applications such as Urban Search and Rescue (USAR) and space exploration.

Stochastic-3D (2005)

High spatial resolution for arbitrary three-dimensional shape formation with modular robots can be accomplished using lattice system with large quantities of very small, prospectively microscopic modules. At small scales, and with large quantities of modules, deterministic control over reconfiguration of individual modules will become unfeasible, while stochastic mechanisms will naturally prevail. Microscopic size of modules will make the use of electromagnetic actuation and interconnection prohibitive, as well, as the use of on-board power storage.

Three large scale prototypes were built in attempt to demonstrate dynamically programmable three-dimensional stochastic reconfiguration in a neutral-buoyancy environment. The first prototype used electromagnets for module reconfiguration and interconnection. The modules were 100 mm cubes and weighed 0.81 kg. The second prototype used stochastic fluidic reconfiguration and interconnection mechanism. Its 130 mm cubic modules weighed 1.78 kg each and made reconfiguration ex-

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Symbrion (2013)

Symbrion (Symbiotic Evolutionary Robot Organisms) was a project funded by the European Commission between 2008 and 2013 to develop a framework in which a homogeneous swarm of miniature interdependent robots can co-assemble into a larger robotic organism to gain problem-solving momentum. One of the key aspects of Symbrion is inspired by the biological world: an artificial genome that allows storing and evolution of suboptimal configurations in order to increase the speed of adaptation. A large part of the developments within Symbrion is open-source and open-hardware.

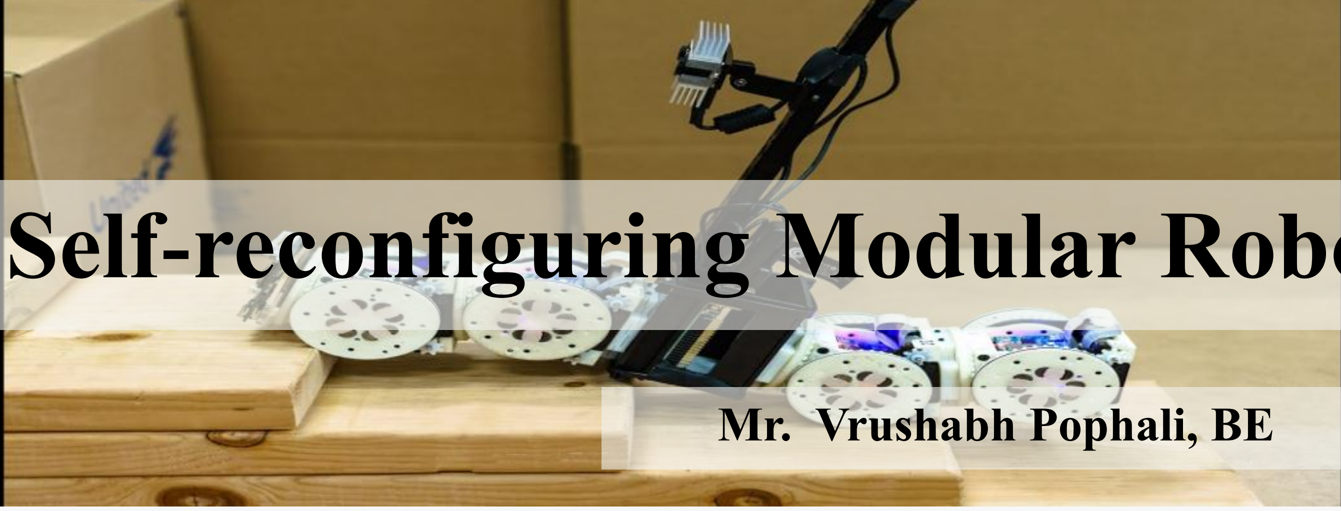
Space Engine (2018)

Space Engine is an autonomous kinematic platform with variable morphology, capable of creating or manipulating the physical space (living space, work space, recreation space). Generating its own multi-directional kinetic force to manipulate objects and perform tasks.

At least 3 or more locks for each module, able the automatically attach or detach to its immediate modules to form rigid structures. Modules propel in a linear motion forward or backward alone X, Y or Z spacial planes, while creates their own momentum forces, able to propel itself by the controlled pressure variation created between one or more of its immediate modules.

Using Magnetic pressures to attract and/or repel with its immediate modules. While the propelling module use its electromagnets to pull or push forward along the roadway created by The statistic modules, the statistic modules pull or push the propelling modules forward. Increasing the number of modular for displacement also increases the total momentum or push/pull forces. The number of Electromagnets on each module can change according to requirements of the design.

The modules on the exterior of the matrices can't displace independently on their own, due to lack of one or more reaction face from immediate modules. They are moved by attaching to modules in the interior of the matrices, that can form complete roadway for displacement.



Self-reconfiguring Modular Robots

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Space Engine Displacement

Space Engine Zero-gravity cell design

Space Engine gravity cell design

Challenges, solutions, and opportunities

Since the early demonstrations of early modular self-reconfiguring systems, the size, robustness and performance has been continuously improving. In parallel, planning and control algorithms have been progressing to handle thousands of units. There are, however, several key steps that are necessary for these systems to realize their promise of *adaptability, robustness and low cost*. These steps can be broken down into challenges in the hardware design, in planning and control algorithms and in application. These challenges are often intertwined.

Hyperbaric Welding

Mr. Sanket Hire , BE

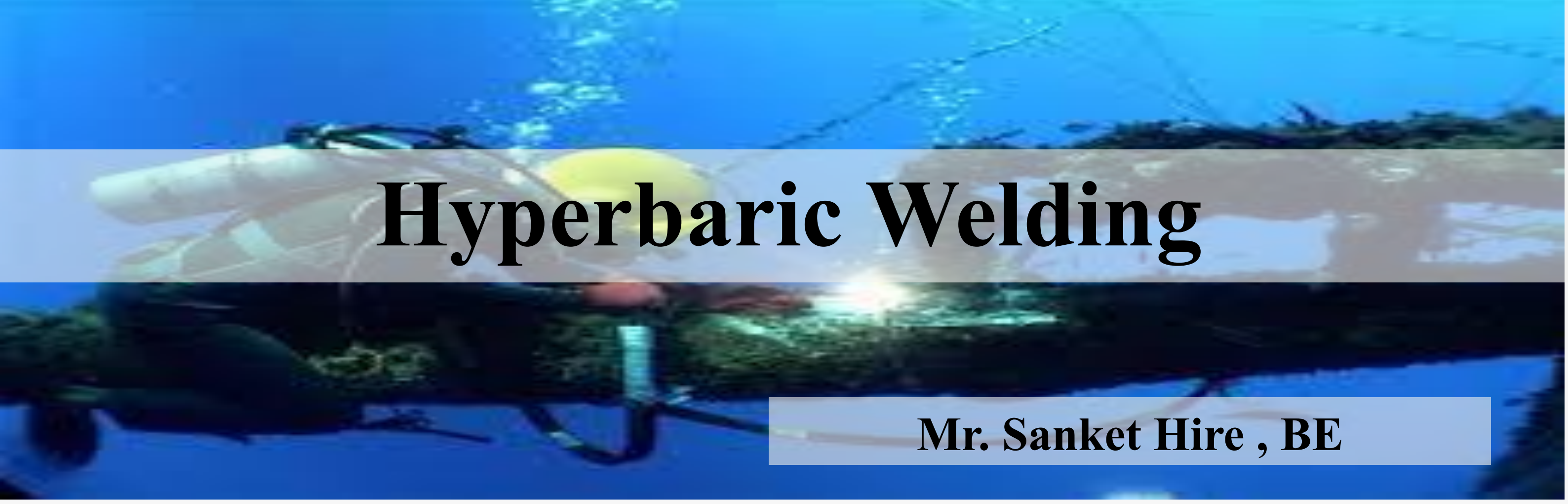
Hyperbaric welding is the process of welding at elevated pressures, normally underwater. Hyperbaric welding can either take place *wet* in the water itself or *dry* inside a specially constructed positive pressure enclosure and hence a dry environment. It is predominantly referred to as "hyperbaric welding" when used in a dry environment, and "**underwater welding**" when in a wet environment. The applications of hyperbaric welding are diverse—it is often used to repair ships, offshore oil platforms, and pipelines. Steel is the most common material welded.

Dry welding is used in preference to wet underwater welding when high quality welds are required because of the increased control over conditions which can be maintained, such as through application of prior and post weld heat treatments. This improved environmental control leads directly to improved process performance and a generally much higher quality weld than a comparative wet weld. Thus, when a very high quality weld is required, dry hyperbaric welding is normally utilized. Research into using dry hyperbaric welding at depths of up to 1,000 metres (3,300 ft) is ongoing. In general, assuring the integrity of underwater welds can be difficult (but is possible using various nondestructive testing applications), especially for wet underwater welds, because defects are difficult to detect if the defects are beneath the surface of the weld.

Underwater hyperbaric welding was invented by the Russian metallurgist Konstantin Khrenov in 1932.

Application

Welding processes have become increasingly important in almost all manufacturing industries and for structural application.[5] Although a large number of techniques are available for welding in atmosphere, many of these techniques cannot be applied in offshore and marine application where presence of water is of major concern. In this regard, it is relevant to note that a great majority of offshore repairing and surfacing work is carried out at a relatively shallow depth, in the region intermittently covered by the water known as the splash zone. Though numerically, most ship repair and welding jobs are carried out at a shallow depth, the most technologically challenging task is repair at greater depths, especially in pipelines and repair of accidental failure.



Hyperbaric Welding

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The advantages of underwater welding are largely of an economic nature, because underwater-welding for marine maintenance and repair jobs bypasses the need to pull the structure out of the sea and saves valuable time and dry docking costs. It is also an important technique for emergency repairs which allow the damaged structure to be safely transported to dry facilities for permanent repair or scrapping. Underwater welding is applied in both inland and offshore environments, though seasonal weather inhibits offshore underwater welding during winter. In either location, surface supplied air is the most common diving method for underwater welders

Dry welding

Dry hyperbaric welding involves the weld being performed at raised pressure in a chamber filled with a gas mixture sealed around the structure being welded.

Most arc welding processes such as shielded metal arc welding (SMAW), flux-cored arc welding (FCAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), plasma arc welding (PAW) could be operated at hyperbaric pressures, but all suffer as the pressure increases. Gas tungsten arc welding is most commonly used. The degradation is associated with physical changes of the arc behavior as the gas flow regime around the arc changes and the arc roots contract and become more mobile. Of note is a dramatic increase in arc voltage which is associated with the increase in pressure. Overall a degradation in capability and efficiency results as the pressure increases.

Special control techniques have been applied which have allowed welding down to 2,500 m (8,200 ft) simulated water depth in the laboratory, but dry hyperbaric welding has thus far been limited operationally to less than 400 m (1,300 ft) water depth by the physiological capability of divers to operate the welding equipment at high pressures and practical considerations concerning construction of an automated pressure / welding chamber at depth.

Hyperbaric Welding

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Wet welding

A diver practices underwater welding in a training pool. Wet underwater welding directly exposes the diver and electrode to the water and surrounding elements. Divers usually use around 300–400 amps of direct current to power their electrode, and they weld using varied forms of arc welding. This practice commonly uses a variation of shielded metal arc welding, employing a waterproof electrode. Other processes that are used include flux-cored arc welding and friction welding.]In each of these cases, the welding power supply is connected to the welding equipment through cables and hoses. The process is generally limited to low carbon equivalent steels, especially at greater depths, because of hydrogen-caused cracking.

Wet welding with a stick electrode is done with similar equipment to that used for dry welding, but the electrode holders are designed for water cooling and are more heavily insulated. They will overheat if used out of the water. A constant current welding machine is used for manual metal arc welding. Direct current is used, and a heavy duty isolation switch is installed in the welding cable at the surface control position, so that the welding current can be disconnected when not in use. The welder instructs the surface operator to make and break the contact as required during the procedure. The contacts should only be closed during actual welding, and opened at other times, particularly when changing electrodes.

The electric arc heats the work piece and the welding rod, and the molten metal is transferred through the gas bubble around the arc. The gas bubble is partly formed from decomposition of the flux coating on the electrode but it is usually contaminated to some extent by steam. Current flow induces transfer of metal droplets from the electrode to the work piece and enables positional welding by a skilled operator. Slag deposition on the weld surface helps to slow the rate of cooling, but rapid cooling is one of the biggest problems in producing a quality weld

Hyperbaric Welding

Mr. Sanket Hire , BE

Hazards and risks

The hazards of underwater welding include the risk of electric shock for the welder. To prevent this, the welding equipment must be adaptable to a marine environment, properly insulated and the welding current must be controlled. Commercial divers must also consider the occupational safety issues that divers face; most notably, the risk of decompression sickness due to the increased pressure of breathing gases. Many divers have reported a metallic taste that is related to the galvanic breakdown of dental amalgam. There may also be long term cognitive and possibly musculoskeletal effects associated with underwater welding.

Dangers of Underwater Welding

Since underwater welders have way more variables to work with—different atmospheric gas, water and gas pressures, specialized diving and welding equipment, and limited space, in addition to water and electric current supply—it is a field only for expert welder-divers (including engineers and managers) who are fully prepared to avoid risks and handle dangers, such as the following:

- Drowning – Usually caused by Delta P hazards, or differential pressure, where a major water pressure difference causes a diver to get stuck in a bottleneck where water is rushing to fill another space with great force, sometimes equal to over a thousand pounds of pressure.
- Explosions – Can happen when hydrogen and oxygen gases mix and build-up in pockets.
- Electric shocks – Often the biggest concern when dealing with water and electricity, particularly when inexperienced welders don't use direct current (DC) to supply power.
- Decompression sickness – A common concern in underwater diving, caused by the build-up of nitrogen bubbles in the bloodstream

Hypothermia – Result of working in dark and cold water conditions for many hours a day.

M&M Plant

M&M's engine manufacturing plant at Igatpuri becomes India's first carbon neutral facility.

Mahindra and Mahindra's engine manufacturing plant at Igatpuri, Maharashtra, has become India's first carbon neutral facility, a move that reaffirms the Group's commitment to go carbon neutral by 2040. The accomplishment was certified by Bureau Veritas (India) Pvt. Ltd., a global leader in Testing, Inspection and Certification (TIC).

By leveraging the latest technological advantages, Mahindra Group assumes pole position in the fight against carbon emissions. Close to 83% of the 100-acre land in the Igatpuri manufacturing plant is covered in green foliage. None of the waste from the plant goes to landfills and more than 99% of the waste generated is either recycled or reused. Owing to the green cover, dust levels have come down by 50-60%. The plant was also a subject of discussion at the World Biodiversity Forum in Egypt last year.

M&M is the first Indian company to announce its internal Carbon Price of USD 10 per ton of carbon emitted to fund investments required to pursue the path of carbon neutrality. It has doubled the energy productivity of its automotive business almost 12 years ahead of schedule.M&M is also the first company in the world to sign on to the EP100 program, which is the global, collaborative initiative of influential businesses that pledges to double energy productivity by 2030.


Mahindra
MAIN GATE
NO ENTRY WITHOUT
Shot on OnePlus
By Mitesh 4141

M&M Plant

Glimpses of En-Genius 2K18

BRIDGE MAKING COMPETITION

PHOTO FEST COMPETITION

Glimpses of En-Genius 2K18

JUNK YARD EVENT

BOX CRICKET COMPETITION

STUDENT INTERNSHIP

SAI PUMPS , MALEGAON

ESSENTIAL EQUIPMENTS LTD. , DHULE

STUDENT INTERNSHIP

TEAM TECH SOLUTIONS LTD., NASHIK

MAHINDRA & MAHINDRA , SHAHADA

ACHIEVEMENTS

DR. SANTOSH D. SANCHETI
ASSOCIATE PROFESSOR & HEAD DEPARTMENT OF MECHANICAL ENGINEERING

Felicitated by the hands of Hon. Vishwas Nangare Patil, IPS, Maharashtra, with BEST PROFESSIONAL PROFESSOR AWARD by YIN SAKAL.

ACHIEVEMENTS

The Avengers Eco-Green Vehicle Challenge 2019 held at Ahmad-abad Gujarat.
2nd in Overall Event with cash prize of 35000/-
1st Rank in Design Event with Cash Prize of 10000/-
1st Rank in Innovation Event with cash prize 10000/-
2nd in Cost and Business Event 2nd in Virtual Round

ACHIEVEMENTS

Team Spartans - Auto India Racing Championship-2018-19 Session 3 held at Pune.

1. Runner-up in Best Innovation category.

2. Winner of Best Faculty advisor (Dronacharya) Award.

This was First time Go-cart was designed and fabricated by Team.

ACHIEVEMENTS

Hearty Congratulations following Project from Mechanical Department have Won First prize in Check-Mech 2K19 National level project competition organized by Guru Gobind Singh college of engineering, Nashik on 22/03/2019.
Title: "Versatile Seed Planter",
Guide: Prof. R S. Chaudhari
Team Member's: - Gaikwad Chetan, Gaikwad Yogesh, Pawar Shailesh, Mayur Nikam.

ACHIEVEMENTS

The Crew Dynamics Result Dirtx - 6th out of 80 teams. Sprint - 10th out of 80 Teams. Acceleration - 19th out of 80 teams. Endurance race 2nd in Nashik Ahmednagar,Dhule, Nandurbar, Jalgaon region.... We must appreciate efforts taken by Prof.H.S. Deore, excellent support by Prof.J.S. Pagar Sir and Workshop Team. Atul Patil (Team Crew) from Mechanical Department Rank First in QUIZitive competition. This Competition was Hosted By SAEINDIA sponsor by Mahindra Rise 27 Oct. 2018

ACHIEVEMENTS

Project from SNJB's KBJ COE Mechanical Department Ranked first at State level Avishkar 2018 Project competition out of 37 Projects.

Title: "Smart Onion Planter",

Guide: Prof. Jadhav V. C.

Team Member's: - Nawale Devidas Kailas, Pophali Vrushabh Ashok, Sahane Nikhil Dinkar, Jadhav Bapu Madhav, Khaire Ashwini Balasaheb. 18 Jan 2019

ACHIEVEMENTS

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Vice President @MVenkaiahNaidu interacts with the students, at the AICTE-ECI-ISTE Chhatra Vishwakarma Awards and AICTE-SAGY Initiative Awards ceremony, in New Delhi

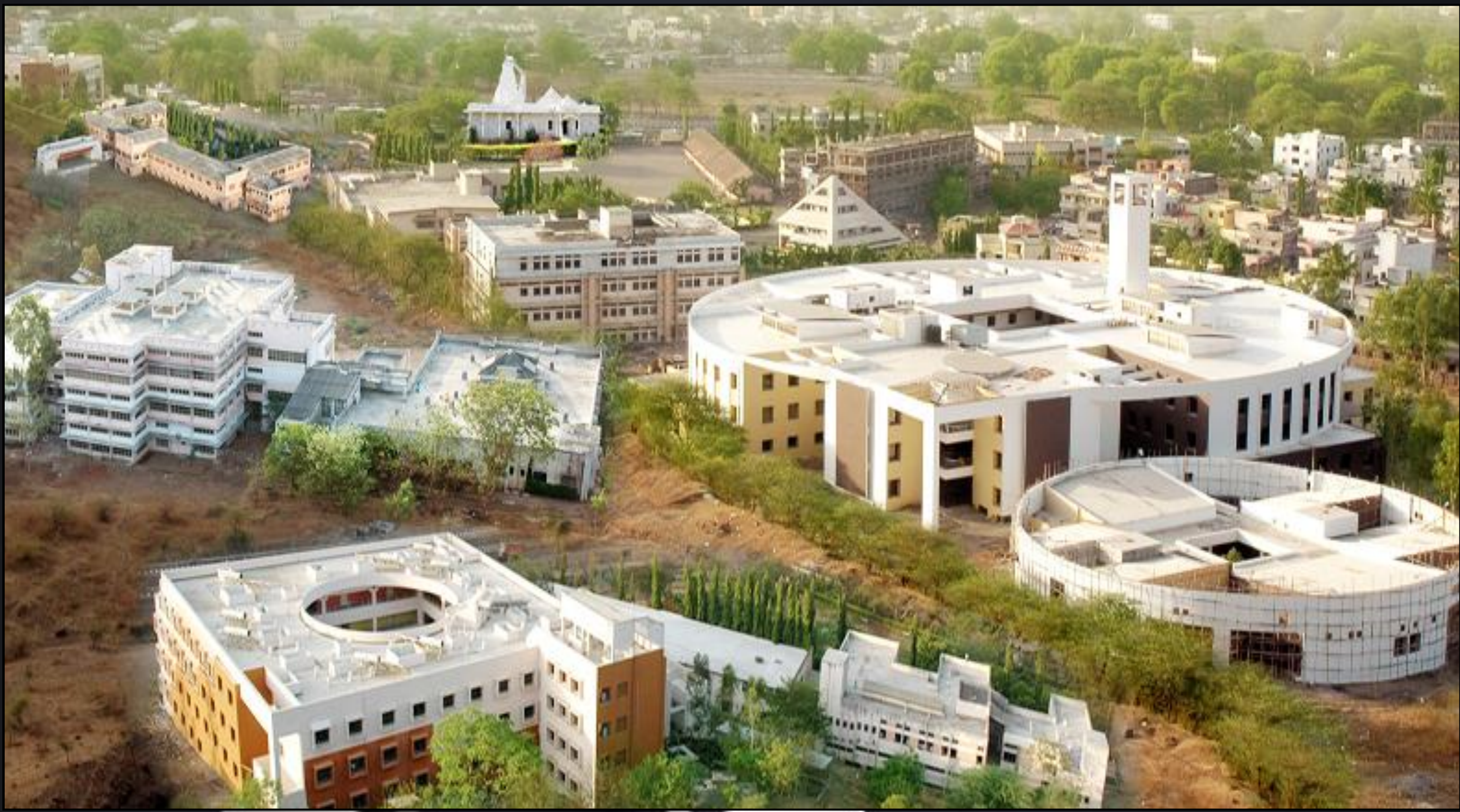
VicePresidentOfIndia

Tweet your reply

ACHIEVEMENTS

SAFE Championship 2018-19 IIT DELHI 1st Stage award Ceremony our Project from Mechanical Department got 3rd Rank.
Theme - Hamse Farak Padata Hai
Name of Students : Sanket Balwant Hire (Team Leader)
Chetan Rajendra Aher
Atul Gotiram Jatiya
Abhishek Suresh Kulkarni.
Date : 9 Oct 2019

SNJB's Late Sau K.B Jain college of engineering



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