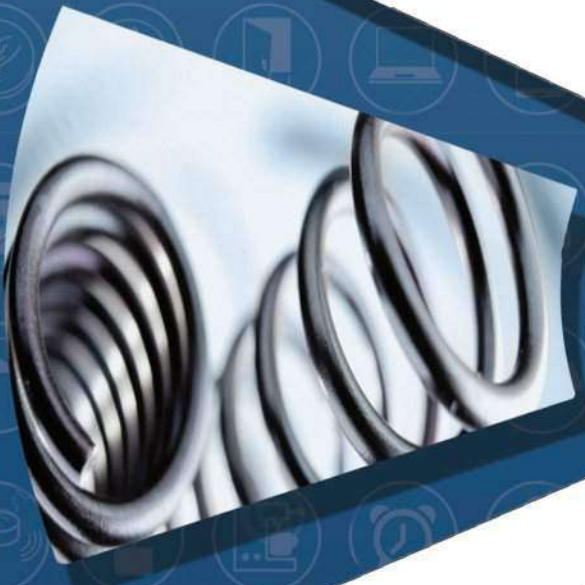
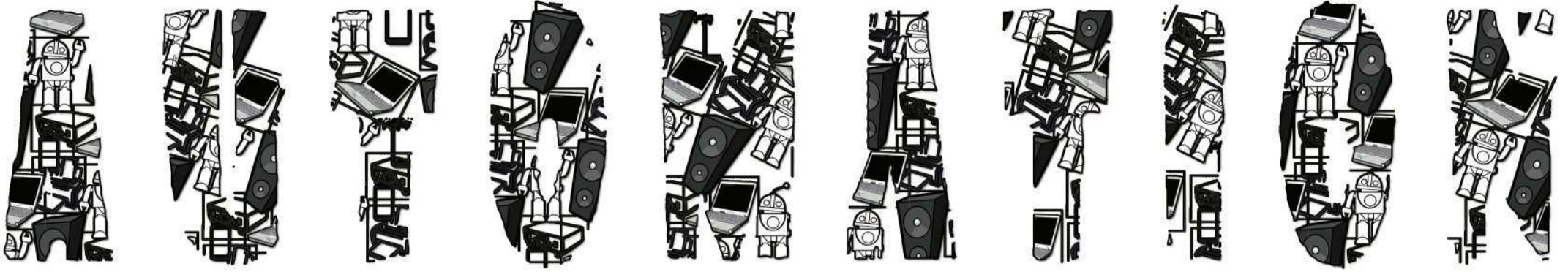


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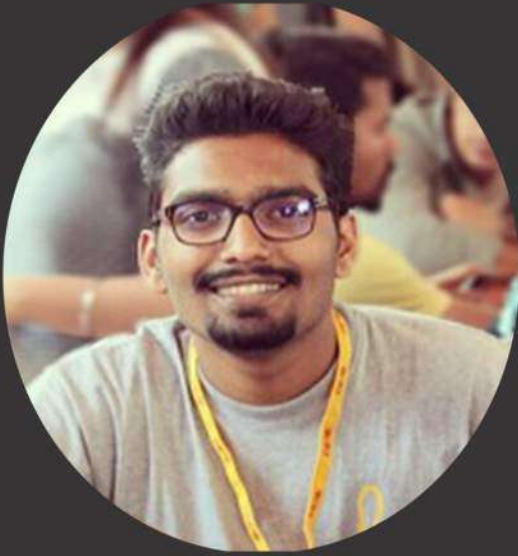
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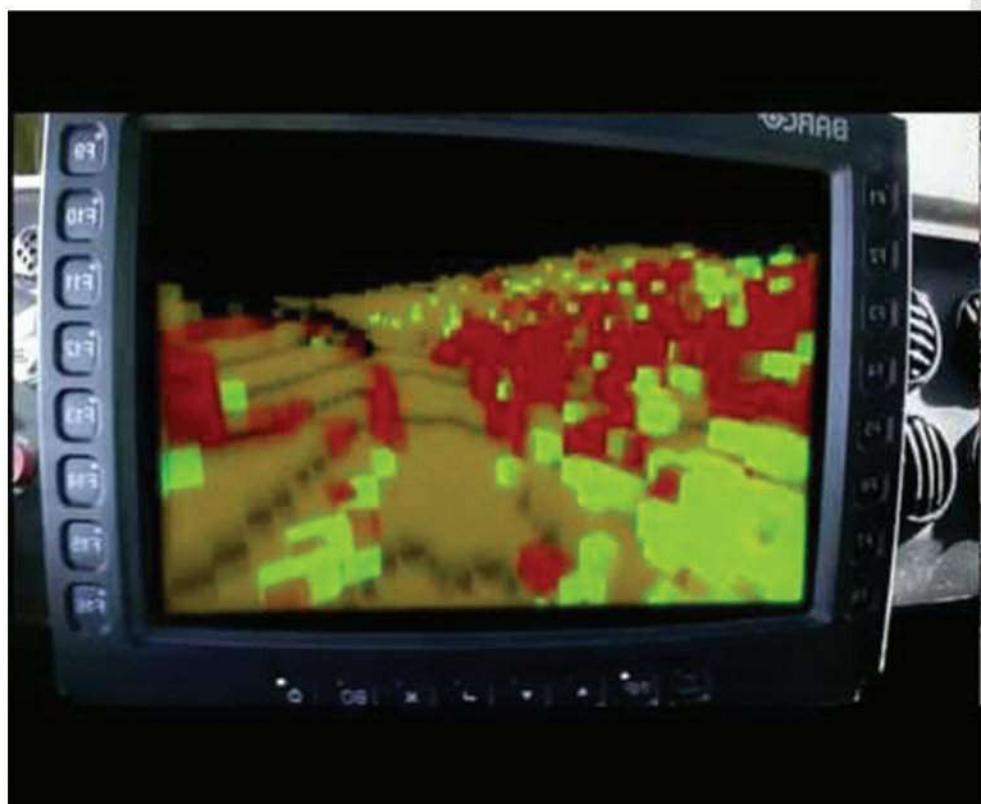
Technical Breakthroughs in the Automotive Industry

Naveen Joshy
PIIT, New Panvel
Email: njoshy@student.mes.ac.in

1. Google Driverless Cars

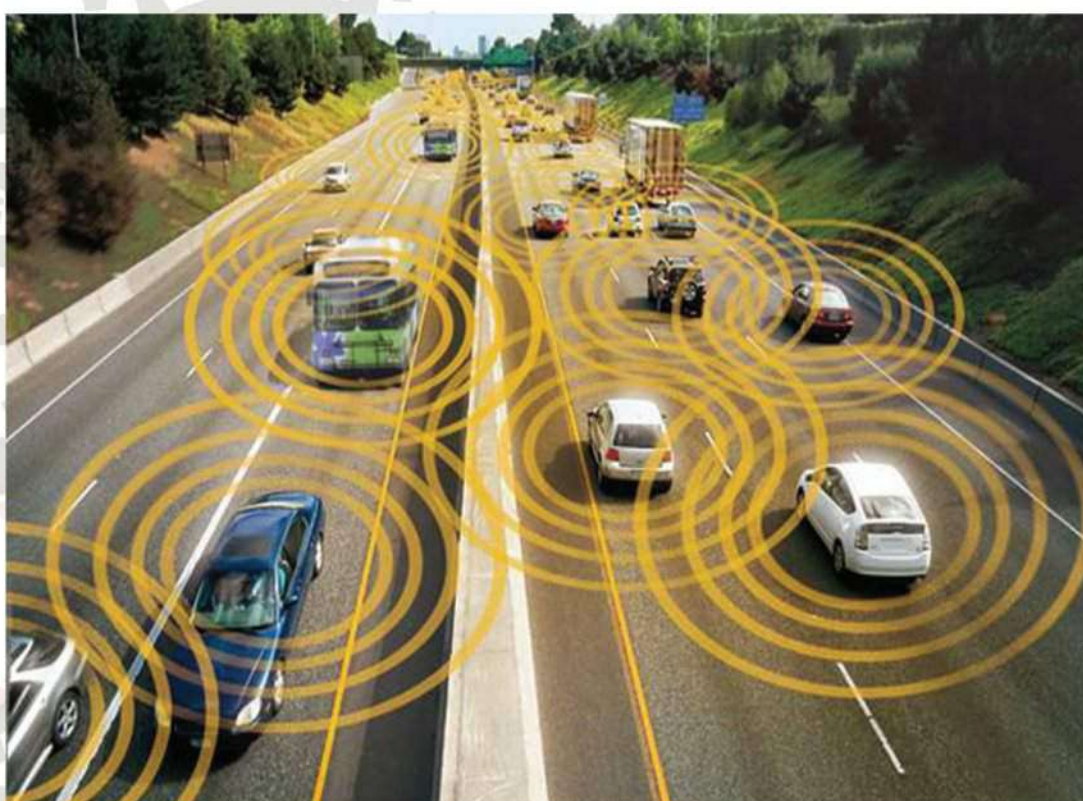


I am sure we are all familiar with the latest and greatest technological breakthrough by the very well known company, Google. Its basis for working is that, it “sees” where it is and where it has been asked to go. If you think that they may be using their Google street view data for this purpose, you are wrong. If you observe, on the roof of their vehicle, there is a weird little cylinder which spins. Well, this cylinder houses an array of lasers which scans its surroundings and makes a map for itself as shown below and takes note of the obstructions and feasible paths to follow to its designated destination.



2. V2V Communications

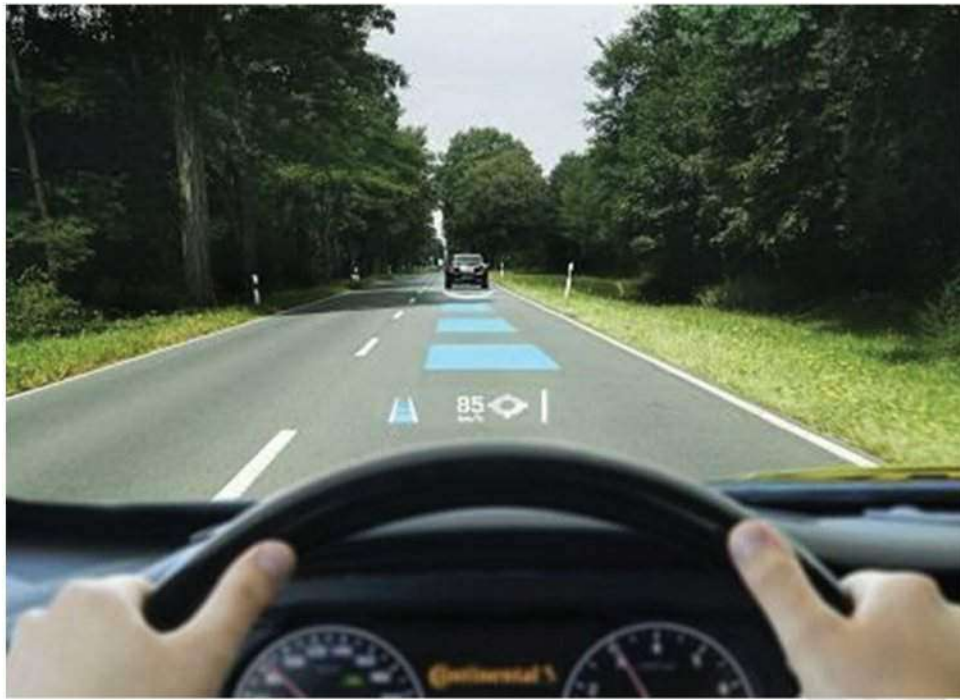
V2V stands for vehicle to vehicle, and communication is interaction between these vehicles. The purpose of this technology is to make the roads more communicative and interconnected. The vehicles can share local data about traffic densities, road accidents, blind spot notification, emergency vehicle approach warning, and road irregularity warning etc. where this information may be crucial in terms of safety. This has been proposed by the US national highway authority for use in the near future and automobile companies like BMW, Audi, Honda, General Motors, Volvo and Daimler are working on developing this technology.



3. Pre-Collision Technology

Pre-collision assist is a complimentary feature with collision mitigation system. The front grill of the car houses radar and a monochromatic camera is mounted in the top edge of the hood. The collective information from these sensors helps the vehicle to predict if a crash is going to take place. If so, it pre-emptively provides audio and visual warnings to the driver.

If the driver is not able to respond to the situation in time, the collision mitigation system applies the brakes for the driver to avoid the collision or to reduce the severity of the crash.

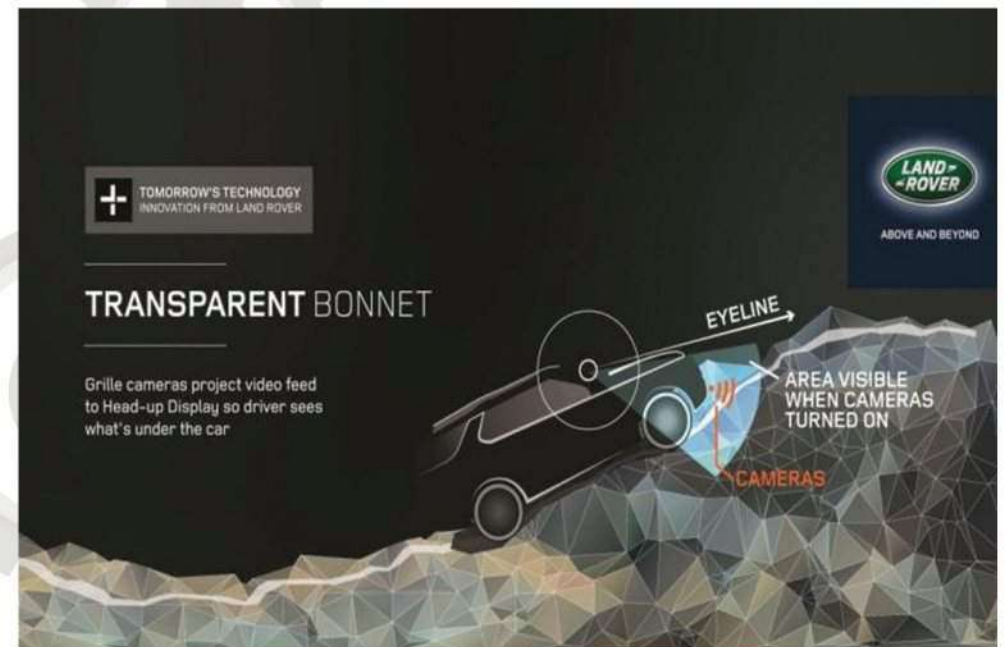


5. Land Rover's Invisible Bonnet



4. Start- Stop Technology

Hero Moto Corp introduced the first motorbike with Start-Stop Technology in India called as the SplendoriSmart. Its special feature is that its ECU (Engine Control Unit) detects when the engine is at idle during waiting at a stop light, or during jammed traffic. This is triggered when the bike has been running for a while and the rider shifts into neutral and allows the bike to idle. When he uses the clutch to shift into first gear, the engine is automatically started again. This technology allows the motorbike to gain better fuel economy, increases the life of various components in the engine and is overall beneficial to the user.



The title looks like a joke, but this really does exist. What Land Rover (Now an Indian Company thanks to Mr.Ratan Tata) has developed a convenience feature for their most capable off-road machine the Range Rover. The front grill and the front bumpers have cameras which supply a video feed to the Heads up display on the windscreen of the vehicle which virtually makes the bonnet translucent and allows the driver to see what is directly below the engine bay and allows for better manoeuvring around obstacles.

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MAN vs MACHINE

TREND OF AUTOMATION



Tilby Susan Thomas
PIIT, New Panvel

E-mail: ttilbysusan@student.mes.ac.in

Introduction

Automation or automatic control is the use of various control systems for operating equipments such as machinery, processes in factories, steering and stabilization of ships, aircrafts and other applications with minimal or reduced human intervention. The greatest advantage of this emerging trend of automation is that it saves labour. However, it is also used to save energy and materials, and to improve quality, accuracy and precision.

Current scenario

We have progressed so much in the past century so as to make our life much more comfortable and luxurious. But in doing so, we have become so dependent on artificial intelligence and man-made machines that it has led to a decline in the optimum use of human potential. Man-made technology has replaced man. And though this has made our life a lot simpler, it has led to side-lining of our capability, leading to a man-machine conflict.



Many may claim that this is a misinterpretation of the situation, that human potential is being completely utilized in the manufacturing of this technology.

But that is applicable to just a very small percent of human population, the majority have been side-lined and this has led to wastage of human resources. Automation has indeed made life easier, but at the same time it has led man to be dependent on his own creation. It has reduced labour to an extent where a new problem of rising unemployment has come to notice.



Replacing human labour by machines also faces the problem that this artificial intelligence is incapable of adjusting and adapting to varied situations that arise in a particular industry, where at the same time, people could have analyzed the problem and come up with a solution. An automated system has a limited level of intelligence, and hence is more susceptible to committing errors outside its immediate scope of knowledge i.e., it is unable to apply simple logic to general problems.

Limitations

- ☒ Current technology is not equipped to automate all the desired tasks.
- ☒ Automation, in general is very expensive with very high capital investment and large productivity. This makes malfunctions and errors extremely costly.
- ☒ Increase in automation has led to less and less labour to be saved or quality improvement to be gained.
- ☒ Automation has led to exhaustion of opportunities for human resources.



Paradox of Automation

The paradox of automation says that the more efficient the automated system, the more crucial the human contribution of the operators. Humans are less involved, but their involvement becomes more critical. If an automated system has an error, it will multiply that error till it's fixed or shut down. This is where the need for human operators comes in.[1] Automation has reduced the use of human operators, but when the system fails the operators should be well capable of recognizing the failure and correcting the errors. At the same time, prolonged

dependence on automation has made the operators blindly trust the system and often it is very late before someone realizes the gravity of the situation and tries to remedy it.

A fatal example of this was Air France Flight 447 on 31st of May 2009, where a failure of automation put the pilots into a manual situation that they were not prepared for. The automated system flying the plane suddenly shut off, leaving the pilots surprised, confused and ultimately unable to fly their own plane. William Langewiesche, a journalist and former pilot who wrote about the crash for Vanity Fair said "We appear to be locked into a cycle in which automation begets the erosion of skills or the lack of skills in the first place and this then begets more automation".[2]

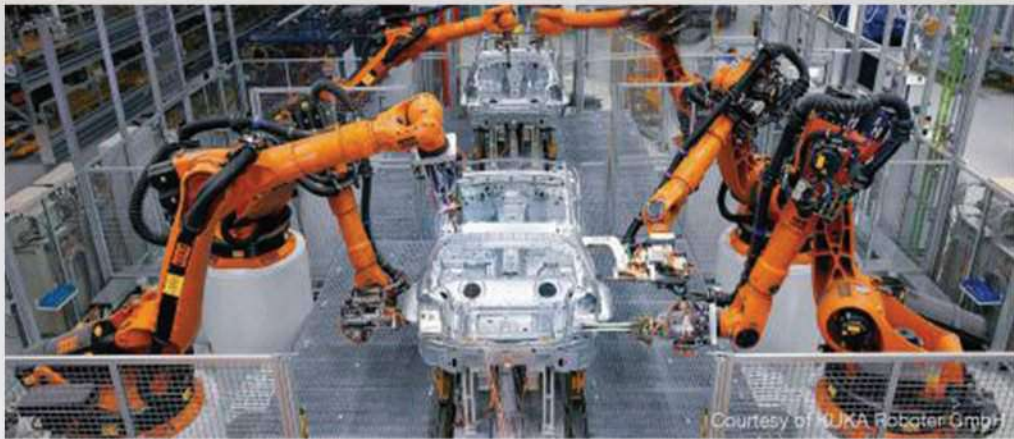


Carnegie Mellon from the Autonomous Driving Collaborative Research Lab has been working on autonomous vehicles since the 1980s. His co-director Raj Rajkumar feels that the transition to full automation will be gradual.

“The number of scenarios that are automatable will increase over time, and one fine day, the vehicle is able to control itself completely, but that last step will be a minor, incremental step and one will barely notice this actually happened,” says Rajkumar.[3]

Conclusion

Automation has indeed been of great benefit to mankind at large. If we can work out the social effects it has and reduce the errors then nothing can stop this technology from revolutionizing human society. The time is not far when we just have to sit back and let the machines take over completely. But we can only hope that this does not come at the cost of losing our ability to take control of situations, formulize and carry out solutions and most importantly, take decisions. Otherwise we have only ourselves to blame for losing the very essence of humanity and giving over the control of our lives to machines that we ourselves have created.



[1]<http://personalmba.com/paradox-of-automation>

[2]<http://99percentinvisible.org/episode/children-of-the-magenta-automation-paradox-pt-1>

[3]<http://99percentinvisible.org/episode/-johnnycab-automation-paradox-pt-2/>

ROBOTIC CAR PARKING SYSTEM

-A solution to the conventional Car Parking Systems

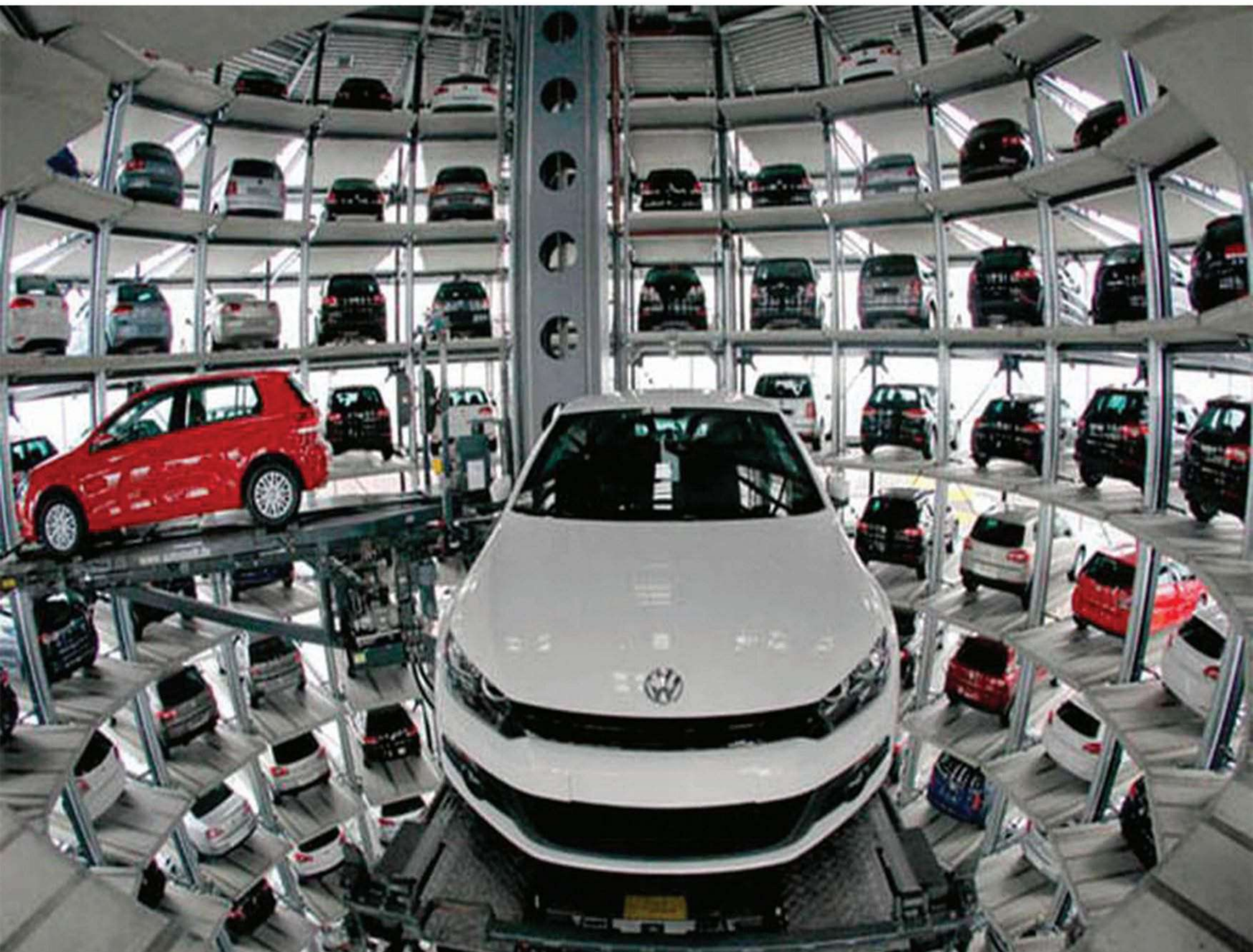
Kshitiz Vishnoi *, Akhilesh Pillai, Sanoob Mohammed & Yashodan Karkarey
Mechanical Engineering , PIIT, New Panvel

kshitiz_vishnoi@yahoo.co.in

aspillai@student.mes.ac.in

m.sanoob@yahoo.com

yash_09@live.com



Key words: Robotic, Car parking, PLC, RFID

Abstract

In metropolitan cities, vehicle parking has become a major concern in all busy areas and a good traffic system needs a good parking system. Different types of vehicle parking are applied worldwide namely Multi-level Automated Car Parking, Automated Car Parking System, Volkswagen Car Parking, etc. The aim of this project is to design and build a prototype of an automated parking system which will automatically park and retrieve the vehicle without the driver. The driver will park his vehicle on a pallet at the platform of the car park. The robotic arm mechanism is used for driving the parking platform. After the driver swipes the RFID card for the desired parking space on the control panel, the vehicle will be transported to that parking space. In order to retrieve the vehicle, the driver will again swipe that RFID card for his vehicle on the control panel. The system will retrieve the vehicle from the parking space and send it back to the original position where the driver is waiting. Programmable Logic Controller (PLC) is used in the design of the prototype of the automated parking system and to control the movement, needed to transport and retrieve the vehicle, to and from, the available parking space based on the signal from the driver. A program is required to run for the PLC using CX-Programmer by drawing ladder diagram. By testing and analyzing the working model, we can definitely get the view to develop the convenient parking facility near the commercial areas. At prototype

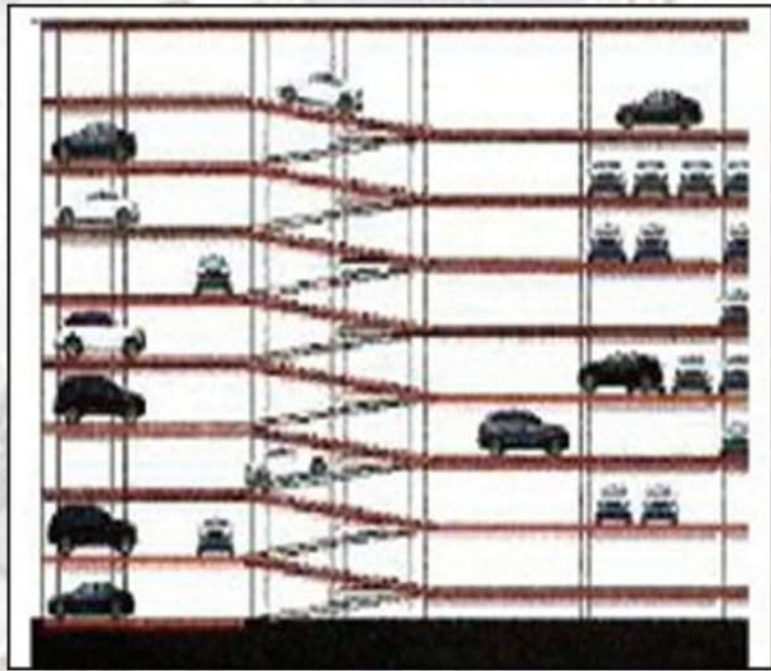
Introduction

It is very frequent for people using their cars as a means of transportation to still walk considerable distances from the place they parked to their destination of interest or to work and conventional parking like open lots, above ground, underground and on street parking, dedicated buildings etc. are generally being in use. But problems are associated with such conventional parking concept. As these are large in size because of inefficient use of space. It is difficult for municipalities as well as the private sector for the development of parking place in central business area due to the non-

availability of such a large parking space. Also in central part of cities will impose cost and surface restrictions on the feasibility of new projects.

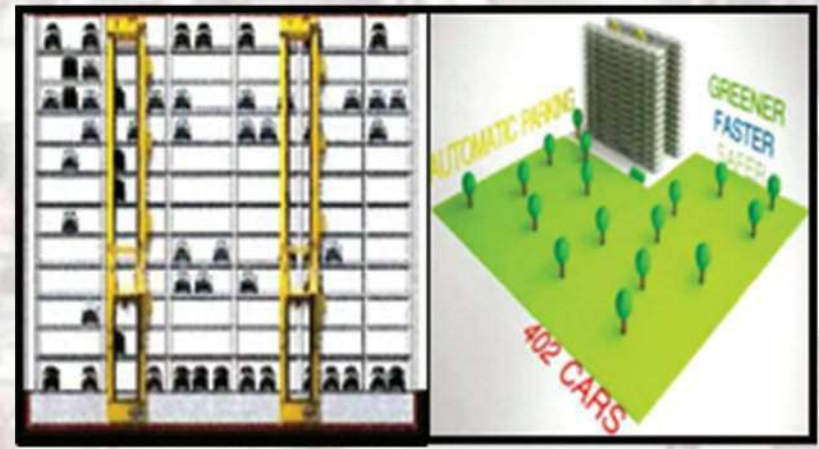
We have seen how conventional parking systems (Fig-1), multilevel ramp parking (Fig-2) have reached their limitations. The increasing number of vehicles on the road, and along with shrinking conventional parking areas, has caused lot of parking problems, particularly in urban areas. As many of India's existing and newer cities are getting urbanized, parking is getting more inconvenient because of diminishing parking spaces. One of the more convenient ways

overcome such problems, is by means of Robotic Car Parking Systems (Fig-3).



Therefore, Automated parking is a solution to overcome such parking problems. This method of automatically parking and retrieving cars or vehicles to solve the problem of increasing demand for safe and convenient parking as the number of vehicles are increasing day by day. The driver parks his car at the entrance of the car park structure and from there; the car is automatically moved through the garage and stored in an open parking space. All these are done by utilizing computer controlled system of pallets, conveyors, shuttles, carriers and lifts in transporting cars from the arrival level to a parking space and vice versa without human assistance.

Later the car will be returned to the driver using a signaling device outside the building.

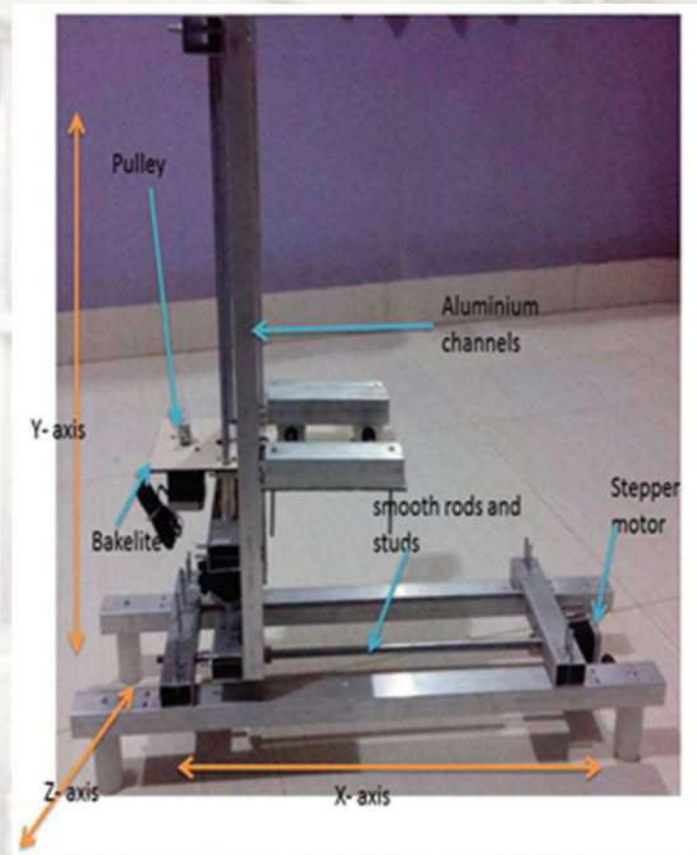


Methodology:

This is demonstration and prototype project. It is a combine effort of mechanical, electrical and electronics for an automatic car parking zone system using PLC control. The basic requirement here is to design and implement an elevator with electric motor. The elevator should able to fetch car and move up. Here, PLC is used to control all the activities. The input devices like sensor, switches will send a signal to PLC and PLC will made a response. The response normally involves turning ON and OFF an output signal to some of devices. The motion of the elevator is again controlled by PLC. Some of the measure components are list below along with Fig-4 & 5.

- 1.PLC AS CONTROLLER
- 2.STEPPER MOTOR
- 3.LINEAR BALL BEARING
- 4.FLEXIBLE BEAM COUPLING
- 5.IR SENSOR
- 6.SMOOTH RODS
- 7.THREADED RODS
- 8.FLANGE NUT
- 9.TIMMING BELT

- 10.RFID
- 11.BAKELITE
- 12.AURDINO
- 13.ALIMINIUM CHANNELS
- 14.DEMO CARS
- 15.CONNECTORS
- 16.PLC AS CONTROLLER
- 17.STEPPER MOTOR
- 18.LINEAR BALL BEARING
- 19.FLEXIBLE BEAM COUPLING
- 20.IR SENSOR
- 21.SMOOTH RODS
- 22.THREADED RODS
- 23.FLANGE NUT
- 24.TIMMING BELT
- 25.RFID
- 26.AURDINO
- 27.ALIMINIUM CHANNELS
- 28.DEMO CARS
- CONNECTORS



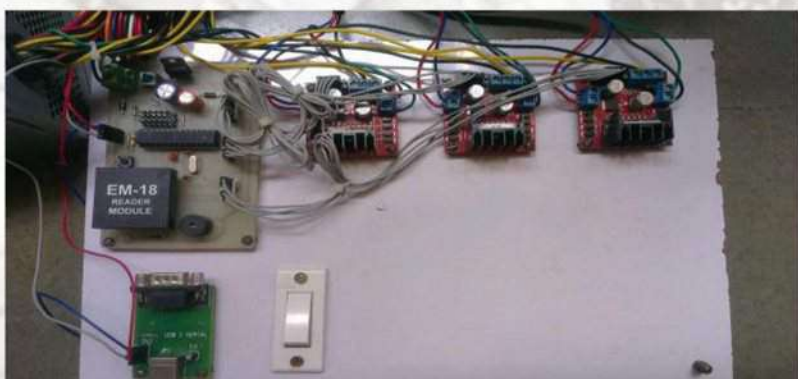
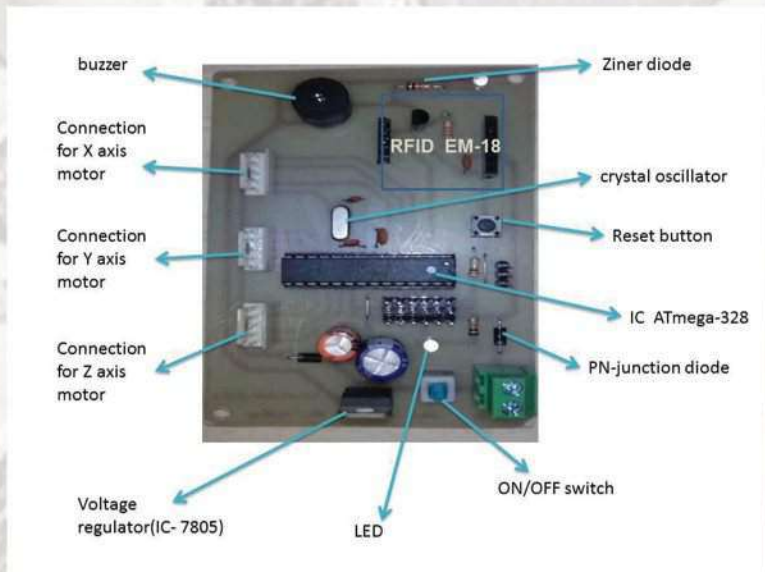
Advantages:

1) Space Saving:

A.P.T. Parking's automated parking system can use 40% less surface area compared to a conventional garage to fit the same number of parking spaces. More importantly, A.P.T. Parking's automated parking garage can save up to 60% of the cubic feet of a garage leaving more space for other more profitable uses.

2) Vehicle Security:

The vehicle is as safe if placed inside a bank vault. Once a driver parks his vehicle in an entry cabin and turns off the engine, the driver is the last person to touch the vehicle. The vehicle is moved by the parking equipment until it is stored in its computer assigned parking space inside the garage Storage Vault. No person has access to the Storage Vault and no equipment ever touches the vehicle. The driver is the only person who has access to his/her vehicle so she/she can leave his/her belongings safety inside in vehicle.



No risk of Dents from other drivers opening doors into your vehicle. No risk of Damage from other drivers backing into your vehicle

3) Personal Safety:

Personal safety is optimized because a driver never leaves the safe and comfortable confines of the well-lit entry cabin. The entry cabins are conveniently located and well monitored so there is no walking aimlessly through a garage searching for your parked vehicle. No driver ever has to walk alone through a garage or a dark stairwell to retrieve his vehicle.

4) No risk of Physical Harm

A.P.T. Parking Technologies is an active participant in the green building boom. Our automated parking system is environmentally responsible by eliminating harmful vehicle toxic. No CO2 Emissions as vehicle engines are off during entire storage and retrieval process

No Fuel Usage driving up and down ramps searching for a parking space or exit

Lower Noise Pollution as no tires screeching up and down ramps and no horns honking

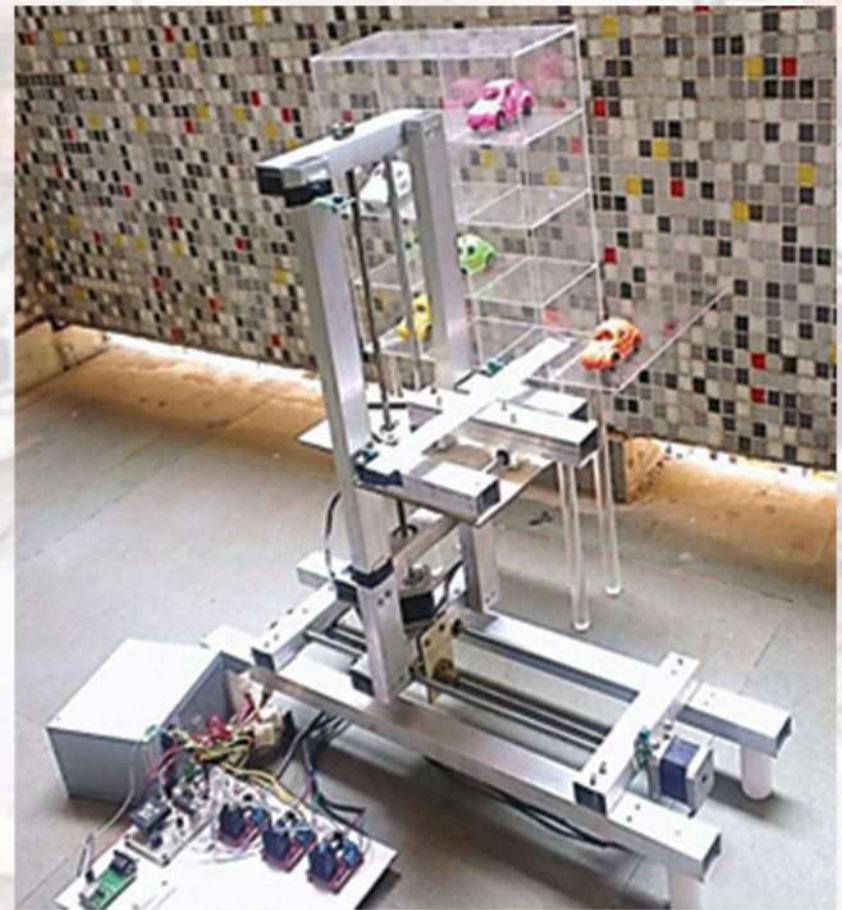
Reduced Building Footprint permits the balance of a site to be dedicated to other "green" features.

5) Design flexibility:

Automated parking's module concept is ideal for office buildings, residential buildings, mixed-use buildings, airports, hotels, and transit centers.

Automated parking garages can be built aboveground, belowground or both and can include any façade to match a neighboring building or historic neighborhood. Lower construction costs and low operation costs because costly construction components are eliminated.

Prototype Model:



Our prototype model (Fig-6) represents what would be the construction and working of an actual robotic car parking system. The main structures of the system are the parking rack, made of acrylic material, and the Robotic Arm. The system utilizes a PLC, which is the main controlling part, as it controls the movement of the Robotic Arm, and thereby stores the vehicle that is to be parked at the available parking slot, and retrieves the vehicle upon being given the signal. Stepper motors are used to provide the required movement of the robotic arm, with 3 motors being used, one for each axis of movement.

The smooth rods and the threaded rods act as guide ways for the movement of the robotic arm in all the three axes of direction, i.e. X-, Y-, and Z-axis respectively. The feedback for the movement of the robotic arm is provided by 3 pairs of IR sensors, each pair positioned at either end of the corresponding axis. Other components such as Flange mount, Flexible Beam Coupler, timing belt, Arduino, etc. complete the entire system. The system is also paired with an RFID card reader system, so that a particular car corresponding to a particular RFID card can be stored and retrieved, by identifying and recognizing the car's corresponding card. These parts in total complete our car parking system.

Conclusion and Discussion:

We have seen how conventional parking systems have reached their limitations. The increasing number of vehicles on the road, and along with shrinking conventional parking areas, has caused lot of parking problems, particularly in urban areas. As many of India's existing and newer cities are getting urbanized, parking is getting more inconvenient because of diminishing parking spaces. One of the more convenient ways overcome such problems, is by means of Robotic Car Parking Systems.

Robotic car parking systems helps utilize existing and newly created parking spaces in an optimum manner. Though still at a nascent stage in India, robotic car parking will help us utilize the ever-shrinking parking space in better ways, particularly in urban areas.

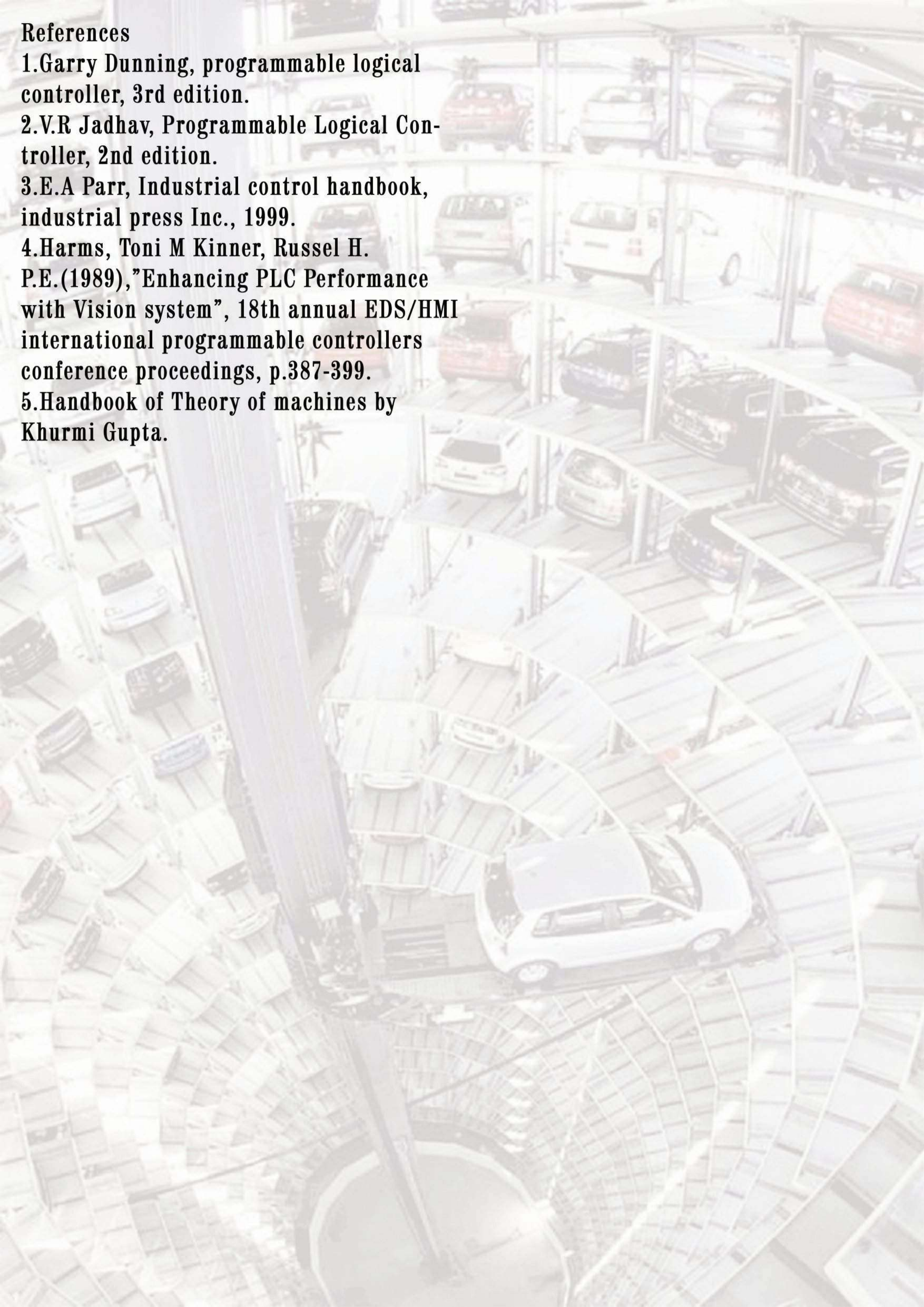
By taking up this project, we have understood the basic requirements, the functioning, and the abilities of such types of vehicular parking systems. While there are existing robotic car parking systems in India, they are implemented on a small scale. To highlight the fact that such a type of parking system has huge potential in India, we have considered a possible what if scenario, that is, what if this type of parking system were to be implemented in an existing parking area which has reached its limitations by conventional parking system. For this, we have considered the possibility of implementation of a robotic car parking system in Nehru Palace, in Delhi. By our estimate, not only better space utilization can be achieved by means of obtaining more parking spaces from an existing area, but the time and money savings are also substantial. Thus, there is a huge potential for robotic car parking systems in India, as they help us utilize existing parking spaces better and help reduce pollution, time wastage and stresses caused due to parking issues.

Acknowledgements

Authors express their gratitude to Dr.Dhanraj.P.Tambuskar, HOD, Mechanical Department , PIIT , New Panvel, for his guidance and support.

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SHAPE MEMORY ALLOYS

Murgendra N Ghulanawar
PIIT, New Panvel

Email id : mghulanawar@student.mes.ac.in



Abstract

Shape memory alloys also known as SMA are a type of smart materials (i.e. materials which can change their properties by subjecting them to magnetic field, electric field, temperature etc). SMA can recover their shape when a specific amount of heat energy is supplied to it (i.e. they have ability to regain their pre-defined shape). SMA finds its application in various fields, SMA is used as actuators in biological inspired robotics, used to make biological stents, used to control vibration in slender parts in aviation industry and are also used in orthopedic implants. This is a review paper covering the principles of SMA technology, its working modes and its fields of applications.

Introduction

SMA exists in two phases. Austenite phase, which exists at high temperature, and Martensite phase, which exists at low temperature. When the temperature or stress condition changes, these two phases transform to the other phase, depending on what change appears. SMA exhibits special properties during the transformations between these two phases, such as shape memory effect, superelasticity effect, and two-way memory effect. For example if a string made of SMA wire is twisted around finger and the moment, the string is released it snap backs to its original shape. This is known as superelasticity.

It is actually the shape memory property of Shape Memory Alloys (SMA) that allows them to do so. As the wire is bent, the increased stress causes the wire to transform from Austenite phase to

Martensite phase and when the wire is released, the stress drops to zero and the wire shifts back to the Austenite phase and its original shape. The important SMA alloys are Ni-Ti and on Cu, such as Cu-Zn-Al and Cu-Al-Ni, these alloys are widely used in commercial appliances as they combine good mechanical properties with shape memory effect.

Literature review

☒ The remarkable properties of SMA were discovered in the 1930s.

☒ In 1932, Chang and Read noticed the reversibility of the Au-Cd alloy by metallographic observations and changes in resistivity.

☒ In 1938, Greninger and Mooradian observed the shape memory effect in Cu-Zn and Cu-Sn alloys.

☒ Ordnance Laboratory, discovered the shape memory effect in an equiatomic Ni-Ti alloy known as Nitinol,

☒ Raychem developed the first industrial application of SMA for the aeronautic industry during the 1960's.

☒ Biocompatibility nature of Ni-Ti alloys was discovered in 1968.

☒ In 1975, Andreasen, of Iowa University, made the first implant of a super elastic orthodontic device.

Properties of SMA

☒ Shape memory effect

Austenite is in hard and inelastic phase and it has FCC type crystal structure. On other hand martensite is soft and elastic phase. It has complex crystal structure. The shape memory effect is shown owing to the following reason. When the shape memory alloy material in twinned Martensite phase is subjected to stress, it transforms to detwinned Martensite phase.

shape memory effect. One way shape memory effect and two way shape memory effect. In one way shape memory effect, material once twisted or bent and when heated regains its original shape, but in two way effect the material remembers two shapes, one at low temperature and other at higher temperature.

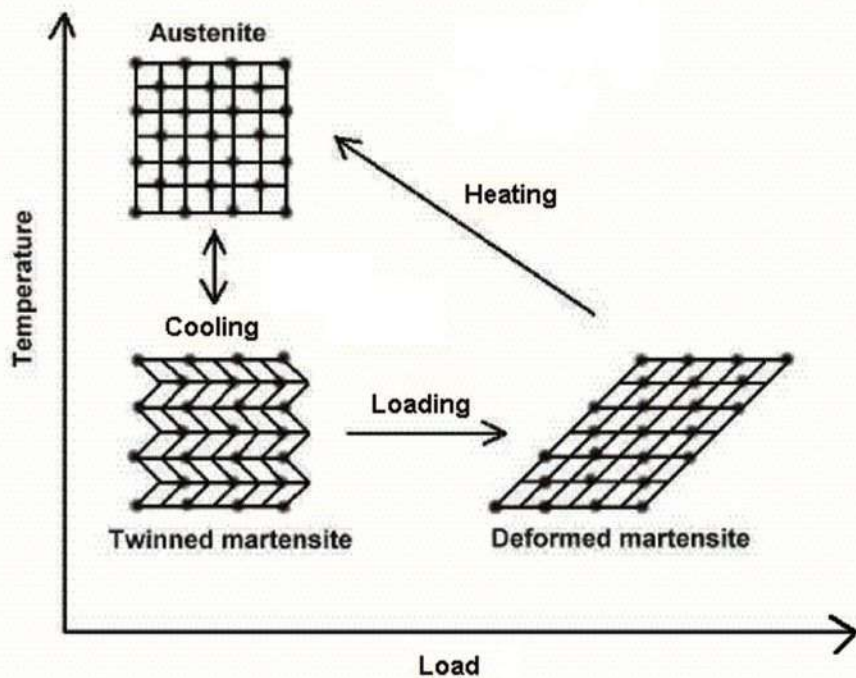
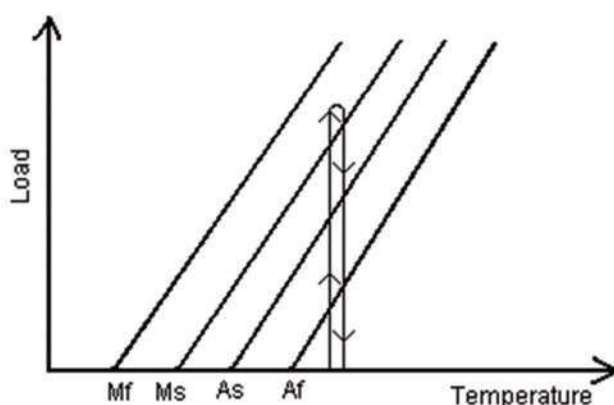


Fig: Phase changes in Ni-Ti alloy.

☒ Superelasticity

Superelasticity (pseudoelasticity) occurs when the SMA alloy is above the martensite temperature, and the stress applied to material is enough to force austenite phase into the martensite phase. The alloy will not return to the austenite phase until the stress is decreased or there is a large change in temperature. The elasticity is called pseudo because it shows elasticity due to phase transformation due to combination of both stress and temperature unlike steels who show elasticity up to elastic limit of material after that they show permanent strain.



for example A 0.5mm diameter Ni-Ti wire can pull a force of 3560 grams when a current of 4A is passed through it Ni-Ti wires have the ability to flex the robotic muscle according to electric pulse sent to it. Ni-Ti alloy is a Biocompatibility material (i.e. the ability of a material to remain biologically innocuous during its functional period inside a living creature). It is found that when human body has contact with nickel person faces problems like lung cancer, pneumonia, chronic sinusitis and rhinitis. But Ni-Ti alloy has very high biocompatible nature due to titanium, when Ti reacts with O₂ in the body a layer of TiO₂ is formed over sample. This layer has high corrosion resistance (greater than stainless steel). One of main application of shape memory effect is found in cardiovascular device named Simon filter. It is used for blood vessel interruption to prevent pulmonary embolism.

Applications

☒ Bio-Engineering:

Broken bones can mended with SMA wires. The alloy plate has memory transfer temperature close to body temperature. From body heat SMA wire tries to contract exerting compressive forces on bones which aids in strengthening of bones.

☒ Reinforcement for arteries and veins:

The flow of blood in arteries and veins gets restricted due to fat deposition or reduction in diameter of artery the stents made of SMA wires are reinforced into arteries and veins which open up the blocked arteries to regulate proper flow.

☒Dental wires:

It is used in braces and dental arcs. Since the wires are at constant temperature because of super elasticity they try to retain their original shape when stress is applied.

☒Fire security:

Lines that carry highly flammable gases or toxic fluids can be controlled by designing a system using SMA wires which can shutdown the system in case of increase in temperature above safe limit.

Advantages

☒Bio-compatibility- SMA offers high extent of biocompatibility in areas of cardiovascular and orthodontic science.

☒Mechanical properties- High tensile strength, capacity to endure high strains.

☒Chemical properties- High corrosion and abrasion resistance

☒Diverse fields of application.

Limitations

☒They are relatively expensive compared to steels and Aluminium in terms of manufacturing

☒Fatigue properties (i.e. cyclic loading) are poor compared to steel.

Future scope of SMA

The future application of SMA is in space systems where space scientists are working to create devices with use of SMA to work under the force of Sun's heat. In the field of Civil engineering the engineers are working to create damping mechanism for suspension bridges. Future applications of nitinol and other shape memory alloys in endovascular, spinal, and in neurosurgery are introduced.

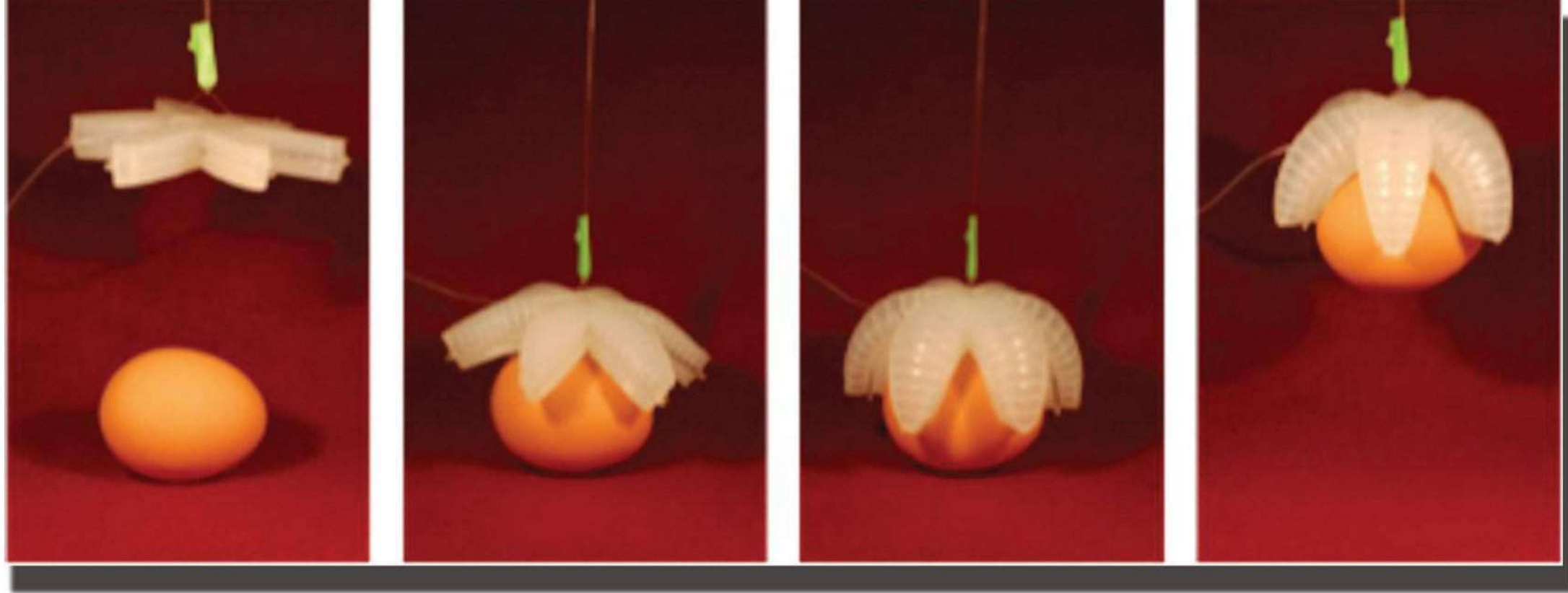
The research should be done to analyze the capabilities of the proposed approach in the hysteretic behavior of the material under more complex thermo-mechanical conditions, like simultaneous variation of both stress and temperature. Study should be to analyze the internal and external variables that influence the TWSM (Two Way Shape Memory) behavior. NiTi actuators are driven by an electric current. Further studies can be carried out to improve the relationship of current versus temperature. Future research can be carried out to analyze the R-phase transition and how this phase influences the OWSME (one way shape memory effect) and TWSME (two way shape memory effect).

Conclusion

Shape memory alloys (SMA) can recover strains up to 3 to 8%. SMA technology can be widely used in robotics designs, aviation industry, biological engineering, with respect to advantages in terms of weight, volume and sensing capabilities. Researchers have overcome SMA limitations in terms of power consumption, actuation speed and low strain by finding suitable applications, designing appropriate mechanism and developing control techniques.

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SOFT ROBOTICS

A NEW EMERGING FIELD OF AUTOMATION

SHRIDHAR DESHMUKH
Lecturer Mechanical dept.
Email: sdeshmukh@mes.ac.in

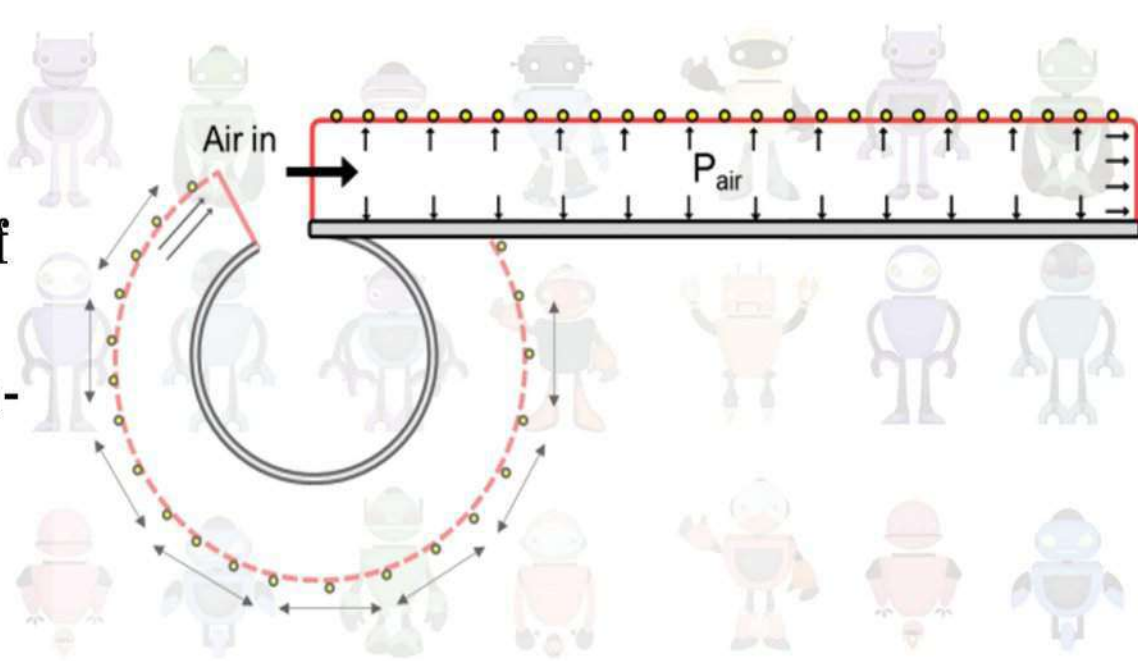


WHAT IS SOFT ROBOTICS

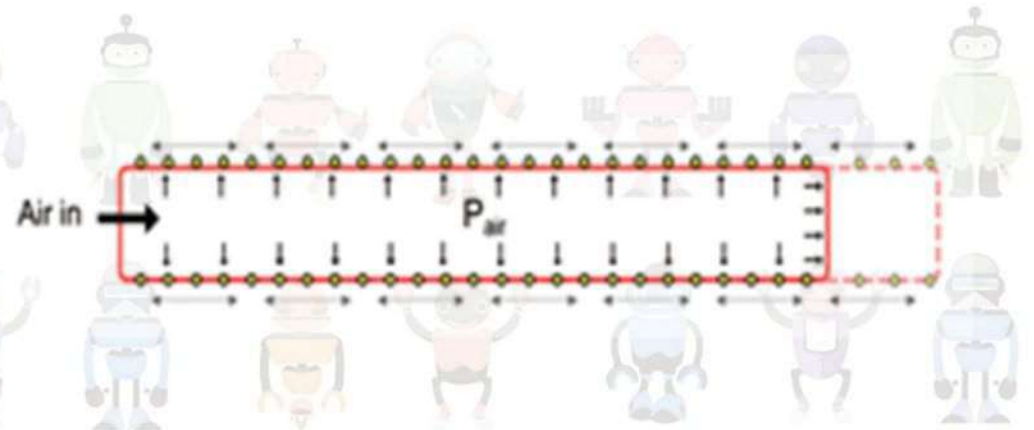
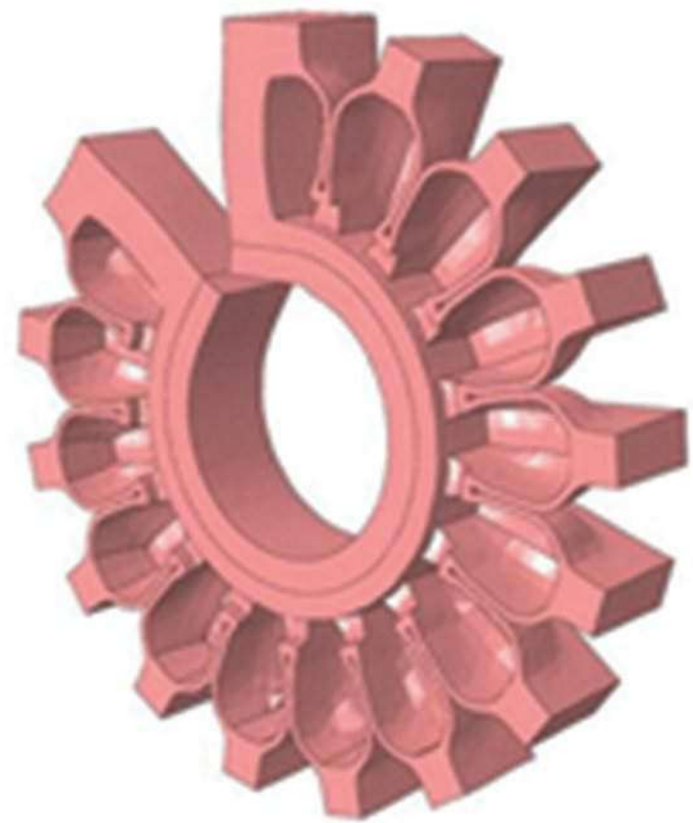
The Soft Robotics Toolkit is a collection of soft actuator and control mechanism. The toolkit was developed as part of educational research being undertaken in the Harvard Bio design Lab. The ultimate aim of the toolkit is to advance the field of soft robotics by allowing designers and researchers to build upon each other's work. The toolkit includes an open source fluidic control board, detailed design documentation describing a wide range of soft robotic components (including actuators and sensors), and related files that can be downloaded and used in the design, manufacture, and operation of soft robots. In combination with low material costs and increasingly accessible rapid prototyping technologies such as 3D printers, laser cutters, and CNC mills, the toolkit enables soft robotic components to be produced easily and affordably.

ACTUATORS USED IN SOFT ROBOTICS.

A) PneuNets Bending Actuators: - These actuators are made up of a series of channels and chambers inside an elastomer. These channels inflate when pressurized, creating motion. The nature of this motion is controlled by modifying the geometry of the embedded chambers and the material properties of their walls. When a PneuNets actuator is pressurized, expansion occurs in the most compliant (least stiff) regions.

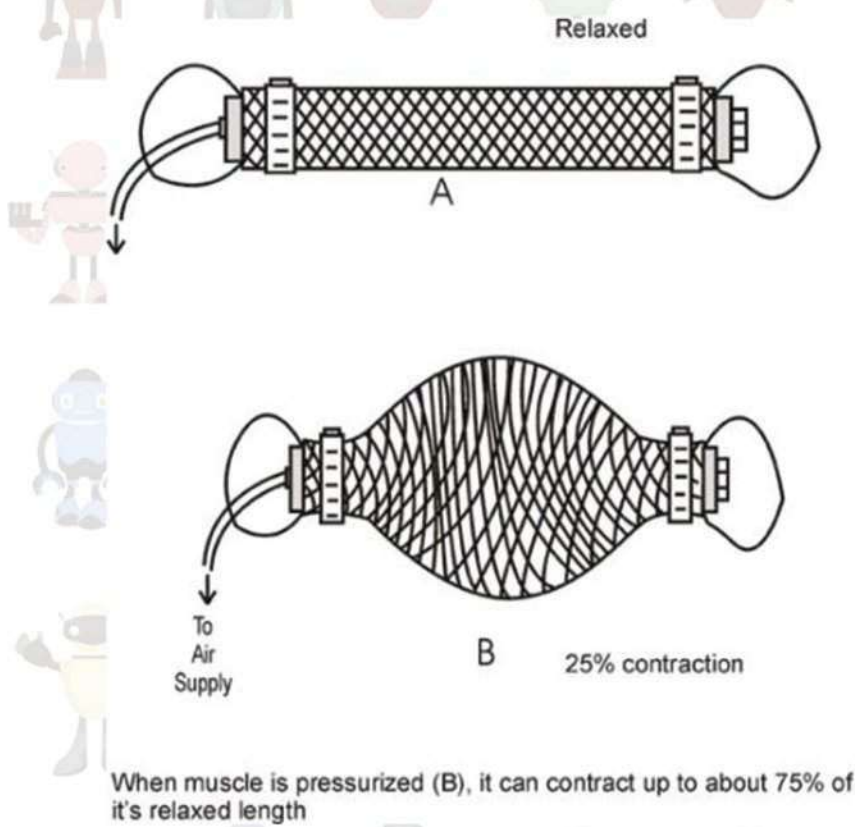


B) Fibre-Reinforced Actuators: - The basic design consists of an elastomer bladder wrapped with inextensible reinforcements. The inner bladder acts like any typical balloon; when inflated it tries to expand in all directions. Wrapping the bladder with inextensible fibres constrains it from expanding radially. when inflated it can only expand in the axial direction. Adding a sheet of inextensible material prevents the actuator from expanding in the region of that sheet; since one side expands axially and one doesn't, the actuator bends when inflated.



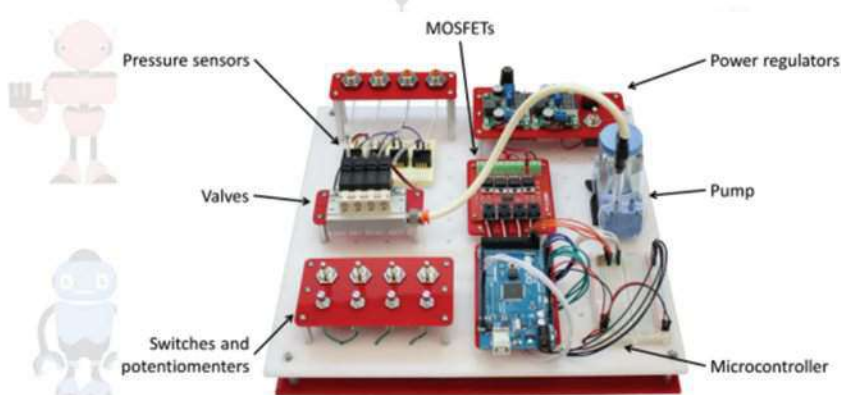
C) Pneumatic Artificial muscles:-

McKibben air muscles were invented for orthotics in the 1950s. They have the advantages of being lightweight, easy to fabricate, are self limiting (have a maximum contraction) and load-length curves similar to human muscle. The muscles consist of an inflatable inner tube/bladder inside a braided mesh, clamped at the ends. When the inner bladder is pressurized and expands, the geometry of the mesh acts like a scissor linkage and translates this radial expansion into linear contraction.



CONTROL SYSTEM

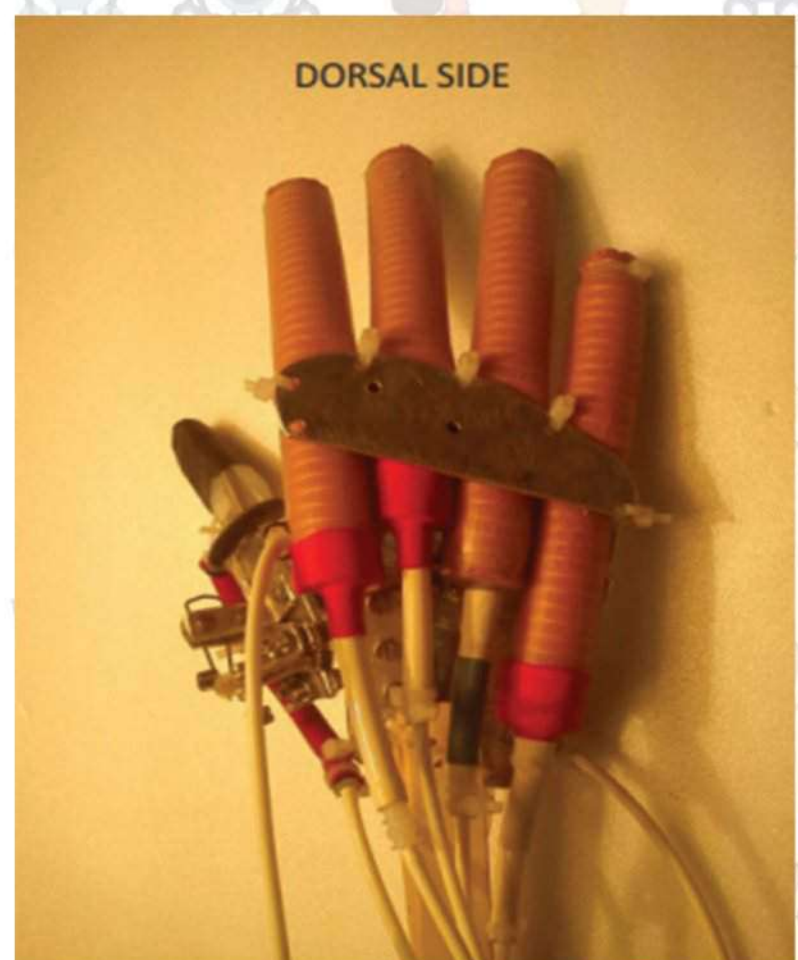
The Soft Robotics Toolkit Control Board is an open source hardware platform that can be used to operate and control fluidic soft actuators, such as the PneuNets Bending Actuator or the Fibre described. The purpose of the control board is to act as a prototyping and testing tool. It also enables designers to quickly test the behavior of pneumatic soft actuators.



The board consists of a pump (which provides pressurized fluid to the system) and a set of solenoid valves (which can open and close to direct the flow of fluid in the system). The pressure in the system is regulated by Pulse-Width Modulation (PWM), which involves the controlled timing of the opening and closing of the valves. Pressure sensors provide feedback on the behaviour of the system. The board can be controlled manually (by adjusting switches and knobs) or automated via software running on the included Arduino microcontroller.

CASE STUDY

Diabetes, peripheral artery disease and trauma cause hundreds of thousands of upper limb amputations worldwide per year. For amputees, restoring the utility of a missing hand is a major factor in being able to do activities of daily living (ADLs) like eating, bathing and dressing themselves. Gaining the ability to do these basic tasks is extremely helpful to the patient achieving a higher quality of life.

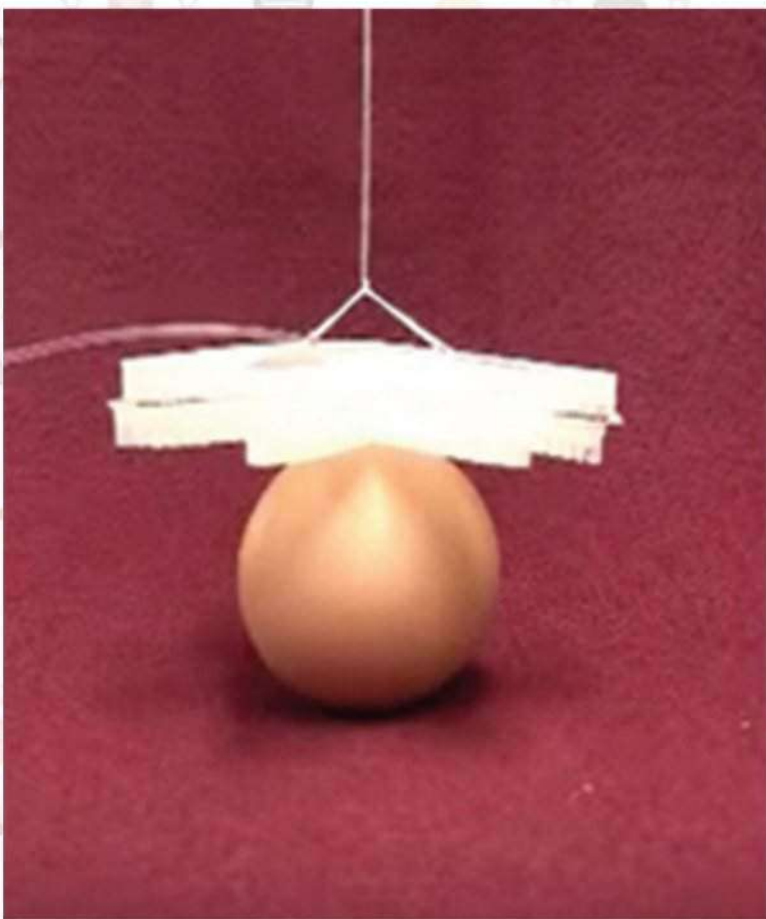


Current prosthetics including body powered and myoelectric devices give a lot of this function back to the patient, but can be tiring to use, expensive, stiff, or have a limited range of motion. The four fingers consisted of fiber reinforced actuators fabricated shown in picture at right.



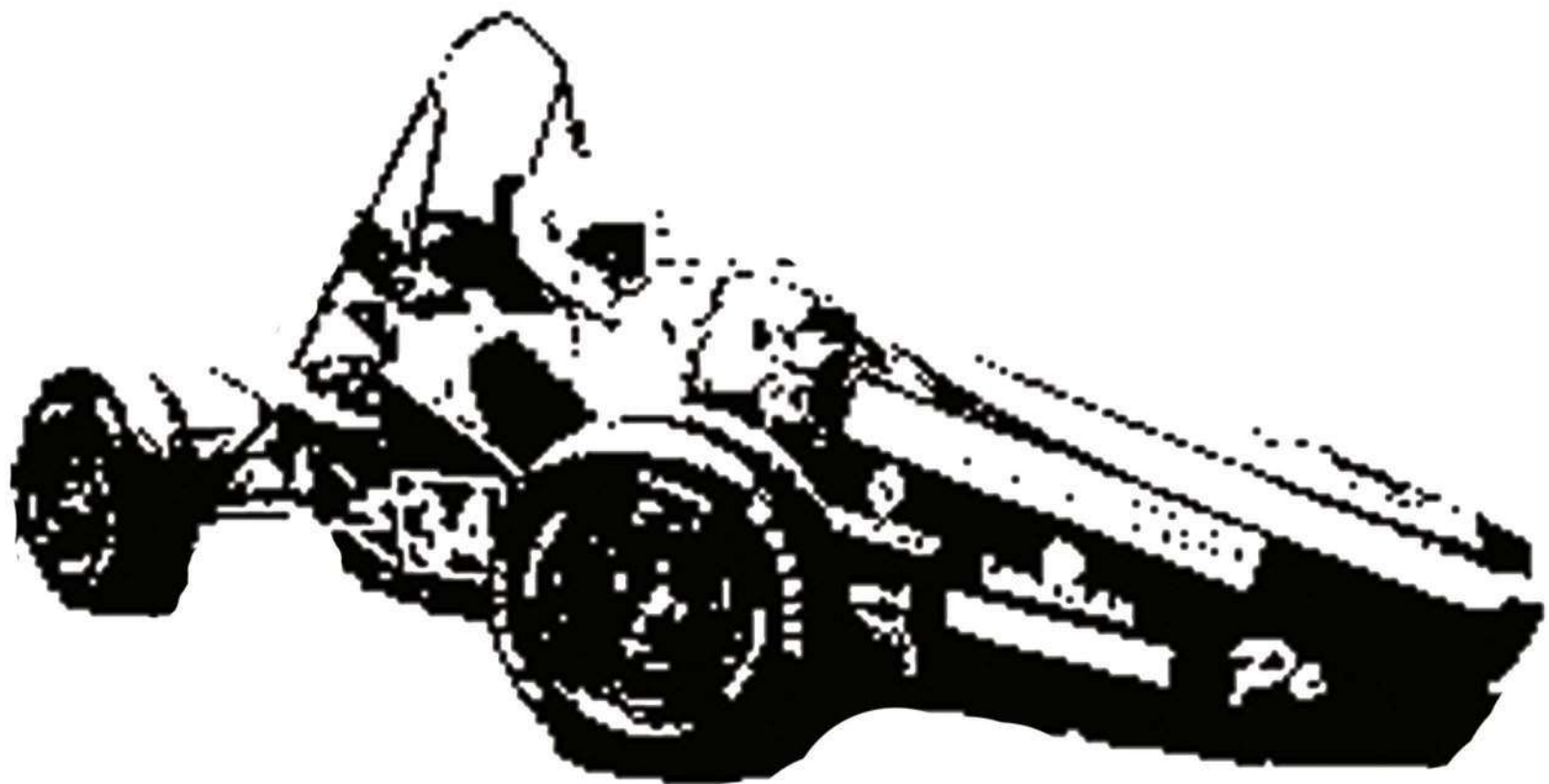
NOTE. The resources required to fabricate these actuators are available at PIIT Research Lab.

FIG. Soft Gripper based on PneuNets Actuators to lift egg. Developed at HARVARD





DESIGN APPROACH:
HYPERION RACING



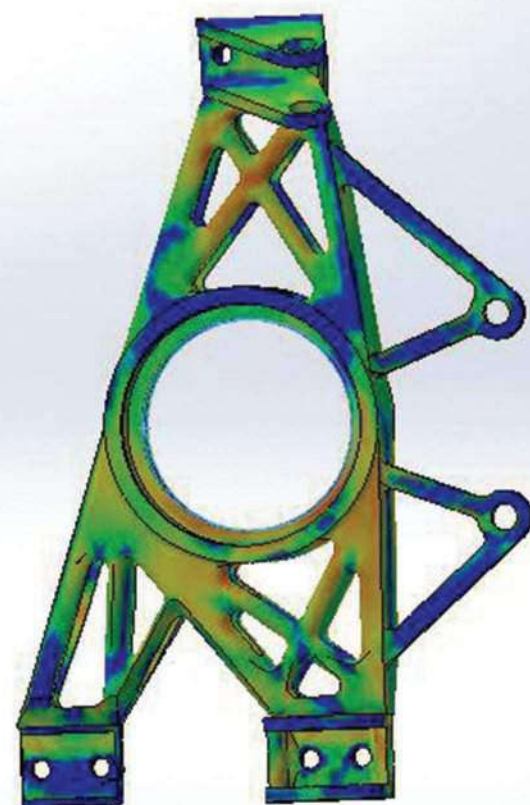
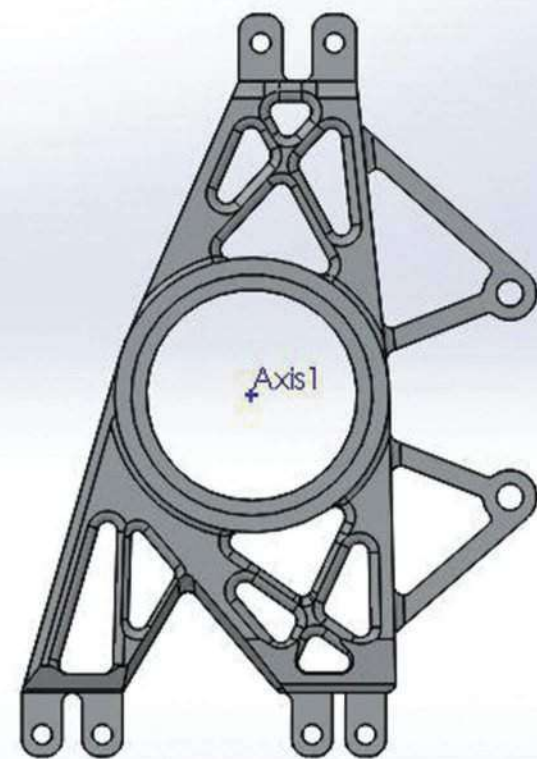
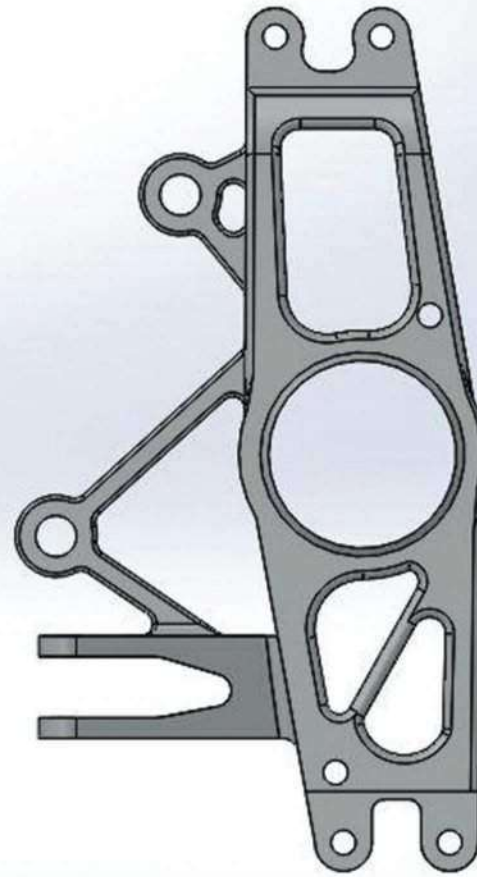
*Rigil Roy
P997, New Panel.*

Introduction

Hyperion racing is a student-run organization consisting of a small group of highly motivated and dedicated group of students dedicated to designing, racing and marketing the best race car possible. They test their knowledge and skills to obtain a valuable experience. The students come from a broad range of backgrounds and majors, allowing for more diverse thoughts and ideas.

Design approach

Majority of the car components are designed by the team members themselves, Uprights being one among them. The purpose of an upright is to provide a physical mounting and links from the suspension arms to the hub as well as brake components. They have to withstand the forces from the tires, brake components, bearings, suspension arms, dampers, pullrod/-pushrod. Uprights are critical because there are many points relative to the mounting points on the chassis which determine caster, camber, toe and Ackerman. Designing an upright is a challenge for teams as they have to consider the weight too. Being a race car, the primary goal is to achieve the best performance to weight ratio. Weight reduction in any area will allow the vehicle for better performance.



By reducing weight there is a finite amount of grip available to each tire to make the car faster through the corners. It is important to reduce the weight of the wheel assembly as this part is called "Unsprung mass". The lighter the unsprung mass, better will be the vehicle response in handling. The heavier it gets, the suspension systems takes valuable time to recover from a bump or droop.

Another aspect of designing an upright is the stiffness. The component is applied with loads and if there is excessive amount of deflection, then the key geometries will not be where they are intended to be.

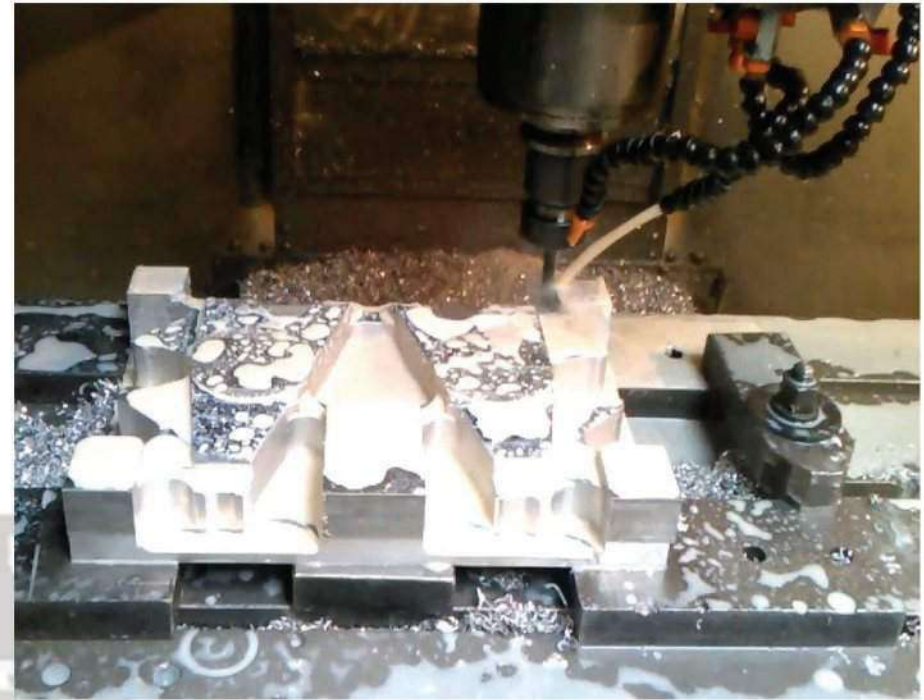
Material choice

The designer has the complete freedom to select the material required. But there are certain factors to be considered before selecting any material, like availability, cost etc. However Formula SAE has a clear constraint about the budget of the car. Alloy steel or Aluminium is mostly used and preferred by teams. We have selected Aluminium 6082 as it meet's all our strength, cost and machinability constraints.

Manufacturability

There are a variety of choices when it comes to manufacturability but like everything else, there are many factors to be considered before making a choice. Like mentioned earlier, cost, completion time, complexity of design are a few factors. 3-axis Vertical Milling Centres are not so economical, but they are better for complex designs and give the desired stiffness.

As the designs get complex, the cost of the machining also increases, but the available resources are used to get an efficiently designed and effective component.





Birds in a Metro

Avadhesh K
PIIT,
New Panvel.

Mumbai is home to over 21 Million people, financial capital of our nation, the city that never sleeps. Most of us have spent our life so far travelling for work/studies, making our way through crowded trains/buses and crashing back home!

Very few of Mumbai's citizens are aware of the natural wealth the city is favoured with. We have a long coastal belt, dense forests, mangroves and grasslands well inside the city limits (Or at least within the reach of local trains)! This variety of natural habitat enriches Mumbai with a large number of birds. To make things simple, Mumbai can have a bird species count easily exceeding over 350! So far you must have noticed crows and sparrows only.

We hardly get enough time to notice this. If you have a fruiting tree near your home, maybe a Banyan tree or Mango tree, that one tree will alone support over 10 different species of birds like Coppersmith Barbet, Asian Koel, Tailor Bird and Parakeets, etc.



Oriental Magpie Robins are responsible to wake up Mumbaikars with its melodious Sound. Coppersmith Barbets are known as Bird of Mumbai and can be commonly heard making *took took* calls.

The dense forests of Sanjay Gandhi National Park, Tungreshwar Wildlife Sanctuary, Aarey Colony and Kharghar Hills are home to many dense tree dwelling or arboreal birds like Hornbills, Koels, Parakeets, Flycatchers, Woodpeckers and Owls. We can always hear them but can hardly see them due to the thick floral growth and the ability of these birds to keep away from any unwanted attention and intruders. Given some time and patience, these birds can be spotted doing their daily activities like searching for food, finding a mate, building nests, etc. My personal favourite arboreal bird is Asian Paradise Flycatcher. Sadly so far, I could not photograph one, but have observed them a number of times. These birds are the ones who keep insects under control and help in dispersal of seeds so new plants



can grow in other areas. And yes, they make the forest echo with their beautiful calls and make the whole environment livelier!

More easily seen birds inside these forests can be the Common Mynah, which of course are common inside the city as well, but you may also spot its cousin, the Jungle Mynah.



While inside a forest, you will surely notice a deep, scary sound, like *hook hook hook*, which belongs to an equally scary looking large bird that is rarely seen flying. Hiding inside dense foliage is a bird with red eyes, called Coucal!



Away from dense forests, if we go towards water bodies like Coast, Lakes, Rivers and Mangroves, a whole new world unfolds with totally different types of birds.

These are mostly “Waders” as they wade through shallow waters to find their meal. Most common birds seen around water bodies are various Egrets, Kingfishers, Gulls, Terns, Herons, Sandpipers etc. They feed on minute molluscs, fishes and small aquatic creatures.

One of the most beautiful spectacles of Mumbai’s winter is of Flamingos. Thousands of these majestic birds come here during winter and are easily seen around lakes and creeks. Flamingos seem to hide their face underwater, but that is not the real story. They actually fill their beaks with water and filter small aquatic creatures and moss that they feed on through a mesh-like organ.



A trio of Greater Flamingos at Palm Beach road in Navi Mumbai. The Greater and Lesser Flamingos are differentiated by their size, and Greater ones having pink beak against black beak of Lesser. Also Greater ones display pink legs against red legs of Lesser. The ‘courtship display’ or ‘mating dance’ of Flamingos is a sight worth watching!

Another interesting bird to observe is the Kingfisher. Different varieties of Kingfishers are found in Mumbai like White Throated Kingfisher (pictured), Small Blue Kingfisher, Black Capped Kingfisher, Pied Kingfisher and Oriental Dwarf Kingfisher (which is a monsoon migratory bird). Pied Kingfishers have a habit of hovering over water surface and suddenly dives down into the water to catch its prey.

Other kingfishers hide themselves (stay still on a branch) and dive into the water to catch their prey. Their ability to catch fish is a clear indication why they are named Kingfisher!



The next bird I would like to mention is probably seen at least once by you. They are Cormorants. The name may sound unfamiliar, but they are very common around us. Ever seen a Duck like bird sitting on a branch near lakes or creeks, spreading its wings to dry? Yes, those are Cormorants! Extremely skilled divers and hunters, they go underwater and can stay there pretty long to find fish.



Cormorants are found in two varieties, Lesser Cormorants or Great/Indian Cormorants.



Along with Flamingos, other winter visitors are many kinds of Storks, like this Painted Stork.

These beautiful and tall birds come in huge numbers and can be seen around Flamingos. Similar birds like Eurasian Spoonbill, Indian Openbill and Woolly Necked Stork (Uncommon) can be sighted on a good day.

Talking of birds, I have to mention our Birds of Prey or Raptors! Big, powerful and menacing to look at, they are apex predators of Avian family. Most common one in the city are Black Kites, seen gliding high up in the sky and often coming down on tall transmission towers to rest.



With a sharp beak, even sharper talons and excellent eyesight, nothing can hide from these hunters! Other Raptors you will spot are Brahminy Kites, Peregrine Falcons, Ospreys and Spotted Eagle or even a Vulture!



A young Common Moorhen bird makes its way through waste dumped at a pond. Who would want an outsider to dirty our home?



This is how they catch their prey! Here is a Brahminy Kite, as it launches itself into the water to catch a fish.

As splendid as our bird life is, they are facing a constant struggle due to habitat loss and hunting.

Most of our green patches are now being cleared to make concrete structures. Mangroves are being filled for the same purpose. This makes many birds homeless and generates a huge imbalance in natural cycles.

The other issue is keeping the remaining habitats clean. Most water bodies are highly polluted due to religious activities, industrial effluents and garbage dumping. Same applies to forests where broken glass bottles may severely injure animals.

The most disturbing threat to birds is hunting. In villages around Mumbai, tribals hunt birds and Bats for food and use feathers as decorative articles. Nets are used to trap birds and Bats (as seen in above image) or many a times they are hunted by gun shots. The only way to win over these issues is by creating awareness among young minds, as they are the ones who will face future consequences. Government should be repeatedly reminded of sustainable development and young minds should be made sensitive towards our natural wealth. If we fail to fight these problems, the only way our future generation will see a Flamingo might be in books, old television documentaries and Google images.



A person with long dark hair, wearing a green and white striped long-sleeved shirt and blue jeans, is sitting on a tiled floor in a hallway. They are looking away from the camera towards the end of the hallway. The floor has a repeating pattern of light and dark tiles. The hallway is dimly lit, with light coming from the end of the hallway. There are plants in the background.

ECHOING SILENCE

-TILBY SUSAN THOMAS

The thick carpet drowning the sound
Of footsteps gliding past the dark hallway.

Silent shadows gliding along –
Past memories and ghosts of loved ones
The muffled screams of long-forgotten past
Threatening to burst from your lips.

Trembling fingers holding onto the remaining shreds
Of a time well past its existence

Quivering lips hold back the passion,

Betraying the fear, the pain, the emptiness –

The empty hallway, the empty house, the empty being....

Vacant eyes looking out the window

Unseeing the present, reliving the past.

The silence in the house engulfing you,

Threatening to withdraw your suppressed screams.

The deafening silence unbearable for a moment longer

Finally tipping over the unseen boundary.


A soft hum leading to a sweet song from your lips,

And at last you gain victory over the echoing silence....

WAR MEANS...



ZEESHAN HASAN
S.E AUTO
PIIT, NEW PANVEL.



War Means death
War Means destruction
War Means fire
War Means bombing
War Means sorrow
War Means turmoil
War Means tears
War Means guns
War Means blood
War Means confusion
War Means explosions
War Means mutilation
War Means sickness
War Means killing
War Means occupation
War Means loss
And lots more

But after one side
Or the other side
Has finally had enough
And lays down their arms
To surrender and give up

War Means Death..