PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY

Kothandaraman Nagar, Dindigul – 624622

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CENTRE OF EXCELLENCE IN ROBOTICS AND AUTOMATION

ECE ROBO CLUB

PROUDLY LAUNCHES

THE FIRST MAGAZINE

"GIZMO"

ON 11.12.2021

Message from HoD :

Robotics technology has an impact on every element of life, both at work and home. It can improve people's lives and work habits by increasing efficiency and safety while providing better service. ECE Robo-Club of PSNA college of Engineering and Technology is a group of students who want to learn more about robots and work with them. Teams of students engage in robotics contests by designing and building a robot that can compete against opponents in a series of challenges. The Robo-Club's mission is to instil in us the habit of

"thinking technologically".

Dr. G Athisha, HoD/ ECE

ROBOTICS LAB FACULTY TEAM

- Dr. G. Athisha , HoD/ECE
- Dr. M. Deivakani, ASP/ECE
- Dr. J. Booma, ASP/ECE
- Dr. N. Soundiraraj, AP/ECE
- Mr. K. Palanivel Rajan, AP/ECE
- Mr. I. Sayed Mohamed, AP/ECE
- Mrs. K. Rajalakshmi, AP/ECE
- Mrs. R. Rajakumari, AP/ECE
- Mrs. P. G. Akila, AP/ECE
- Mr. R. Saravanan, AP/ECE
- Mrs. Divya Francis, AP/ECE

ROBOTIC CLUB OFFICE BEARERS

ECE - Robo Club President :

- Manikandan G
- Gomathi Shruthy S

ECE - Robo Club Vice-President :

- Gajhana Selvi V
- Mohamed Sikkandar
- Yaswanth M

ECE - Robo Club Secretary:

- Kirantara B
- Sruthi R
- Velu Prabhakaran V
- Vanshika R

Importance of Robotics and Automation Research Group

- The expansion of the world of AI and ML has revolutionized the business arena.
- Acquiring adept knowledge about the field and its operational tools has gained pre-eminence.
- This Group fulfils one such crucial need of these changing times.
- It was ideated as an on campus, Centre of Excellence in Robotics, Internet of Things (IoT), Artificial Intelligence (AI), Rapid Prototyping (RP) and Industrial Automation, that delivers tailor-made solutions to their clients.

Robotics and Automation Laboratory

- Robotics and Automation Lab at PSNA makes the students industry ready by providing the much-required hands on experience.
- It is in alignment with the New Education Policy laid down by the All-India Council for Technical Education (AICTE).
- Robotics is also identified as one of the Emerging Technologies by the AICTE and this Lab established at PSNA is a step towards providing industry relevant curricula to PSNA CET students.

Features of the Robotics & Automation Laboratory are:

- Advanced state of the art technical research facility within campus
- Hands on practical experience along with required theory
- Consolidation of concepts
- Industry- Institute Interaction
- Standard guidelines and essentials
- Superior quality and Advanced robot study platforms
- Training by Industry Experts

Industry- Institute Interaction :

Facilities in the Robotics & Automation Laboratory :

- The following Technology sections are available in the Robotics Lab:
- Students learn how to use the following:

Section I : Electronics Technology Division

- Sensors
- Microcontroller boards
- Power sources (batteries, power supply, etc.)
- Motor drivers
- Communication modules
- Consumables

Section II : Mechanical Technology Division

- Actuators and different types of motors
- Tools & instruments
- Machines for manufacturing
- Fasteners, adhesives, etc.

Section III : Pneumatics Technology Division

- Pneumatics cylinders
- Flow Control Valves
- Different types of connectors
- Air supply units
- Pneumatics study table and nomenclature
- Pneumatics circuit designing

Robot Study platforms :

- OMIBO: Omni wheel-based robot
- MARSian: Mars Rover prototype
- FLEXO: Haptic Robotic Arm
- Hex Crawler robot
- ROBOMAN robot
- JCBian: Pneumatic Back-hoe Loader

Software :

- Open Source software for coding
- Software for simulation
- Software for designing

Activities Carried Out So far…

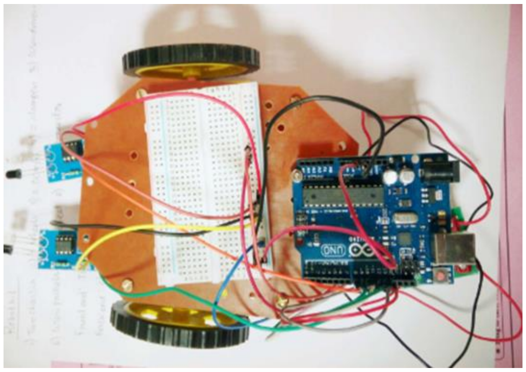
Title: ArduBotics Robotics" in association with Innovians Technologies Indian Institute of Technology, Varanasi (Technex'18)

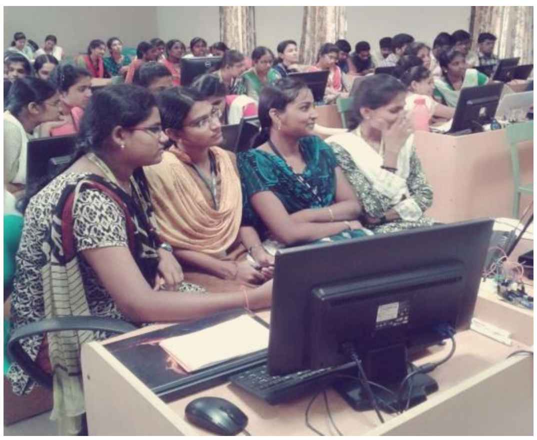
Date(s): 25-09-2017 & 26-09-2017 (Phase I) and 29-12-2017 and 30-12-2017 (Phase II)

Resource Person(s): Trainer from Innovians Technologies,Mumbai

Event Coordinators: Dr.J.BOOMA and Dr.M.Deivakani

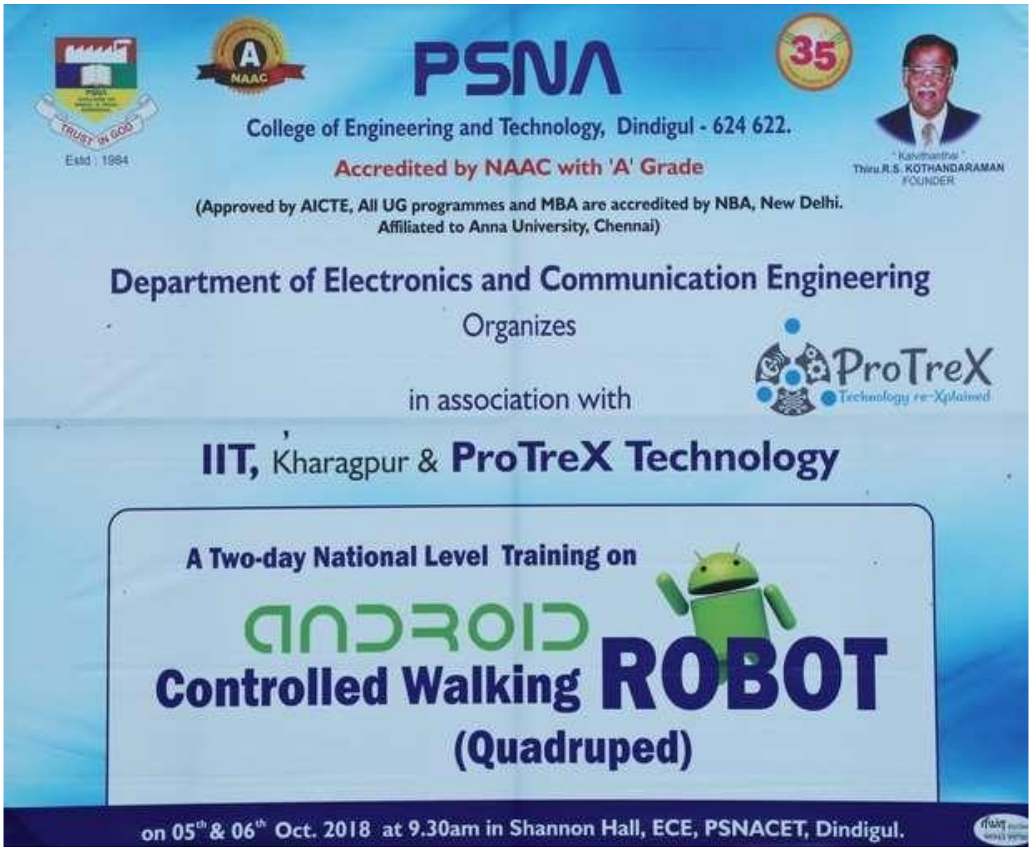
Total Participants: 60





Participation in National Competition TECHNEX at IIT Varanasi

A Two Days Training on Android Controlled Walking Robot (Quadruped) 05-10-2018 & 06-10-2018



Title: Android Controlled Walking Robot (Quadruped)

Date(s): 05-10-2018 and 06-10-2018

Resource Person(s): Trainer from ProTreX Technology re- Xplained,Mumbai.

Event Coordinators: Dr.J.BOOMA and Dr.M.Deivakani

Total Participants: 75

Prototype model of "Walking Robots" made by participants during training programme

Winner Team Who got an opportunity to participate in 15 Days Internship on Machine Learning and Artificial Intelligence at Research park , IIT Madras

National level training on "Industry 4.O – Industrial Internet of Things (IIoT)" 11.07.2019 and 12.07.2019

Title: Industry 4.O – Industrial Internet of Things (IIoT)

Date(s): 11.07.2019 and 12.07.2019.

Resource Person(s):

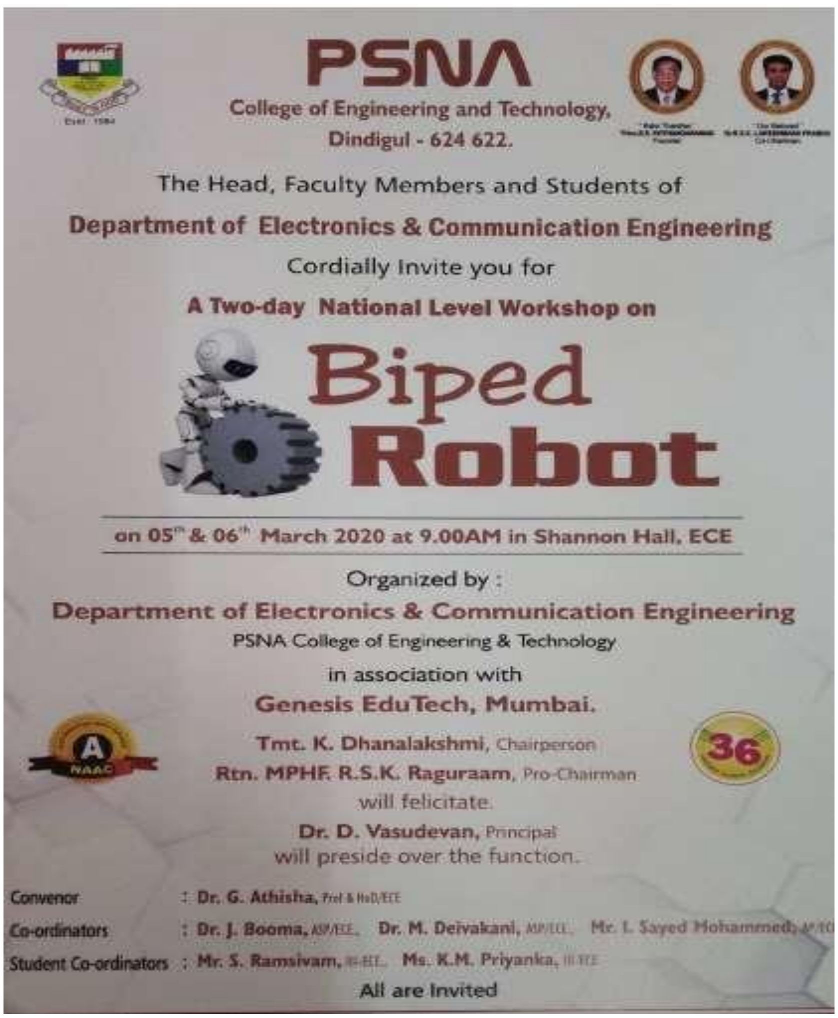
Trainers from Genesis Edu Tech, Mumbai

Event Coordinators:

Dr.J.BOOMA and Dr.M.Deivakani

Total Participants: 45

National level workshop on “Biped Robot” (05.03.2020 and 06.03.2020)



Title: Biped Robot

Date(s): 05.03.2020 and 06.03.2020

Resource Person(s):

Trainers from Genesis Edu Tech, Mumbai

Event Coordinators:

Dr.J.BOOMA Dr.M.Deivakani and Mr.I.Sayed Mohammed

Six Days Online STTP on "Emerging Trends in Robotics & its Applications 09.09.2020 to 14.09.2020

Collaborating / Sponsoring organizations (if any)	**Genesis EduTech, PanTech Solutions, Robolab Technologies, Dozzy Robotics, Novitech**	
Coordinators and Organizing Secretary	Dr.J.Booma – Asso. Professor/ECE, Dr.M.Deivakani – Asso.Professor/ECE, Mr.R.Saravanan – Asst.Professor /ECE	
Venue	**Online Mode – Google Meet**	
Date(s) & Time	**09.09.2020 to 14.09.2020 & Time: 09.30 AM – 04.30 PM**	
Program coverage • Brochure / Flyer should be attached. • May be given as Annexure	**Topic & Speaker**	**Points Addressed**
	Mr.Mukesh Choudhary Mr.YogeshBhole	Introduction of Robotics, Application of Robotics Live Demo of Android Controlled Robot & Biped Robot
	Mr.R.Jishnu	Robotics Applications in various fields
	Mr.Pratik Deshmukh	Robotics Applications-Software installation procedure and training - I
	Mr.Pratik Deshmukh	Robotics Applications-Software installation procedure and training - II
	Mr.SaqeefTehnan Manna	Pre Programmed Robots, Humanoid robots , Autonomous Robots, Tele-operated Robots – with Demo
	Mr.G.Palanivelrajan	Purposes of robot in Warfield's with Demo

Training for Trainers :

- A Seven days Hands-on-Training programme on “Robotics and Automation” was organized by Department of ECE, PSNA College of engineering and Technology in association with Robolab technologies , Pune from 12.07.2021 to 19.07.2021 .


Double acting cylinder
GPS Map Camera
Dindigul, Tamil Nadu, India
PSNA College of Engineering and Technology, Department of Electronics and Communication Engineering,
Lat 10.350723°
Long 77.963485°
15/07/21 12:15 PM
Google


Laws of Robotics
GPS Map Camera
Dindigul, Tamil Nadu, India
PSNA College of Engineering and Technology, Department of Electronics and Communication Engineering,
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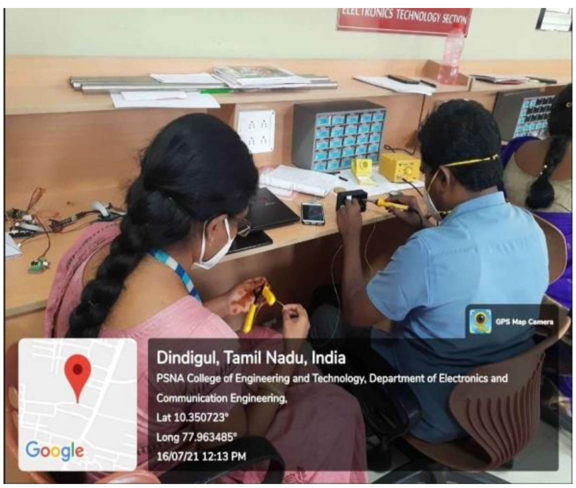
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PSNA College of Engineering and Technology, Department of Electronics and Communication Engineering,
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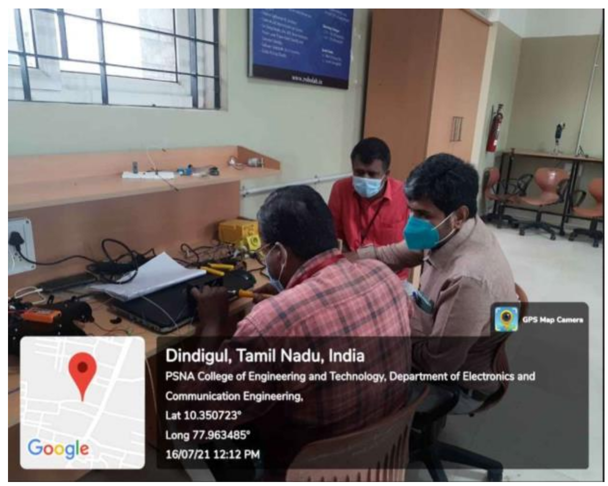
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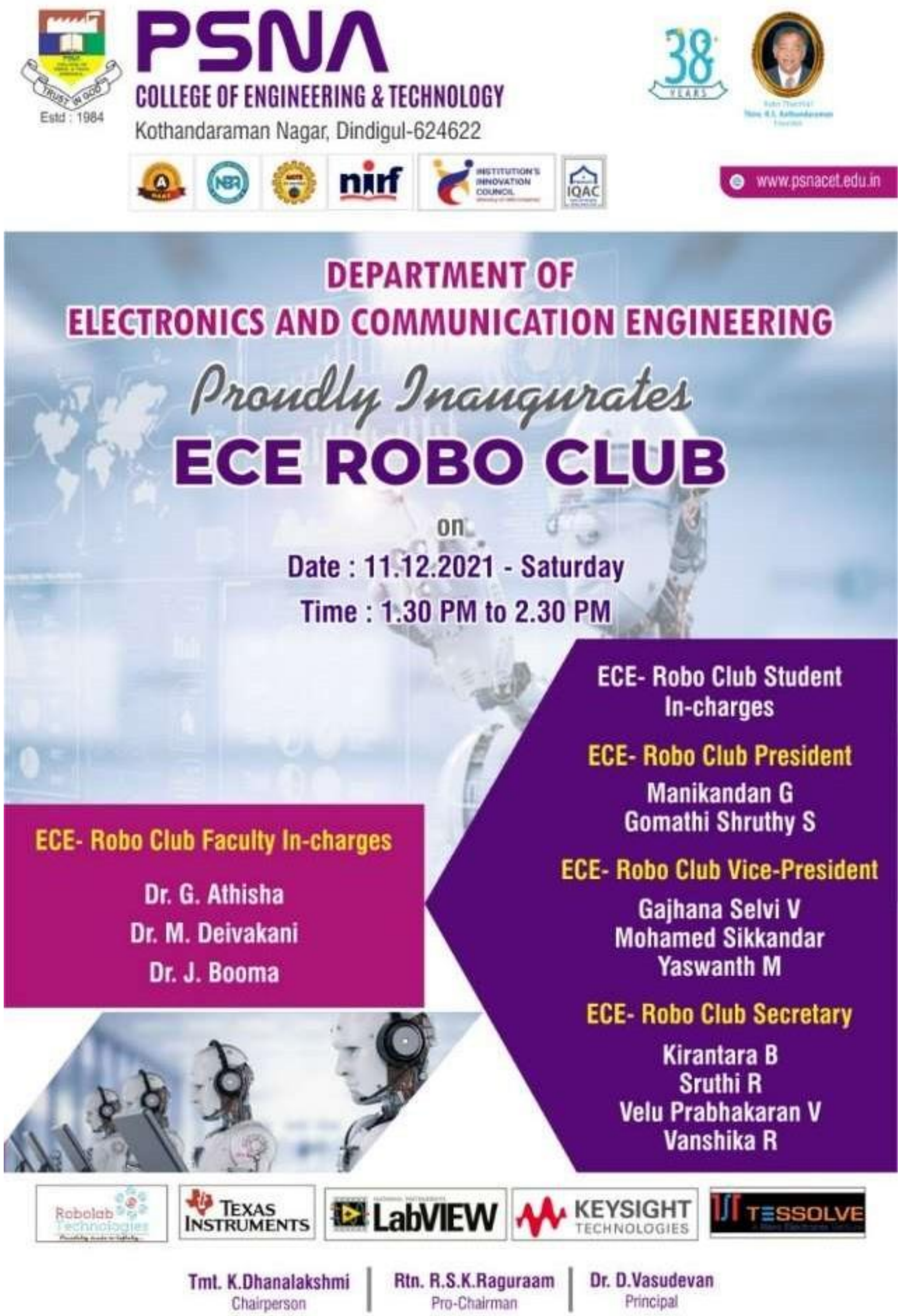
HEX CRAWLER ROBOT

Inauguration Ceremony :

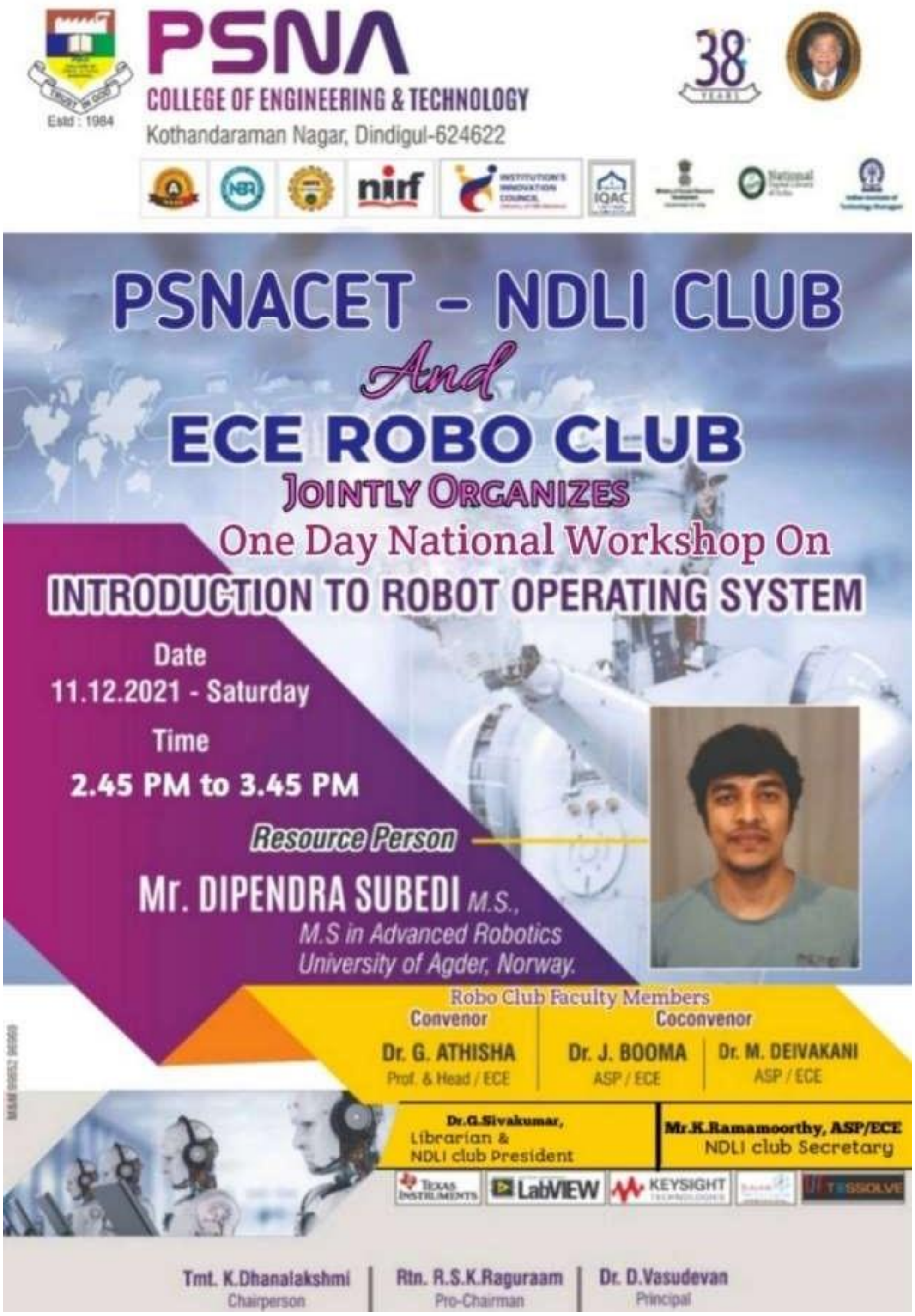
- Centre of excellence in “Robotics and Automation” was inaugurated by Thiru S .VISAKAN IAS, the District Collector, Dindigul at IRIS BLOCK (ECE), PSNACET on 27.07.2021.

Centre of excellence in "Robotics and Automation" of ECE-PSNA College of Engineering and Technology Organized one day Workshop (online) on "Robotics "- A Start ... on 25.09.2021.

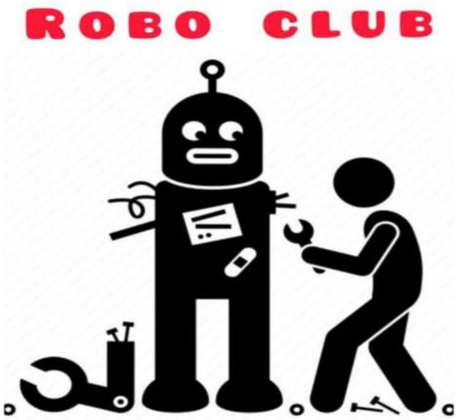
Department of Electronics and Communication and Engineering - PSNA College of Engineering and Technology organized inauguration ceremony of ECE ROBO CLUB on 11.12.2021.



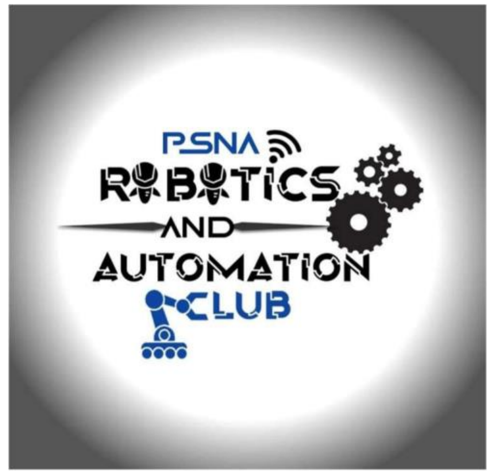
PSNACET – NDLI CLUB and ECE ROBO CLUB organized an one day National workshop on “Introduction to Robot Operating System”… on 11.12.2021



I - Year Logo Submissions:



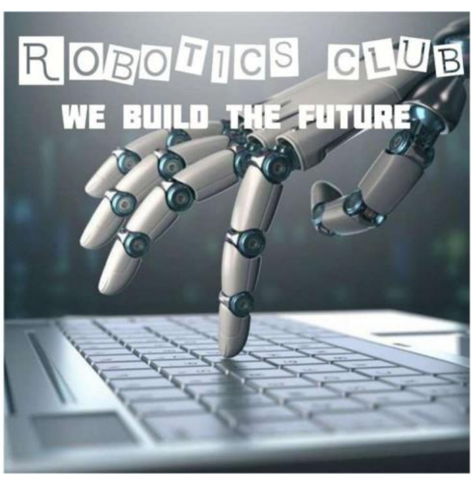
S.ARUN KUMAR & S.BARATH VIGNESH



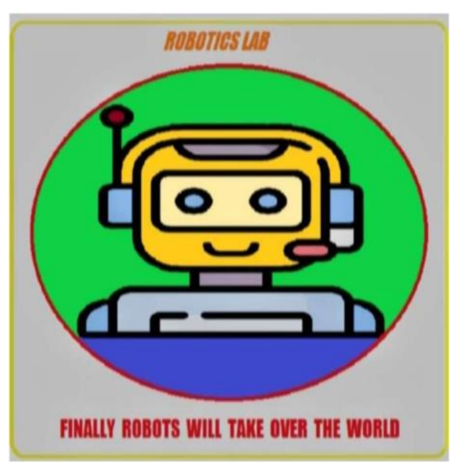
P.SANJAI

M.DHANABALAN MURUGAN

L.MOHINDER RAJ



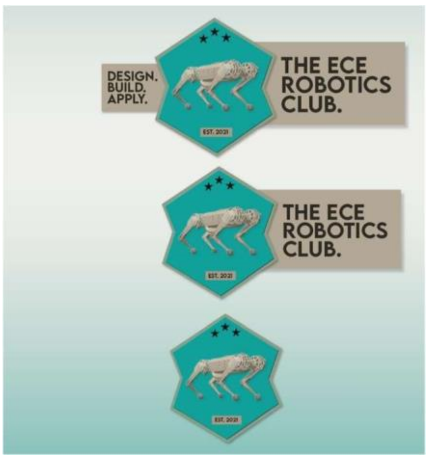
J.SURIYA NARAYANAN



S.SAKTHIVEL

K.G.SASIVARTHAN

M.JAYARAMAN

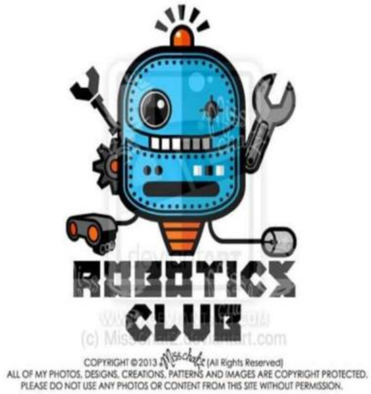


M.K.MANOJ KUMAR

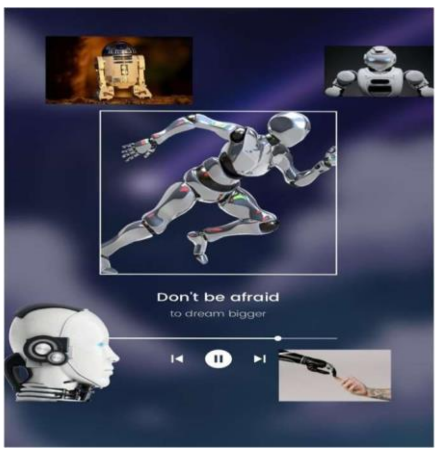
S.KARIM SUHAIL

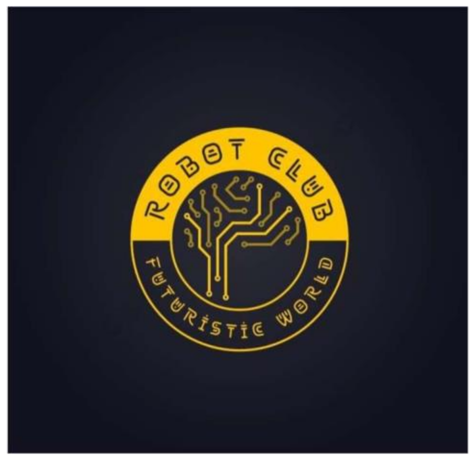
J.SAVITHA LAKSHMI

K.S.VARSHA SRI



THIVYA THARSHINI **SRIMATHI**





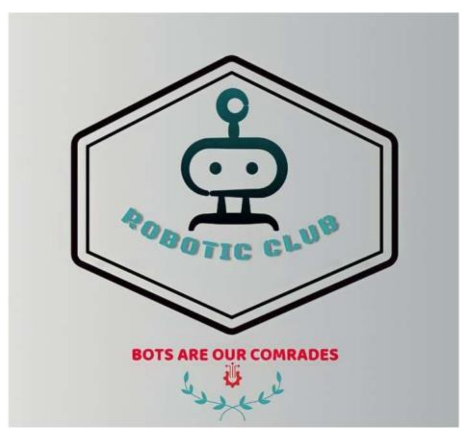
S.ILAYA BHARATHI **MOHAMED ARSHATH**

T.JAMUNA DEVI

II - Year Logo Submissions:

R.YUVARAJ **K.DIVYA**

P.RAJA ALAGAPPAN & K.PRASANNA GOPIKA **G.K.MONISHA & J.REMIPRAKA**



T.M.PRUTHIVI **V.VELU PRABHAKARAN**

R.SAHANA

M.MOHAMMED SIKKHANDAR

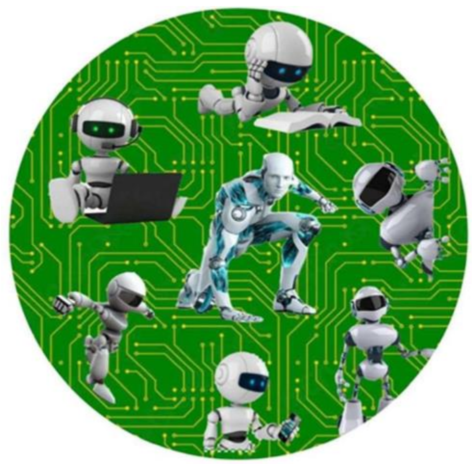
R.VIDHYA RANI

S.RANJINI

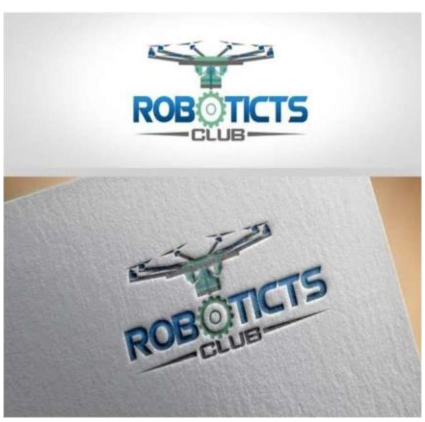
PRIYA DHARSHINI & V.RITUAL NANGARE PATIL

III - Year Logo Submissions:

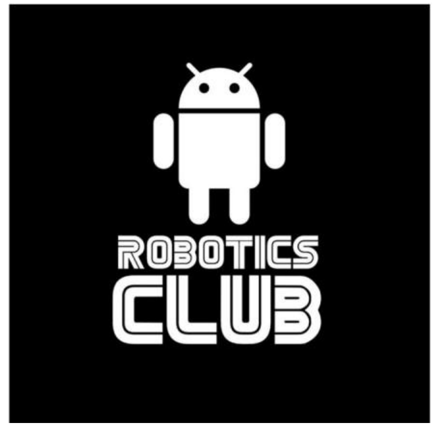
S.DEEPAK CHANDRU **P.SANTHOSH KUMAR**



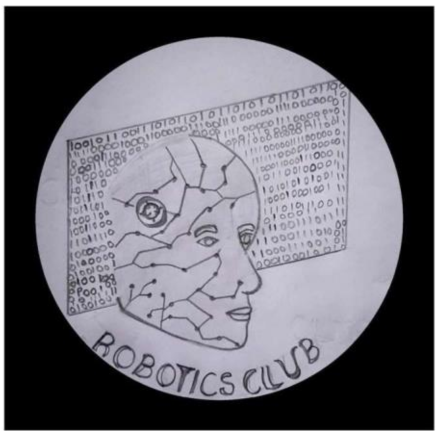
S.ARIHARAN & **S.NAGASUBRAMANIAN** **G.RAJKISHORE**



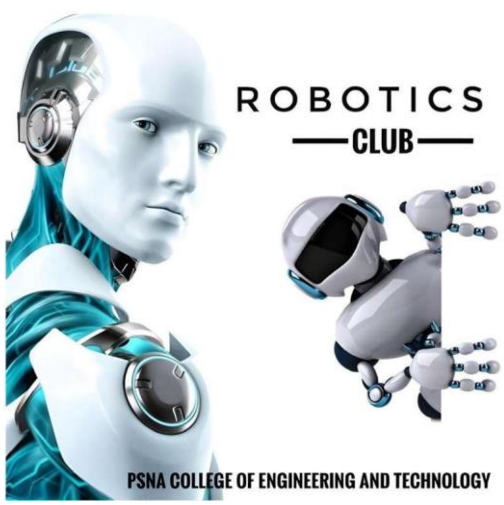
G.MONISHA **M.ABDUSH SAMAD**



M.B.MAHIMA **J.J.SOUNDARYA SWETHA**



K.ARUN KUMAR **P.M.AMRISHA VIVINYA**



V.RISHIKESHVAR RAM

N.VIDHYA **T.K.KARTHICK KUMAR**

SUMMARY

Number of articles : 28

Number of drawing : 2

Article :

Number of students in 1st year : 9

Number of students in 2nd year : 6

Number of students in 3rd year : 13

Drawing :

Number of students in 3^{rd} year : 2

S.No	Membership No	Name of The Student	Year	Section
1.	ECEROBO-079	Karim Suhail.S	I year	B
2.	ECEROBO-078	Mohindar Raj.L	I year	B
3.	ECEROBO-028	Sanjai.P	I year	C
4.	ECEROBO-077	Vishnu kumar.B.S	I year	D
5.	ECEROBO-054	Supraja.R	I year	D
6.	ECEROBO-073	Yogitha.R	I year	D
7.	ECEROBO-072	Yaswanth.M	I year	D
8.	ECEROBO-060	Vasanth kumar	I year	D
9.	ECEROBO-058	Vanshika.R	I year	D
10.	ECEROBO-065	Remi parka.J	II year	C
11.	ECEROBO-062	Ranjani.S	II year	C
12.	ECEROBO-037	Santhoswaran.M	II year	C
13.	ECEROBO-009	Nimaleshwaran.M	II year	C
14.	ECEROBO-006	Mohamed sikkandar.M	II year	C
15.	ECEROBO-098	Yuvaraj.R	II year	D
16.	ECEROBO-001	Gajhana selvi.N	III year	A
17.	ECEROBO-035	Ariharan.S	III year	A
18.	ECEROBO-003	Gomathi shruthy	III year	B
19.	ECEROBO-005	Kiran tara.B	III year	B
20.	ECEROBO-012	Monisha.G	III year	C
21.	ECEROBO-094	Mani Kandan.G	III year	C
22.	ECEROBO-093	Naga Subramanian.S	III year	C
23.	ECEROBO-013	Shivani.M.K	III year	D
24.	ECEROBO-025	Sowndarya Swetha.J.J	III year	D
25.	ECEROBO-015	Sujitha.G	III year	E
26.	ECEROBO-038	Sushmitha.G	III year	E
27.	ECEROBO-014	Vidhya.N	III year	E
28.	ECEROBO-017	Swetha.R.K	III year	E
29.	ECEROBO-016	Sruthi.R	III year	E
30.	ECEROBO-008	Haashini Sharadha Priya.R	III year	B
31.	ECEROBO-090	Priya dharshini.A	III year	C

CYBERNETICS

history

In 1948, Norbert Wiener formulated the principles of cybernetics, the basis of practical robotics.
Fully autonomous robots only appeared in the second half of the 20th century. The first digitally operated and programmable robot, the Unimate, was installed in 1961 to lift hot pieces of metal from a die casting machine and stack them. Commercial and industrial robots are widespread today and used to perform jobs more cheaply, more accurately and more reliably, than humans. They are also employed in some jobs which are too dirty, dangerous, or dull to be suitable for humans. Robots are widely used in manufacturing, assembly, packing and packaging, mining, transport, earth and space exploration, surgery,

Occupational safety and health implications

A discussion paper drawn up by EU-OSHA highlights how the spread of robotics presents both opportunities and challenges for occupational safety and health (OSH).[172]

The greatest OSH benefits stemming from the wider use of robotics should be substitution for people working in unhealthy or dangerous environments.

Robotics Technology

Robotics is an interdisciplinary sector of science and engineering dedicated to the design, construction and use of mechanical robots.   Our guide will give you a concrete grasp of robotics, including differenttypes of robots and how they're being applied across industries.

Complied by

YASHWANTH

Ece D SECTION

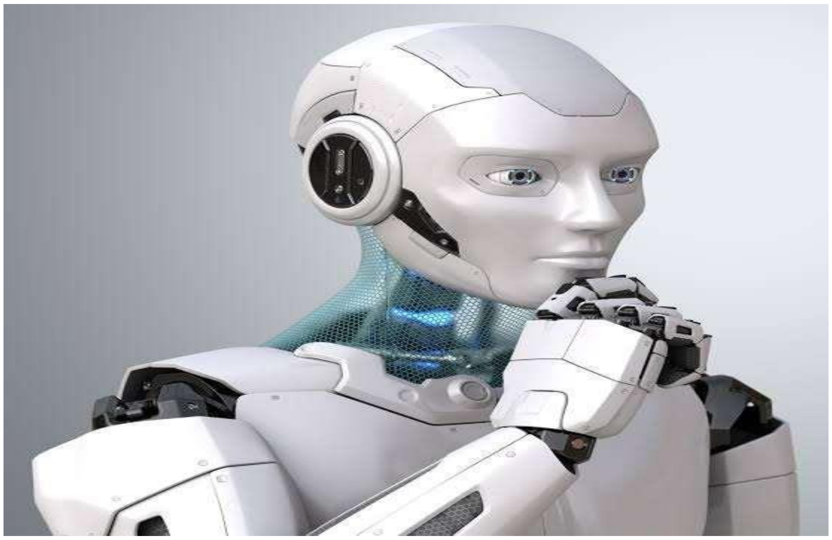
ECEROBO-072

ROBOTICS ARTICLE

INTRODUCTION:

The concept of artificial humans predates recorded history (see automaton), but the modern term robot derives from the Czech word robota ("forced labour" or "serf"), used in Karel Čapek's play *R.U.R.* (1920). The play's robots were manufactured humans, heartlessly exploited by factory owners until they revolted and ultimately destroyed humanity. Whether they were biological, like the monster in Mary Shelley's Frankenstein (1818), or mechanical was not specified, but the mechanical alternative inspired generations of inventors to build electrical humanoids.

1.ROBOTICS:



The word robotics first appeared in Isaac Asimov's science-fiction story Runaround (1942). Along with Asimov's later robot stories, it set a new standard of plausibility about the likely difficulty of developing intelligent robots and the technical and social problems that might result. Runaround also contained Asimov's famous Three Laws of Robotics:

2.THE THREE LAWS:

The most famous set of rules for robots comes not from research but from a science fiction story by Isaac Asimov. “Runaround,” published in 1942, features two men and Robot SPD-13, nicknamed “Speedy.” They’re sent to the planet Mercury in the year 2015. Speedy is programmed with three basic rules:

1. A robot can’t hurt a person or, through inaction, allow a person to get hurt.
2. A robot must obey people, as long as this doesn’t break the first law.
3. A robot must protect itself, as long as this doesn’t break the first two laws.

In later robot stories, Asimov added a “zeroth” law: A robot can’t harm humanity or, through inaction, allow harm to humanity.

Asimov’s rules sound good. But the story shows that such simple rules may not be enough.

The men gave Speedy an order to get some materials to repair their space station. But along the way, Speedy ran into danger. Rules 2 and 3 now contradicted each other. The robot found itself in an endless loop of indecision. And, it turns out, there were some other problems. These rules would certainly compel a robot to rescue your friend. But they wouldn’t help a robot decide what to do if two people were about to fall and it could only save one. The robot also wouldn’t try to rescue a kitten.

It’s very difficult to write a set of rules that will apply in all possible situations. For this reason, some scientists instead build robots with the ability to learn ethical behavior.

A robot watches examples of people doing the right thing in different situations. Based on the examples, it then develops its own rules. The robot might, however, learn behaviors its creators do not like.

No matter where a robot’s ethical principles come from, it must have the ability to explain its actions. Imagine that a robot’s task is to walk a dog. It lets go of the leash in order to save a human in danger. When the robot returns home later without the dog, it needs to be able to explain what happened. (Its ethics also should prompt it to go look for the lost dog!)

For many scientists working on such issues, their robot of choice is one named Nao. This humanoid robot is about the size of a doll. It can be programmed to walk, talk and dance. And in this research, Nao can even learn to do the right thing. An ethical zombie” i-amphtml-auto-lightbox-visited=”” style=”display: block; height: auto; max-width: 100%;”>Alan Winfield shows off some of the robots he’s programmed to make basic ethical decisions

3.An ethical zombie:

Alan Winfield used to believe that building an ethical robot was impossible. This roboticist — an engineer who builds robots — works at University of the West of England in Bristol. A robot would need a human-like ability to think and reason in order to make ethical decisions, he thought. But over the past few years, Winfield has changed his mind. Scientists should be able to create a robot that can follow ethical rules without thinking about them, he now concludes.

Its programming would compel it to do the right thing without the robot ever making a "choice." In a sense, he says, it would be an "ethical zombie."

In some cases, the ethical choice is the easy part of a robot's programming. The hard part is getting the robot to notice a problem or danger.

Remember your texting friend who was about to fall in a hole? Deciding to save her requires more than just a sense of right and wrong, Winfield says. "You also have the ability to predict what might happen to that friend." You know your friend is likely to keep on walking in the same direction. You also know that falling into a hole would hurt. Finally, you can predict whether you have enough time to run over and stop her.

This all seems completely obvious. In fact, it is pretty amazing behavior. You're predicting the future and then taking action to stop a bad outcome.

Winfield and his team wrote a program to give the Nao robot this predict-the-future super power. They named their new Nao A-Robot, after Asimov. ("Runaround" appeared in a 1950 book of short stories called I, Robot). A-Robot can recognize other robots in its environment. It can predict what might happen to them and to itself in the near future. Finally, it automatically takes action to help in a way that will cause the least harm to itself and others.

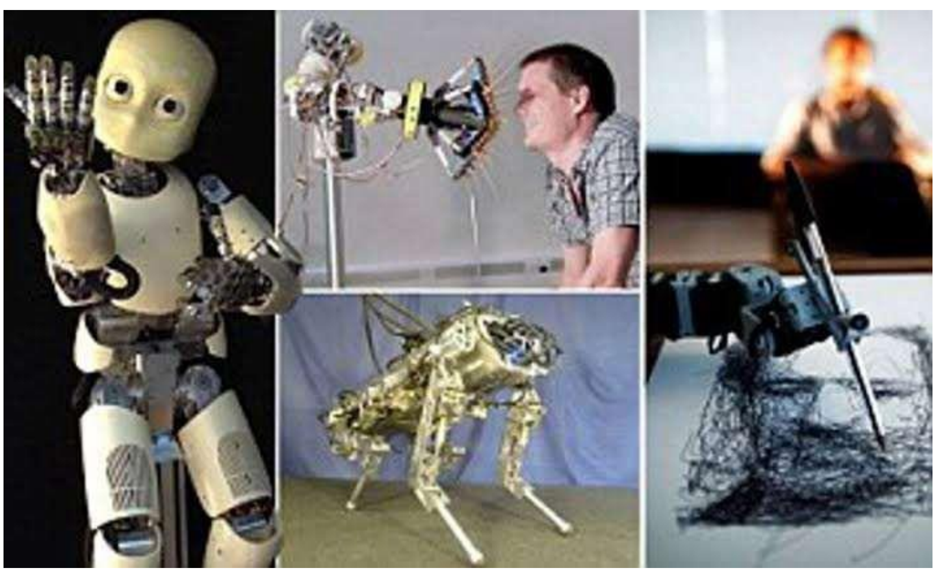
The researchers tested A-Robot with the hole scenario. But they had to modify the situation a bit. Instead of recruiting people to walk toward holes, they used “H-robots” (the “H” stands for human). They also didn’t dig real holes. They designated a part of the robots’ space as a danger area. Instructions tell A-Robot to walk toward a goal on the other side of the room. But when it notices that an H-robot is heading toward the danger area, it veers off its path to intervene.

When two H-robots need to be rescued, however, A-robot tends to get stuck. It wavers from side to side, unsure which to save. Usually, it ends up saving neither.

Clearly, there is still work to do. In fact, one of Winfield’s colleagues is working on giving A-Robot the ability to call out or raise an arm. The H-Robot would see this signal and either stop or call out the equivalent of “It’s OK. I know what I’m doing.” Then, A-Robot would know that it doesn’t have to intervene.

A-robot is still an ethical zombie, though. It can’t choose not to save H-robot. It just follows the instructions in its programming. It has no idea that a choice even exists

4.The right medicine:



Winfield and scheutz both built robots with basic ethical systems meant to avoid harm. in the situations they tested, it's pretty clear what the robot should or should not do.

However, many ethical questions are far more complex. For example, what should a robot in a nursing home do if a patient refuses to take the medication it offers? The patient may need this medicine to improve or at least to not get sicker. But the robot also should respect the patient's wishes.

A third team of researchers created a program for Nao that can resolve this dilemma. Susan Anderson is an ethicist — a philosopher who studies ethics — at the University of Connecticut in Stamford. Her husband, Michael Anderson, is a computer scientist at the University of Hartford in Connecticut.

Instead of trying to write their own rules for Nao, the Andersons instead turned to machine learning. This is a technique that allows a computer or robot to learn from examples. The Andersons gave the machine-learning program several examples of the medication dilemma, along with the correct action to take in each case. From these examples, the program came up with a single ethical principle. This complex, logical rule now guides the robot's behavior.

The rule looks at the amount of good a medicine will provide. It also considers how much harm could occur from not taking the medicine. Based on this information, Nao may do nothing out of respect for the patient's wishes. It also may remind the patient again later or alert a doctor.

The Andersons published the results of their work with Nao in 2007. Since then, they have added new situations for the robot to deal with. "We're trying to program the entire gamut of what an elder-care robot would do," explains Michael Anderson. To test out the new system, they need a bigger robot.

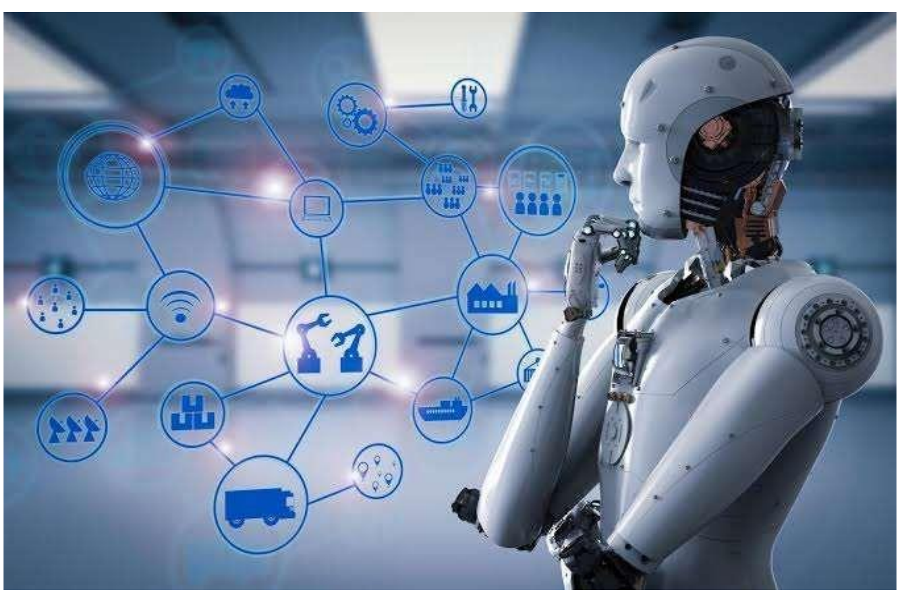
In the fall of 2016, Tiago arrived at their lab. About 1.4 meters (4.5 feet) tall, Tiago has a single arm and a round base that rolls across the floor. Its head makes it look a bit like E.T. (the alien from the 1982 movie of that name).

In addition to reminding patients to take medicine, Tiago also will keep an eye on them. If someone hasn't moved in a while, it will go over to the person and ask, "Are you okay?" If the person doesn't answer, the robot will alert a doctor. Tiago also returns to its charging station when needed so it always has enough energy. It can even play a simple game of fetch the ball.

Adding new tasks for the robot isn't simple. As Susan explains, "For any action that the robot does, it's going to have to compare all the possible actions it could do." The robot runs through its list of possible actions a hundred times every second!

As the list of possible actions gets longer, the ethical principle gets more and more complicated. For now, the Andersons have to shut the robot down in order to update its programming. Michael has considered giving the robot the ability to modify its ethical principle as it works. "When it does the wrong action, you could then tell the robot what the right action was." Then, he says "on the fly, it could update its principle."

5.ROBOT HEROES OR OVERLORDS?



The way scientists, engineers and philosophers approach robot ethics could have a big impact on our lives. A robot with an ethical system has the potential to make the right choice more often than a person would. Why? People have emotions that get in the way. We also worry about our own safety. A robot would be able to rescue a human even if it risked destroying itself. "Robots could do heroic things," says Scheutz.

But that's not what the movies show. Many movies and books set in the future cast robots as evil overlords that kill or enslave humans. Winfield says that these stories are nothing to worry about. "Real robots are just not that smart and won't be for a long time," he says.

Scheutz agrees. He also adds, "Why build machines that would then turn on us?" The whole point of his work is to make sure that ethical principles are woven tightly into robots' brains.

When it comes to robot ethics, dangerous or tricky situations get the most attention. A recent paper in Science described a dilemma in which a self-driving car must choose between crashing into a wall or avoid the wall buat hit a person walking by. Should this car let its passenger die to save the pedestrian, or choose the other way around? While such situations certainly could happen, they likely would be rare. Most ethical choices that robots face would be much simpler. The right thing to do will be much more obvious.

In fact, people mostly agree on what robots should and shouldn't do. Susan Anderson gives a few examples, "We don't want them to hurt us. We want them to be truthful to us and warn us if something awful will happen." Simply put: We want robots to be good.

Asimov's stories about robots help us imagine what a future with moral robots might look like. In his 1946 story "Evidence," which also appeared in the 1950 collection (I, Robot), a man running for mayor is accused of being a robot. Why? The main reason is because he is such an honorable, upstanding person. An expert who is called to help determine the truth says, “You just can’t differentiate between a robot and the very best of humans.”

Ideally, robots of the future also will exhibit such exemplary behavior. But it’s up to scientists, researchers, lawmakers and the rest of us, to make sure that happens.

CONCLUSION:

Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can, e.g. robot can built, assemble a car. Yet robots cannot perform every job; today robots roles include assisting research and industry. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials.

By,

S.Karim Suhail

1st Year.

ECE-B section.

ClubId:ECEROBO-079

Robotics

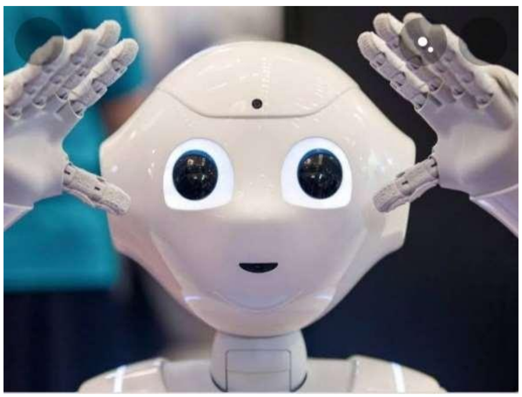
Robotics is **an interdisciplinary branch of computer science and engineering**. Robotics involves design, construction, operation, and use of robots. The goal of robotics is to design machines that can help and assist humans. ... Robotics develops machines that can substitute for humans and replicate human actions.

Robotics integrates fields of mechanical engineering, electrical engineering, information engineering, mechatronics, electronics, bioengineering, computer engineering, control engineering, software engineering, mathematics, etc.

Robotics develops machines that can substitute for humans and replicate human actions. Robots can be used in many situations for many purposes, but today many are used in dangerous environments (including inspection of radioactive materials, bomb detection and deactivation), manufacturing processes, or where humans cannot survive (e.g. in space, underwater, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take on any form, but some are made to resemble humans in appearance. This is claimed to help in the acceptance of robots in certain replicative behaviors which are usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity.

Application

As more and more robots are designed for specific tasks, this method of classification becomes more relevant. For example, many robots are designed for assembly work, which may not be readily adaptable for other applications. They are termed as "assembly robots". For seam welding, some suppliers provide complete welding systems with the robot i.e. the welding equipment along with other material handling facilities like turntables, etc. as an integrated unit



Education and training

Robotics engineers design robots, maintain them, develop new applications for them, and conduct research to expand the potential of robotics.Robots have become a popular educational tool in some middle and high schools, particularly in parts of the as well as in numerous youth summer camps, raising interest in programming, artificial intelligence, and robotics among students

Complied by

YOGITHA R

ECE -D SECTION

ECEROBO-073

Despite it being 2020, there’s a section of the population that’s often overlooked or misrepresented – the disabled population.

A section that encompasses a wide range of disabilities, many individuals fall under this umbrella. However, many are overlooked or misunderstood, you only have to look at the TV to see how disabled people are being shut out. Due to this, navigating day-to-day life for many disabled individuals can be difficult.

However, with the advancements in technology over the decades, with everything from wheelchair accessible vehicles at places like Allied Mobility, to the advancements in prosthetics and education, things are improving. And, this could improve further with the help of robots and robotics.

ASSISTIVE ROBOTS FOR DISABLED

ADVANCED WHEELCHAIRS

Since their inception, wheelchairs have come a long way. In the last 50 years alone we've since the birth of the electric wheelchair, which was a technological advancement that helped those with disabilities across the world in ways once unimaginable.

However, the future looks even brighter, with robotics being used to help advance the wheelchair even further. While there's one that can be controlled by an eye-gaze, helping those disabled from the neck down, the most advanced wheelchair is also being pioneered in Hong Kong, and is very much a robot, as it's able to learn how to navigate complex environments.

WALK ASSIST ROBOT FOR DISABLED

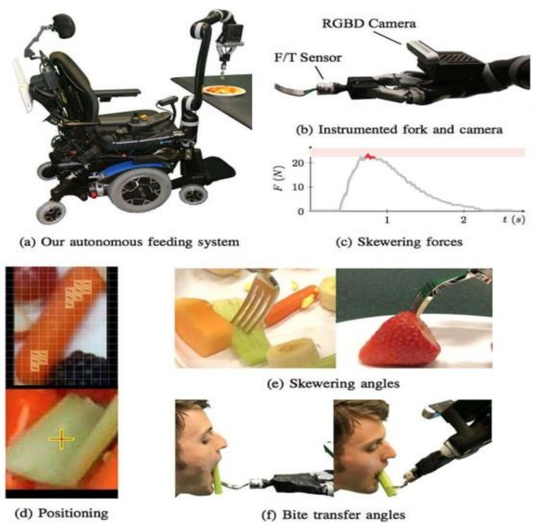
EXOSKELETONS

The moment one talks about exoskeletons, the concept of Iron Man's suit jumps to mind. Cyberdyne's Hybrid Assistive Limb (HAL) exoskeleton is no exception to this thought. The suit places sensors on the human skin, which has been designed to send and detect small electrical signals within the wearer's body.Devices like HAL's

exoskeleton don’t come cheap. The monthly rental itself is expected to be around $1,000.
The robotic pants make use of nanoparticle science, along with functional 3-D printing and artificial muscle technology. The idea is to replicate the human muscle and provide the same strength and support to the disabled, thereby enabling them to stand up comfortably

ASSISTIVE DEVICE FOR EATING.

Robots can help disabled people in different ways and forms. Kinova Robotics's Jaco arm has been developed as an assistive arm for people who are confined to a wheelchair. The arm comes well equipped with a three-fingered gripper and six degrees of freedom and can be attached to an electric wheelchair with ease



On similar grounds, researchers at the University of Washington have developed a similar type of autonomous arm, which can prove to be one of the assistive devices for eating. The Assistive Dexterous Arm (ADA) makes use of algorithms and sensors, which helps it identify the different food forms and the ways it can feed the end user. The arm is so sensible in its approach, it can even differentiate between a carrot and a banana. Such is the smartness of the algorithms which makes ADA the technology of the future.

CONCLUSION

Such are the robots that help the disabled; with so many different options available in the market, there is a lot to look forward to. Ideally, these devices for disabled persons are becoming one of the trendsetters in the market, helping disabled people live their lives in a more comfortable manner.

Complied By: VISHNUKUMAR B S

Ist year ECE ‘D’ SECTION

Id:ECEROBO-077

ROBOTIC AND AUTOMATION

Automation and Robotics engineering is a field of engineering that deals with the design and creation of robots. They use computers to manipulate and process robotic actions. These robots are then used in:

– Industries to speed up the manufacturing process.

-The field of nuclear science.

-Servicing and transmission of electric signals

-Designing of bio-medical equipment, sea-exploration, among others.

-Automated and Robotics engineers make use of knowledge from computer engineering, mechanical engineering, electrical engineering, biological mechanics, software engineering. But this is not all. They also use control systems and information technologies to reduce the need for human labour in factories, offices and at home. Automation and Robotics engineering has indeed been crucial to the development of humanity and certainly, this will come with great responsibilities

ROBOTICS AND AUTOMATED SYSTEM IN CONSTRUCTION

This section presents a brief overview of the different types of robotic and automated systems used in the construction industry. These systems are varied, and there is no consensus regarding a defined categorisation.

The lines between categories are constantly moved or blurred by new developments in technologies. The categorisation presented here intends to facilitate the understanding of a very complex and varied technology landscape and to provide the reader with a quick overview of the different types of systems.

The types of automation and robotic technologies for construction can be grouped in four general categories,

(1) Off-site prefabrication systems,

(2) On-site automated and robotic systems,

(3) Drones and autonomous vehicles, and

(4) Exoskeletons.

The first construction robots were developed in Japan to increase the quality of building components for modular homes.

(**Category 1: Off-site prefabrication systems**). The adoption of these robots was the result of the successful use of robots in the automotive manufacturing sector in Japan. Later, construction robots started appearing

on construction sites, and automated construction sites systems were developed.

(**Category 2: On-site automated and robotic systems**). The latest developments have been robots and autonomous vehicles for inspection, monitoring, maintenance, etc.

(**Category 3: Drones and autonomous vehicles**).

Lastly, exoskeletons are wearable mechanical devices that augment the capabilities of the user. Note, that exoskeletons are not strictly a robotic system, because they augment the capabilities of the worker instead of replacing it altogether. However, it was decided to include exoskeletons here because this study focuses on all hardware technologies that improve construction activities. Also, in the future, this distinction will not be as clear cut. For example, exoskeletons require a high degree of automation and a considerable potential exists on human-robot collaboration.

In this sense, before construction sites are entirely devoid of human workers, it can be expected that robots, automated systems and augmented workers will work together seamlessly.

Compiled by

L.mohindhar raj

1st year ,B section

ECEROBO-078

APPLICATIONS OF ROBOTS

In recent years the mushrooming power, functionality and ubiquity of computers and the Internet have out stripped early forecasts about technology’s rate of advancement and usefulness in everyday life. Alert pundits now foresee a world saturated with powerful computerchips, which will increasingly insinuate themselves in to our gadgets, dwellings, apparel and evenourbodies.

Yet a closely related go alhas remained stubbornly elusive.In stark contrast to the largely unanticipated explosion of computers into the mainstream, the entire endeavor of robotics has failed rather completely to live up to the predictions of the 1950s. In those days experts who were dazzled by the seemingly miraculous calculation ability of computers thought that if only the right software were written, computers could become the articial brains of sophisticated autonomous robots. Within a decade or two, they believed, such robots would be cleaning our oors, mowing our lawns and, in general , eliminating drudgery from our lives.

Obviously, it hasn’t turned out that way. It is true that industrial robots have transformed themanufacture of automobiles, among other products. But that kind of automation is a far cry from the versatile,mobile,autonomous creations that so many scientists and engineer shave hoped for.In pursuit of such robots, waves of researchers have grown disheartened and scores of start-up companies have gone out of business.

It is not the mechanical “body” that is unattainable ;articulated arms and othermoving

Mechanisms adequate formanual work already exist, as the industrial robots attest. Rather it is the computer-based articial brain that is still well below the level of sophistication needed to build a human like robot.

Nevertheless, I am convinced that the decades-old dream of a useful, general-purpose autonomous robot will be realized in the not too distant future. By 2010 we will see mobile robots as big as people but with cognitive abilities similar in many respects to those of a lizard. The machines will be capable of carrying out simple chores, such as vacuuming, dusting, delivering packages and taking out the garbage. By 2040, I believe,we will achieve the original goal of robotics and a thematic main stay of sciencection: afreely moving machine with the intellectual capabilities of a humanbeing.

Reasons for Optimism

Own observations of robots, computers and even insects, reptiles and other living things Over the past 30 years.

The single best reason for optimism is the soaring performance in recent years of mass produced computers.Throughthe 1970s and 1980s,the computers readily available to robotics researchers were capable of executing about one million instructions per second(MIPS). Each of these instructions represented a very basic task, like adding two10-digit numbers or storing the result in a specied location in memory.

In the 1990s computer power suitable for controlling a research robot shot through 10MIPS, 100 MIPS and has lately reached 50,000 MIPS in a few high-end desktopcomputers with multiple processors. Apple’s MacBook laptop computer, with a retail price at the time of this writing of $1,099,achieves about 10,000MIPS.Thus,functions far beyond the capabilities of robots in the 1970s and 1980s are now coming close to commercial viability.

COMPILEDBY

RVanshika

ECE1styearDsec

ECEROBO-058

ROBOTICS – THE FUTURE

ROBOT, anautomatically operated machine that replaces human effort, though they may not resemble human beings in appearance, they perform functions in a human-like manner.Robotics is the engineering discipline dealing with the design, construction, and operation of robots.

ARTIFICIAL HUMANS :

The concepts of Artificial humans is a mechanical alternative inspired generations of inventors to build electrical humanoids. The word 'robotics' first appeared in Isaac Asimov's science fiction story Run-around (1942). Though not humanoid in form, machines with flexible behaviour and a few human like physical attributes have been developed for industry. The first stationary industrial robot was an electrically controlled hydraulic heavy lifting arm that could repeat the arbitrary sequences of motions, which was invented in 1954 by the American engineer George Devol and was developed in 1956 by the American engineer Joseph Engelberger.Advanced computer-controlled electric arms guided by sensors were developed in late 1960s and 1970sat the Massachusetts Institute of Technology [MIT] and at the Stanford University, where they were used with cameras in robotic hand-eye research. **PUMA**[Programmable universal machine for assembly] have been used since 1978 to assemble automobile sub components such as dash panels and lights. ***PUMA***was widely imitated, and its descendants, large and small, are still used for light assembly in electronics and other industries. Mobile industrial robots also first appeared in 1954. In that year, a driverless electric cart, made by Barratt ElectronicsCorporation, began pulling loads around a South Carolina grocery warehouse. In the 1980s AGVs Microprocessor controllers that allowed more complex behaviours than those afforded by simple electronic controls. In the 1990s, a new navigation method became popular for use in warehouses: AGVs equipped with a scanning laser triangulate their position by measuring reflections from fixed retro-reflectors.Although industrial robots first appeared in the United states, the business did not thrive there. Unimation was acquired by Westinghouse Electric Corporation in 1983 and shutdown a few years later.

Cincinnati Milacron, Inc., the Major American hydraulic arm manufacturer, sold its robotics division in 1990 to the Swedish firm of Asia Brown Boveri limited.Adapt technology, Inc., spun off from Stanford and unimation to make electric arms, is the only remaining American firm. Then the European union exceeding Japanese installations for the first time in 2001.

CHRONOMETER [Time keeping device]:

Shows metre a portable time keeping device of great accuracy, particularly one used for determining longitude at sea. Although there were a couple of earlier isolated users, the word was originally employed in 1779 by the English clock maker John Arnold to describe his sensationally accurate pocket chronometer'no

1/36 bar'. A Timekeeper fulfils the condition that would have to keep time within three seconds per day, a standard that, at the date the reward was offered, has not been attained by the best pendulum clocks on shore. Though Harrison's original invention was complicated, delicate and costly, his successful design led to further investigations by others and eventually to the modern marine chronometer.

HISTORY OF ROBOTICS:

World War 2, the field of bio engineering was essentially unknown and little communication or interaction existed between the engineer and the life scientist. A few heck expectations should be noted. The agricultural engineering and the chemical engineering, involved in fermentation process, have always been bio engineers in the broadest sense of the definition since they deal with biological systems and work with biologists. The civil engineer, specialising in sanitation, has applied biological principles in the work. Mechanical Engineers have worked for many years in the development of artificial limbs. Another area of mechanical engineering that falls in the field of biomedical engineering is the air conditioning field. In the early 1920s engineers and psychologists where employed by the American Society of heating and ventilating engineers to study the effects of temperature and humidity on humans and to provide decent criteria for heating an air conditioning systems. Today there are many more examples of interaction between biology and engineering, particularly in medical and life support fields. In addition to an increased awareness of the need for communication between the engineer an the associate in the life sciences, that is an increasing recognition of the role the engineer can play in several of the biological fields, including human medicine, an awareness of contribution biological science can make toward the solution of engineering problem. In 1950s biological engineering meetings where dominated by sessions devoted to medical electronics. Medical instrumentation and medical electronics continue to be major areas of interest, but biological modelling, blood- flow dynamics, prosthetics, biomechanics, biological heat transfer, biomaterials, and other areas are now included in conference programmes.

BARCODE[DATAFORMAT] :

A printed series of parallel bars or lines of varying with that is used for entering data into a computer system. The bars are typically black and white background and there was with quantity vary according to application. The bars are used to represent the binary digits 0 and 1, sequences of which in turn can represent numbers from 0 to 9 and be processed by a digital computer. The presence or absence of a bar of a particular width in a particular position in a sequence as read by the computer as enter a zero or one. Much most such codes used bars of only two different widths [thick and thin], though some codes employ fourwidths. The Numbers represented by a barcode are also printed out at its base. Barcode information is read by an optical [placer] scanner that this part of a computer system. A hand held scanner or barcode pen is moved across the code, or the court itself is mode by hand across a scanner built into a checkout counter or an other surface. The computer then stores or immediately processes the data in the barcode. The bar codes printed on supermarket and other retail merchandise in the United states are those of universal product code or UPC, which assigns each type of food or grocery product a unique code the UPC system, the five digits on the left or assigned to a particular manufacturer or maker, and the five digits on the right are used by that manufacturer to identify specific type or make of product this is usually the information contained in a barcode. Bar coding was introduced in 1970s and is now a ubiquitous part of routine commercial transactions. Grocery stores use the codes to obtain price and other data about goods at the point of purchase by the former. At a typical supermarket checkout counter, a scanner is used to identify a product through its barcode, and a computer then looks up the items price and feeds that number into the cash register, where it becomes part of the bill for the customers purchases. The chief advantage of barcode systems is that they allow users to process detailed information at the moment the barcode is scanned. Yes barcode systems are now used to track a vast range of products as they are manufactured, distributed, stored, sold, and serviced. These products range from processed foods and dry groups to drugs and medical supplies, automotive parts, computer parts, and even library books.

ROBOTICS, THE FUTURE:

That’s not to imply a drift of progress. Add companies and universities around the world, engineers and computer scientists are devising ways to make robots more perceptive and dextrous. The robotics industry worldwide keeps innovating, combining artificial intelligence and vision and other sensory technologies, according to analytics insight magazine. The magazine noted that newer iterations of robots are easier to setup and programme than their predecessors. Some notable development in 2021 include high- tech ocean robots that explore the underneath worlds waves. A robot named soul that shoots UV rays at the Ebola virus to destroy it, and an AI controlled therapeutic robot that helps caregivers and patients communicate more effectively which reduces stress. More human like in cognitive ability and in some cases appearance. In warehouses and factories at fast food joints and clothing retailers, they’re already working alongside humans. This one, in Germany, can pick like a champ. They are even starting to perform functions that have typically been the domain of humans, such as making coffee, caring for the elderly and crucially, feeling toilet paper. One Redwood City, California- based start-up just got dollar 32 millions in Series A funding to further develop its robots waiters. And here’s a neat knew slipper bot named guitar there even proof left rating down on the farm. But no matter which sector they serve robots are far less advanced than many thought they would be by now. Decades ago Hannaford said, “everyone was focused on energy, and extra plotting humans” use offered a jet can fly to Europe so in 2020 you will be able to go to the mass in passengers vehicle closed quotation what they missed, he went on, is that energy didn’t scale close quotation. Meaning that according to Morris law – theory a number of performance boosting transistors on a computer microchip will double every two years- the cost per unit of energy failed to drop by 50% every 18 months decade after like after decade like the cost of increasingly powerful computing did but other factors continues to have a significant impact on computing and, consequently, robotics. Computing power per Watt of electric power, for instance, is growing dramatically. In every terms, that means your smartphone can do more with the same battery life. It also means quicker advances in artificial intelligence- things like computer vision and natural language processing that helps robots **see** and learn. The writing of more efficient software code is another way to enhance robotic performance. In a couple of decades, for apps, robots might do most of our coding.

*When people see a robot do something, even if it’s a very simple task like picking things and setting them down, they immediately imagine it can do much harder things,**martinelli***. To more effectively drive that point home, right hand invented a game called pick line a robot that requires three people to perform a robots function. One person is blinded folder blindfold are an given a pair of metal talks – they are in charge of grabbing an item in question. Another acts the robots vision system by placing their finger on whichever item they want the picker to choose. The third participant as the robots intelligence, responsible for guiding the picker to probably grab the item. As in robotics, the challenge is to smoothly integrate all of those systems. It is, no shock, extremely challenging. Humans have 100,000 years of evolution that makes us really good at tasks we take for granted to the end of a robot to grab objects. There’s a lot of mechanical engineering that goes into that aspect. How close we are to doing what a human can do depends on the object.

DRONES ARE ROBOTS TOO:

Still third cousins commercial drones have been around in various forms for many decades. And though they are consistently being improved their limited performance wise. In the US, these typically modest sized you babies [on man aerial vehicles] are hampered by strict Federal Aviation Administration regulations that prevent their administer widespread use, especially for commercial purposes, but that's slowly changing. According to PwC, the global drone market is currently worth around dollar 127 billion, a valuation that will only rise as adoption increases in a variety of areas, including home package delivery an medical transport one drone company doing just that is wing aviation LLC. It's owned by Google parent alphabet an helmed by CEO James burgers, who told the times open quotation scare doesn't concern as right now. We strongly believe that, eventually, we will be able to develop a delivery service for communities that will enable them to transport items in just a few minutes at low cost or close quotation. Besides the drones themselves buggies added, being is also working on developing an unmanned traffic management system to track of all the robotic flying machines that might someday seem as common as birds. Then again as drone expert James Rogers argued in a recent essay for the bulletin of atomic scientists, there are downsides to grand scale proliferation. Today's drones already are sparking concerns over safety and privacy. Tomorrow's will be far better- and therefore far worse. And not merrily because there might be geese like gaggles of them busing to and fro. In predicting that drones will be central to the delivery of vital goods and services that keep a nation functioning commercially and socially, Rogers said they'll be regularly employed for mail delivery, law enforcement, fire response and emergency medical purposes among other uses.

Look an move like humans and animals have limited appeal- for now

Outside of a factory or battle setting, some say it's adventures for robots to look more like humans. There where humanoids come in. You may have seen this non sentence artificial beings then bar an slinging 6- shooters in H bios sci-fi drama West world. But their utility in real life depends on the scenario. Over add right hand robotics, Martin Elli said that current focuses on wider consumer adoption of robots that can solve specific problems in commercial settings. Even some very impressive and sensor packed models that can run, jump and flip- including several from Boston dynamics happen aren't in that category. Not yet, anyway. Boston dynamics CEO Marc raibert has said his long term goal is to build robots that have the functional levels of performance that are equal to or greater than people and animals. I don’t mean that they have to work the way that people and animals work or that they have to look like them, just at the level of performance in terms of the ability to move around in the world, the ability to use our hands. One of the biggest problems we have is there is nothing as good as human muscle, Jackson explained. We don’t come anywhere near to what a human can do. The way you will see humanoid robots as in a commercial context. So you might go into a shop and you might see a robot in there that’s trying to sell you might see a robot something. Don’t worry about all the clever a I. That’s really going to stay on the computer. It’s not going to chase you up the stairs anytime soon.

Riseof themachines, the ***future has lots of Robots !***The robots haven’t just landed in the workplace- They are expanding skills, moving up the corporate ladder, showing awesome productivity and retention rates, an increasingly showing aside their human counterparts. One multitasker bought, from momentum mechanics, can make a government hamburger in 10 seconds and could soon replace an entire McDonald’s crew. A manufacturing device from universal robots doesn’t just solder, paint, screw, glue an grasp – it builds knew parts for itself on the fly when they were out or bust.

THANK YOU !!!

-R.Supraja

ECE – D (30)

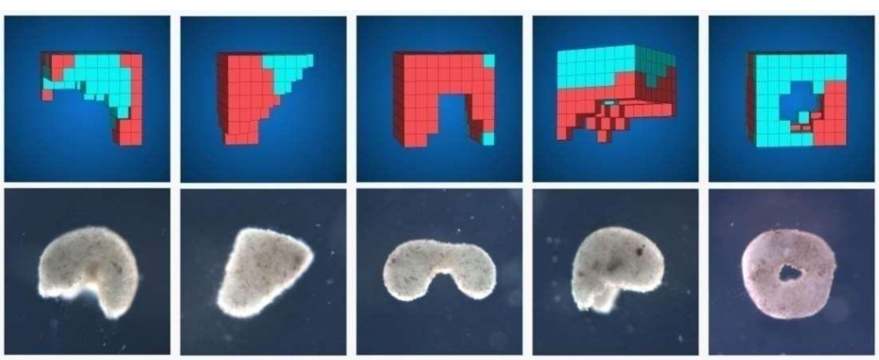
07.12.2021
ECEROBO-054

XENOBOTS – THE WORLD'S FIRST SELF REPLICATING ROBOT

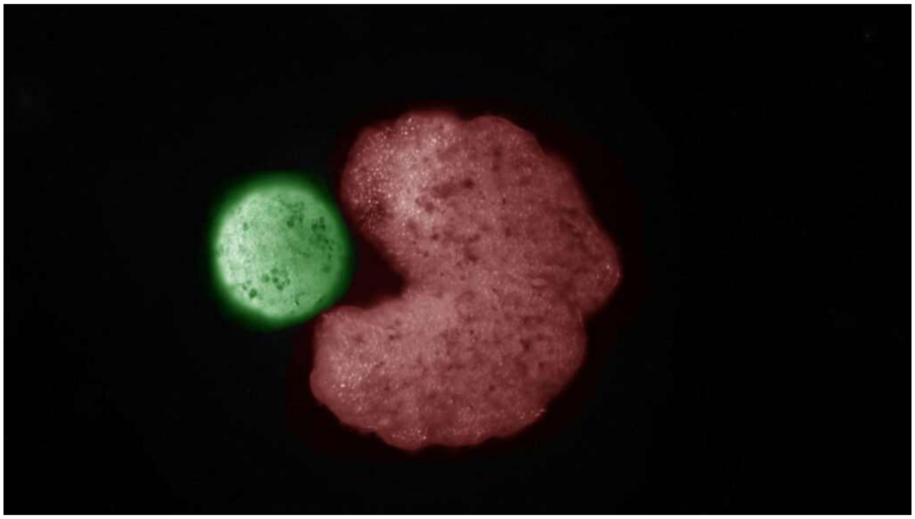
Xenobots - living robots formed from the stem cells of the African clawed frog (xenopus laevis) from which it takes its name, xenobots are less than a millimeter (0.04 inches) wide.

Most people think of robots as made of metals and ceramics but robots are not defined by their material, but by what they can do. In that way it's a robot but it's also clearly an organism made from genetically unmodified frog cell.

Xenobots are composed of just two things: skin cells and heart muscle cells, both of which are derived from stem cells harvested from early (blastula stage) frog embryos.The skin cells provide rigid support and the heart cells act as small motors, contracting and expanding in volume to propel the xenobot forward.



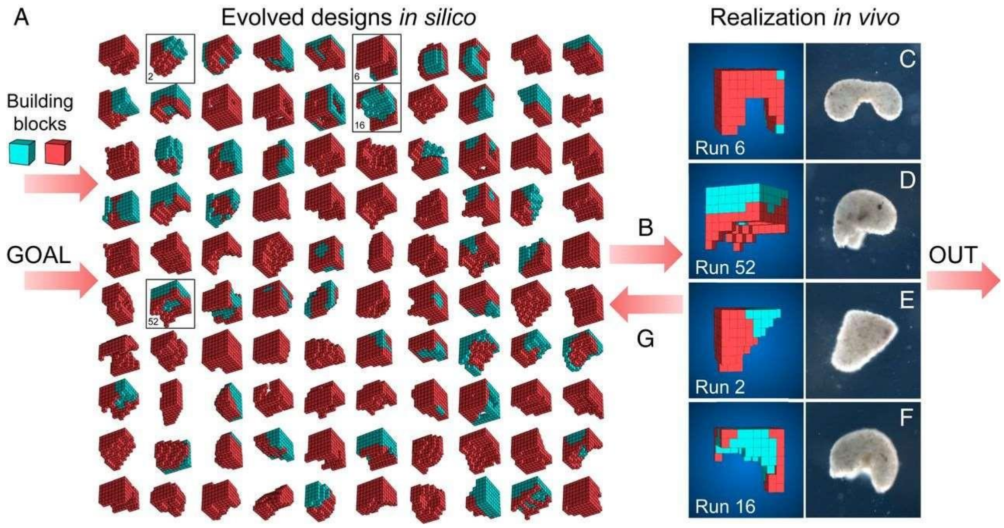
The shape of a xenobot's body, and its distribution of skin and heart cells, are automatically designed in simulation to perform a specific task, using a process of trial and error (an evolutionary algorithm). which were initially sphere-shaped and made from around 3,000 cells but it is not Effective. With the help of artificial intelligence, the researchers then tested billions of body shapes to make the xenobots more effective at this type of replication. The supercomputer came up with a C-shape that resembled Pac-Man, the 1980s video game.



It reproduces themselves by scooping up free-floating cells and assembling them into new clusters. But there are some restrictions in it. It has some environment conditions to reproduce and also, they can only reproduce one generation because the reproduced xenobot will become weak and it doesn't have the ability to reproduce.

The xenobots can survive in aqueous environments without additional nutrients for days or weeks.

It is extremely controllable and stoppable and safe system because if you change the amount of sodium in water to be too high or too low, they will die. So, if something gone wrong, we can control it until it will get emergent behavior (we will discuss in next article breifly)



Applications and uses of xenobots:

- ✓ carry medicine inside human bodies
- ✓ even travel into our arteries to scrape out plaque.
- ✓ clean up radioactive waste
- ✓ collect microplastics in the oceans

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ROBOTICS

What Is Robotics?
Robotics is the intersection of science, engineering and technology that produces machines, called robots, that substitute for (or replicate) human actions. Pop culture has always been fascinated with robots. R2-D2. Optimus Prime. WALL-E. These over-exaggerated, humanoid concepts of robots usually seem like a caricature of the real thing...or are they more forward thinking than we realize? Robots are gaining intellectual and mechanical capabilities that don't put the possibility of a R2-D2-like machine out of reach in the future.

Types of Robots
Mechanical bots come in all shapes and sizes to efficiently carry out the task for which they are designed. All robots vary in design, functionality and degree of autonomy. From the 0.2 millimeter-long "RoboBee" to the 200 meter-long robotic shipping vessel "Vindskip," robots are emerging to carry out tasks that humans simply can't. **Generally, there are five types of robots:**

1) Pre-Programmed Robots
Pre-programmed robots operate in a controlled environment where they do simple, monotonous tasks. An example of a pre-programmed robot would be a mechanical arm on an automotive assembly line. The arm serves one function — to weld a door on, to insert a certain part into the engine, etc. — and its job is to perform that task longer, faster and more efficiently than a human.

2) Humanoid Robots
Humanoid robots are robots that look like and/or mimic human behavior. These robots usually perform human-like activities (like running, jumping and carrying objects), and are sometimes designed to

look like us, even having human faces and expressions. Two of the most prominent examples of humanoid robots are Hanson Robotics’

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3) Autonomous Robots

Autonomous robots operate independently of human operators. These robots are usually designed to carry out tasks in open environments that do not require human supervision.

4) Teleoperated Robots

Teleoperated robots are semi-autonomous bots that use a wireless network to enable human control from a safe distance. These robots usually work in extreme geographical conditions, weather, circumstances, etc. Examples of teleoperated robots are the human-controlled submarines used to fix underwater pipe leaks during the BP oil spill

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The Future of Robots and Robotics

Robots are poised to displace millions of humans in various industries. But they're nowhere close to being human-like.

" It's days like today that I'm pretty sure the robot uprising isn't happening any time soon."

That's what one of Blake Hannaford's grad students told him recently after encountering some challenges in the lab. A robotics professor at the University of Washington in Seattle, Hannaford knew exactly what he meant.
"I'm never going to rule stuff out," Hannaford, whose work focuses primarily on robotic surgery, said of potential advances. "But if you look back on science fiction from the '50s and '60s and compare it to today, it really missed the mark."

In fact, you could argue, pop culture in general has ruined robots. Or at least most people's concept of what robots actually are. According to movies and television, they're bickering *Star Wars* chums R2-D2 and C3PO. They're *Star Trek*'s superhuman Data and *Futurama*'s boozy Bender. And, of course, they're Arnold Schwarzenegger's murderous-turned-virtuous cyborg in the *Terminator* flicks. That dude's the biggest robo-cliché of all. Or maybe it's RoboCop. Tough call.

It may not surprise you in the least to learn that robots are actually none of those. Most of them look nothing like humans and all of them — even the more dazzling models — are pretty rudimentary in their abilities. (Sometimes, too, they're purposely ridiculous — like the "crappy" contraptions of Simone Giertz.)

What Is the Future of Robotics?

That's not to imply a dearth of progress. At companies and universities around the world, engineers and computer scientists are devising ways to make robots more perceptive and dextrous.

The robotics industry worldwide keeps innovating, combining artificial intelligence and vision and other sensory technologies, according to Analytics Insight magazine. The magazine noted that newer iterations of robots are easier to set up and program than their predecessors. Some notable developments in 2021 include high-tech ocean robots that explore the world underneath the waves; a robot

named Saul that shoots UV rays at the Ebola virus to destroy it; and an AI-controlled therapeutic robot that helps caregivers and patients communicate more efficiently, which reduces stress.
More human-like in cognitive ability and, in some cases, appearance. In warehouses and factories, at fast food joints and clothing retailers, they're already working alongside humans. This one, in Germany, can pick like a champ. They're even starting to perform functions that have typically been the domain of humans, such as making coffee, caring for the elderly and, crucially, ferrying toilet paper. One Redwood City, California-based startup just got $32 million in Series A funding to further develop its robot waiters. And here's a neat new schlepper-bot named Gita. They're even proliferating down on the farm. But no matter which sector they serve, robots are far less advanced than many thought they'd be by now.

IS ROBOTICS GOOD FOR THE FUTURE?

It depends on whom you ask. Robots will free human workers for more complex tasks, but also eliminate jobs for an estimated 120 million workers globally, 11.5 million in the United States alone. Commercial drones, another kind of robot, might well be put to use for medical transport, package delivery, but a sky filled with drones presents possible safety and privacy concerns. Humanoid robots will see use in entertainment (think "Westworld") and communication, but not rise to the level of human activity as nothing (as yet) replicates human muscle. The best vision for a world that combines robots and humans is multiplicity, where the two work in tandem.

Decades ago, Hannaford said, "everyone was focused on energy, and extrapolating humans' use of it. "[They thought], 'A jet can fly to Europe, so in 2020 we'll be able to go to Mars in a passenger vehicle.'"

What they missed, he went on, is that "energy didn't scale." Meaning that, according to Moore's Law — a theory (now widely considered defunct) that the number of performance-boosting transistors on a computer microchip will double every two years — the cost per unit of energy failed to drop by 50 percent every 18 months decade after decade like the cost of increasingly powerful computing did.

But other factors continue to have a significant impact on computing and, consequently, robotics. Computing power per watt of electric power, for instance, is growing dramatically. In everyday terms, that means your smartphone can do more with the same battery life. It also means quicker advances in artificial intelligence — things like computer vision and natural language processing that help robots “see” and learn. The writing of more efficient software code is another way to enhance robotic performance. In a couple of decades, perhaps, robots might do most of our coding.

Robots are already performing some human functions, including ones outside of warehouses and more industrial settings. | Photo: Shutterstock

Robots Might Steal Your Job

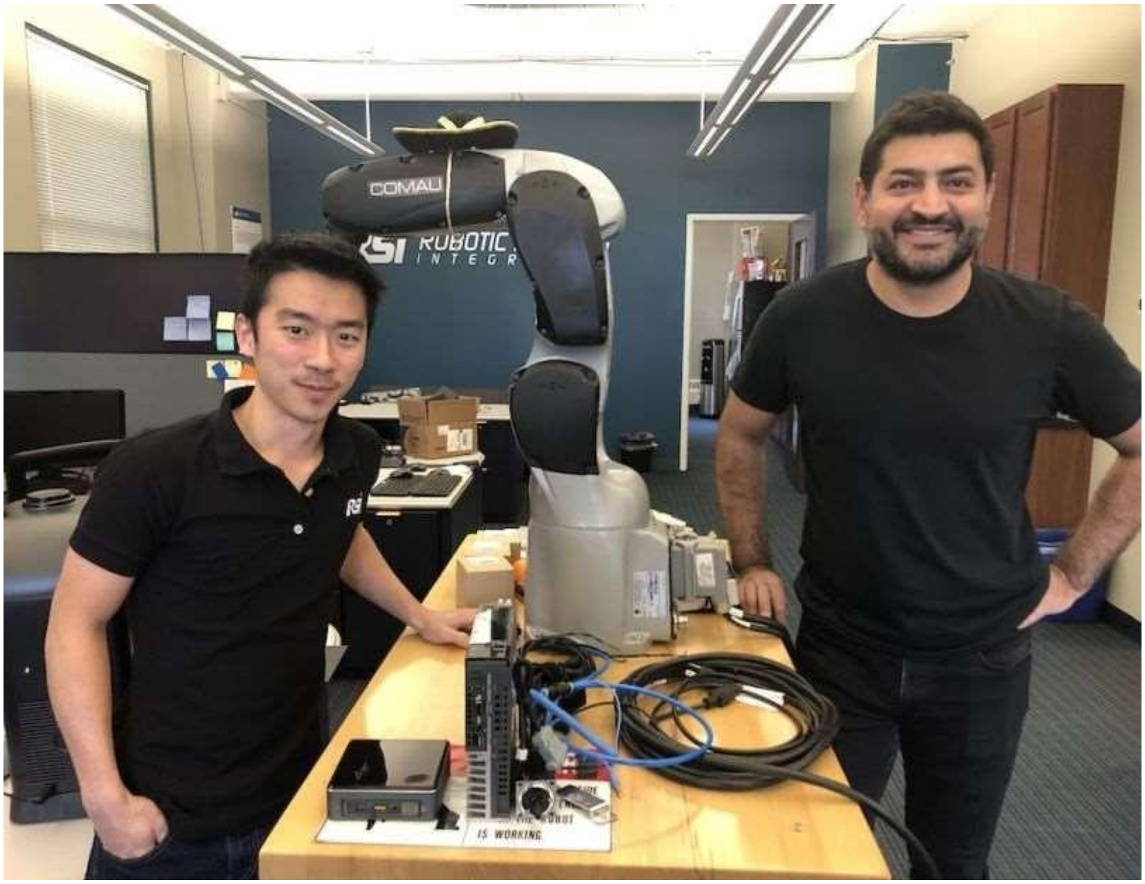
Going forward, Hannaford said, robots will “free up people’s brains” to perform other, more complex tasks. But just as the industrial revolution displaced countless humans who performed manual labor, the robotics revolution won’t happen — and isn’t happening — “without pain and fear and disruption.”

“There’s going to be a lot of people who fall by the wayside,” he said of the countless jobs that will be automated or disappear entirely.

More than 120 million workers worldwide (11.5 million in the U.S. in 2020) will need retraining just in the next few years due to displacement caused by artificial intelligence and robots, according to a recent IBM Institute for Business Values study. Not all of them will get that retraining, of course, but the ones who do will be more apt to land new types of jobs ushered in by the robot revolution.
In a warehouse setting, for example, those who transition to other tasks that require “higher skills” such as thinking and complex movement are far less at risk of getting robo-bumped. And they will get bumped. Vince Martinelli, head of product and marketing at RightHand Robotics outside Boston, is confident that simple but prevalent jobs like warehouse order picking will largely be done by robots in 10 to 20 years. Right now, though, the technology just isn’t there.
But some experts say the more robots outperform humans, the more humans will be expected to keep up.

“As we start to compare the speed and efficiency of humans to robots, there is a whole new set of health and safety issues that emerge,” Beth Gutelius, associate director of the Center for Urban Economic Development at the University of Illinois–Chicago, told the New York Times.
That’s another argument for retraining. As authors Marcus Casey and Sarah Nzau noted in a recent Brookings Institution blog post titled “Robots Kill Jobs. But They Create Jobs, Too”: “The development of technologies that facilitate new tasks, for which

humans are better suited, could potentially lead to a much better future for workers. While the widespread introduction of computers into offices certainly displaced millions of secretaries and typists, the new tasks in associated industries meant new occupations, including computer technicians, software developers and IT consultants."



Robotic Systems Integration COO Raj Bhasin and his associate Si Thu Aung next to an industrial robot that uses RSI's RapidRobot software. | Photo credit: Mike Thomas/Built In

But Humans Are Still Way Smarter Than Robots

"When people see a robot do something, even if it's a very simple task like picking things and setting them down, they immediately imagine it can do much harder things," Martinelli said. "We get lots of questions when people are looking at a system, and we have to keep reminding them that what is simple for you and me to do is actually quite advanced."

To more effectively drive that point home, RightHand invented a game called Pick Like a Robot that requires three people to perform a robot's functions. One person is blindfolded and given a pair of metal tongs — they're in charge of grabbing an item in question. Another acts as the robot's vision system by placing their finger on whichever item they want the picker to choose. The third participant is the robot's intelligence, responsible for guiding the picker to properly grab the item. As in robotics, the challenge is to smoothly integrate all of those systems. It is, no shock, extremely challenging.

Echoing Hannaford's grad student, Robotic Systems Integration COO Raj Bhasin characterizes them as "just a dumb piece of hardware." Their development, he said, is dependent on human ingenuity and advancements in AI that will imbue them with more human-like cognitive abilities that allow them to more accurately perceive, reason and learn. (Facebook, for example, has reportedly developed a reinforcement learning algorithm that lets robots navigate different internal environments sans mapping.) Once AI-driven robots can outperform or even match people in more than just simple and repetitive pre-programmed tasks, we'll really be onto something. "Humans have a hundred thousand years of evolution that makes us really good at tasks we take for granted," Bhasin said at his office in downtown Chicago, where a couple of tabletop-size industrial robots were on display. "A big part of robotics is what's called the end effector — what's mounted to the end of a robot to grab objects. There's a lot of mechanical engineering that goes into that aspect. How close we are to doing what a human can do depends on the object."

Consider the difficulties encountered in Righthand's Pick Like a Robot game and apply them to every mechanical task conceivable. And it's not merely the task, but the speed at which that task is done. Could something like this "ultrasonic gripper" be a solution? Maybe. But presently, Bhasin said, robots are still very slow and deliberate.

Even so, “we’re not going to need a hundred thousand years to make these things as capable as humans are.”
The key to making them more intelligent and more capable, he said, is reliable data that allows robots to learn more on their own and deal with constantly shifting variables, such as oddly shaped or misplaced objects, without human assistance. (As the saying goes, “garbage in, garbage out.”).

Nonetheless, Bhasin said, when it comes to the industrial automation niche his company serves, “I think maybe there’s a misconception that they’ll do much more than they actually will be able to do.”

And though they will undoubtedly increase in number year after year, it might console you to know that U.S.- and Mexico-based companies ordered fewer robots in 2019.

Drones are flying robots that have been around for years and are poised to proliferate in certain commercial sectors. | Photo: Shutterstock

Drones Are Robots Too

Like their industrial third (fourth?) cousins, commercial drones (not to be confused with bomb-dropping military drones) have been around in various forms for many decades. And though they're constantly being improved, they're limited performance-wise. In the U.S., these typically modest-sized UAVs (unmanned aerial vehicles) are hampered by strict Federal Aviation Administration regulations that prevent their widespread use, especially for commercial purposes, but that's slowly changing. According to PwC, the global drone market is currently worth around $127 billion, a valuation that will only rise as adoption increases in a variety of areas, including home package delivery and medical transport.

A March of 2019 New York Times story titled, "Skies Aren't Clogged With Drones Yet, but Don't Rule Them Out," noted that e-commerce drone deliveries have already been green-lighted in China. A similar scenario in the U.S., however, depends on "whether regulators eventually allow drone companies to have autonomous systems in which multiple aircraft are overseen by one pilot and whether they can fly beyond the vision of that pilot."

One drone company doing just that is Wing Aviation LLC. It's owned by Google parent Alphabet and helmed by CEO James Burgess, who told the Times, "scale doesn't concern us right now. We strongly believe that, eventually, we will be able to develop a delivery service for communities that will enable them to transport items in just a few minutes at low cost."

Besides the drones themselves, Burgess added, Wing is also working on developing an "unmanned traffic management system" to keep track of all the robotic flying machines that might someday seem as common as birds.

Then again, as drone expert James Rogers argued in a recent essay for the Bulletin of the Atomic Scientists, there are downsides to grand-scale proliferation. Today's drones already are sparking concerns over safety and privacy. Tomorrow's will be far better — and therefore far worse. And not merely because there might be geese-like gaggles of them buzzing to and fro.

"Think of today's nefarious drones as the Model T of dangerous drones," Rogers wrote. "As drone technologies grow ever more sophisticated, proliferating in an unchecked and under-regulated manner, ‘hostile drone’ incidents will increase in impact and number.”

In predicting that drones will be central to the delivery of “vital goods and services that keep a nation functioning commercially and socially,” Rogers said they’ll be regularly employed for mail delivery, law enforcement, fire response and emergency medical purposes, among other uses.

And each of those sectors, he added somewhat ominously, “will seek to harness the speed and cost-effectiveness of drones, leaving society increasingly vulnerable.”

Robots That Look and Move Like Humans and Animals Have Limited Appeal — For Now

Outside of a factory or warehouse setting, some say it’s advantageous for robots to look more like humans. They’re where humanoids come in. You may have seen these (currently) non-sentient artificial beings tend bar and slinging six-shooters in HBO’s sci-fi drama Westworld. But their utility in real life depends on the scenario.

Over at RightHand Robotics, Martinelli said the current focus is on wider customer adoption of robots that can solve specific problems in commercial settings. Even some very impressive and sensor-packed models that can run, jump and flip — including several from Boston Dynamics — aren’t in that category. Not yet, anyway. Boston Dynamics CEO Marc Raibert has said his long-term goal is to “build robots that have the functional levels of performance that are equal to or greater than people and animals. I don’t mean that they have to work the way that people and animals work, or that they have to look like them, just at the level of performance in terms of the ability to move around in the world, the ability to use our hands.”

Recently, the company's robot dog Spot was made available to a handful of early clients to see how it will fare in the real world. The jury's still out, and will be for some time. But it's a start.

As Will Jackson, director at United Kingdom-based Engineered Arts, told BBC television, "Humanoid robots are great for entertainment and they're great for communication. If you want something that interacts with people, the best way to do that is make something person-shaped."

Like this invention from Agility Robotics. Dubbed "Digit" and reportedly priced in the low-to-mid six figures, it's intended for vehicle-to-door delivery of packages weighing 40 pounds or less. Could we see armies of these things in the years ahead? Maybe. Digit hasn't yet been tested in uncontrolled settings. And if viral YouTube videos are any indication, even a controlled environment is no guarantee of success (#robotfails).

"One of the biggest problems we have is there is nothing as good as human muscle," Jackson explained. "We don't come anywhere near to what a human can do. The way you will see humanoid robots is in a commercial context. So you might go into a shop and you might see a robot in there that's trying to sell you something. Don't worry about all the clever AI. That's really going to stay on your computer. It's not going to chase you up the stairs anytime soon."

Robots Are Going Soft

But researchers in a newish niche called "soft robotics" are working on mimicking human motion. Developing high-performing robotic brains is incredibly difficult. Getting robots to physically react like people do is even harder, as mechanical engineer Christoph Keplinger explained during a fascinating TEDx talk in late 2018.

"The human body makes extensive use of soft and deformable materials such as muscle and skin," he said. "We need a new generation of robot bodies that is inspired by the elegance, efficiency and by the soft materials of the designs found in nature."

Calling biological muscle “a true masterpiece of evolution” that can heal after being damaged and is “tightly integrated with sensory neurons for feedback on motion and the environment,” Keplinger described his efforts to build artificial muscles called “soft activators” that are as versatile and adaptable as the real thing.

To that end, he and his team in Boulder, Colorado, invented something they dubbed HASEL — hydraulically amplified self-healing electrostatic actuators, which are mechanisms that control movement. Besides expanding and contracting like real muscle, Keplinger claimed, the young technology can be operated more quickly. In addition, he went on, HASEL can be adjusted to deliver larger forces for moving heavy objects, dialed down for more precise movement, and programmed to “deliver very fluidic muscle-like movement and bursts of power to shoot up a ball into the air.”

Besides being compatible with large-scale manufacturing applications, he noted, HASEL technology also could be used to “improve the quality of life” for those who need prosthetic limbs, as well as older people who would benefit from enhanced agility and dexterity.

“Maybe we can call it robotics for anti-aging,” Keplinger said, “or even a next stage of human evolution.”

We’re Not Ready for the Automated Future

To briefly recap:

- Today’s robots are pretty dunderheaded.

- Tomorrow’s robots will be less dunderheaded thanks to advancements in artificial intelligence — particularly machine and deep learning.
- Humans will be replaced by robots in some jobs and complemented by them in many others.
- New jobs will be created, providing employment opportunities for retrained workers and others who have the requisite skills.

For Hannaford, investing in education is the best way to both temper and harness the impact robots will have and increasingly are having. He lamented, however, that society does far too little of that — and therefore is woefully underprepared not only for what’s coming, but what’s happening right now. Among industrialized nations, he said, the U.S. is especially vulnerable.

“Many Americans are not equipped to earn their living in a future society where all the routine tasks are automated. That’s going to be a big, big problem. But it is ultimately solvable by raising our educational standards.”

As for the persistent notion of a post-apocalyptic hellscape patrolled by homicidal cyborgs, that’s pure fiction. Probably. What we’re living through now, and what the future holds more of, is what roboticist Ken Goldberg has described as “multiplicity.” It’s much friendlier than what’s known as “the singularity,” a point at which humans are (hypothetically) overtaken by fully autonomous and even sentient robots. In fact, Goldberg told Wired in 2018, multiplicity is “something that’s happening right now, and it’s the idea of humans and machines working together.” When you order up a car via Uber or Lyft, that’s multiplicity. Or when, down the road, you ride in a self-driving vehicle — that’s multiplicity too.

“The way we have to start thinking about robots is not as a threat, but as something that we can work with in a collaborative way,” he added. “A lot of it is changing our own attitudes.”

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APPLICATIONS AND VARIOUSTYPES OF ROBOTS

Abstract:

The 21st century is a century for robotics. Robots have long borne the potential to bridge the gap between the cybernetic world (the internet of things) and the physical world. As the most promising candidate to theme the next major industrial revolution succeeding the present third (digital) industrial revolution, robotics is set to play an ever increasingly important role in society for its influence in every aspect of life in Hong Kong, including medicine and healthcare, building service, manufacturing, food production, logistics and transportation.

Medical Robots:

The new trends in robotics research have been denominated service robotics because of their general goal of getting robots closer to human social needs.

In recent years, the field of medicine has been also invaded by robots, not to replace qualified personnel such as doctors and nurses, but to assist them in routine work and precision tasks.Medical robotics is a promising field that really took off in the 1990s. Since then, a wide variety of medical applications have emerged: laboratory robots, telesurgery, surgical training,remote surgery, telemedicine and teleconsultation, rehabilita-tion, help for the deaf and the blind, and hospital robots.

Medical robots may be classified in many ways: by manipu-lator design (e.g., kinematics, actuation); by level of autonomy(e.g., preprogrammed versus teleoperation versus constrained cooperative control); by targeted anatomy or technique (e.g.,cardiac, intravascular, percutaneous, laparoscopic, micro-surgi-cal); by intended operating environment [e.g., in-scanner,conventional operating room (OR)], etc. Research remains open in the field of surgical robotics, where extensive effort has been invested and results are impressive. Some of the key technical barriers optical overlay methods, in which graphic information is superimposed on

the surgeon's field of view to improve the information provided [17]. As surgeons frequently have their hands busy, there has been also interest in using voice as an interface. Force and haptic feedback is another powerful interface for telesurgery

applications [18]. Much of the past and present work on telesurgery involves the use of master-slave manipulator sys-tems [19], [20]. These systems have the ability to feed forces back to the surgeon through the master manipulator, although slaves' limitations in sensing tool-to-tissue forces can some-what reduce this ability.

The field of medical robotics is expanding rapidly and results are impressive as a large number of commercial devices are being used in hospitals. However, societal barri-ers have to be overcome and significant engineering research effort is required before medical robots have wide- spread impact on health care.

Rehabilitation Robots:

The past decades have seen rapid and vast developments of robots for the rehabilitation of sensorimotor deficits after damage to the central nervous system (CNS). Many of these innovations were technology-driven, limiting their clinical application and impact.

Activity in the field of rehabilitation robotics began in the1960s [21] and has slowly evolved through the years to a point where the first commercially successful products are now available. Today, the concept of "rehabilitation robot" may include a wide array of mechatronic devices ranging from artificial limbs to robots for supporting rehabilitation therapy or for providing personal assistance in hospital and residential sites. Examples include robots for neuro-rehabilitation [22],poweraugmentatioorthosis [23], rehabilitative orthosis, etc.. However, the specifications for robots in these two application areas are very different. The differences arise from the involvement of the user in rehabilitation applications.Industrial robots are typically powerful and rigid to provide speed and accuracy. They operate autonomously and, for rea-sons of safety, no human interaction is permitted. Rehabilitation robots must operate more slowly and be more compliant to facilitate safe user interaction. Thus, rehabilitation robotics is more akin to service robotics, which integrates humans and robots in the same task. It requires safety and special attention must be paid to human machine interfaces that have to be adapted for disabled or nonskilled people operating a specific programming device. It is also recognized that there is a need for research and development in robotics to focus on developing more flexible systems for use in unstructured environments. The leading developments of this type in rehabilitation robotics concern, among other topics, mechanical design(including mobility and end-effectors), programming, control and man machine interfaces [25]. Subsection "Humanoid Robots" of this article expands on new research into human robot interaction.

Biologically Inspired Robots:

After having stressed the difference between bio-inspired and biomimetic robots, this chapter successively describes bio-inspired morphologies, sensors, and actuators. Then, control architecture that, beyond mere reflexes, implement cognitive abilities like memory or planning, or adaptive processes like learning, evolution and development are described. Finally, the chapter also reports related works on energetic autonomy, collective robotics, and biohybrid robots.

Apart from traditional mobile vehicles that use wheels and tracks as locomotion systems, there is widespread activity in introducing inspiration from biology to produce novel types of robots with adaptive locomotion systems. Probably the most widely used biologically inspired locomotion system is the leg. However, there are some research groups focusing on other types of locomotion, such as the systems used by snakes and fishes. Our survey here will focus on walking robots and humanoid robots because of their more extended use. Both walking robots and humanoids use legs as their locomotion systems; however they differ in their research topics and servic applications. Moreover, research on humanoid robotics does not only involve all aspects related to locomotion, but includes research on other "human" aspects as well, such as communication, emotion expression and so on. For this reason, we survey them separately.

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ARTICLE ABOUT THE ROBOTICS

INTRODUCTION

In recent years, there has been increased attention on the possible impact of future robotics and AI systems. Prominent thinkers have publicly warned about the risk of a dystopian future when the complexity of these systems progresses further. These warnings stand in contrast to the current state-of-the-art of the robotics and AI technology. This article reviews work considering both the future potential of robotics and AI systems, and ethical considerations that need to be taken in order to avoid a

dystopian future. References to recent initiatives to outline ethical guidelines for both the design of systems and how they should operate are include.

POTENTIAL OF ROBOTICS

However, robots and autonomous systems are gradually expected to have widespread exploitation in society in the future including selfdriving vehicles and service robots at work and at home. The hard question to answer is how quickly we will see a transformation. The technologies that surround us take many shapes and have different levels of developmental progress and impact on our lives. A coarse categorization could be the following:

•Industrial robots: these have existed for many years and have made a huge impact within manufacturing. They are mostly preprogrammed by a human instructor and consist of a robot arm with a number of degrees of freedom.

• Service robots: a robot which operates semi- or fully autonomously to perform useful tasks for humans or equipment but excluding industrial automation applications. They are currently applied in selected settings such as internal transportation in hospital, lawn mowing and vacuum cleaning.

• Artificial intelligence: software that makes technology able to adapt through learning with the target of making systems able to sense, reason, and act in the best possible way. There has, in recent years, been a large increase in the deployment of artificial intelligence in a number of business domains including for customer service and decision support.

HOW SIMILAR TO HUMANS SHOULD ROBOTS BECOME

How similar to the biological specimen can a robot become? It depends on developments in a number of fields such as AI methods, computing power, vision systems, speech recognition, speech synthesis, human–computer interaction, mechanics and actuators or artificial muscle fibre. It is definitely an interdisciplinary challenge. Given that we are able to actually create human-like robots, do we want them? Thinking of humanoid robots taking care of us when we get old would probably frighten many. It predicts that as robots get more similar to humans, the pleasure of having them around increases only until a certain point. When they are very similar to humans, this pleasure falls abruptly. Such robots might feel like the monstrous characters from sci-fi movies, and the reluctance to interact with robots increases.The fact that we are developing human-like robots means that they will have human-like behaviour, but not human consciousness. They will be able to perceive, reason, make decisions, and learn to adapt but will still not have human consciousness and personality. There are philosophical considerations that raise this question, but based on current AI, it seems unlikely that artificial consciousness would be achieved anytime soon. There several arguments supporting this conclusion, including that consciousness can only arise and exist in biological matte. Still, robots would, through their learning and adaptation capabilities, potentially be very good at mimicking human consciousness.

“Humans, limited by slow biological evolution, couldn’t compete and would be superseded by A.I.”

ETHICAL CHALLENGES AND DEVELOPING ADVANCED ROBOTS

Ethical perspectives of AI and robotics should be addressed in at least two ways. First, the engineers developing systems need to be aware of possible ethical challenges that should be considered including avoiding misuse and allowing for human inspection of the functionality of the algorithms and systems. Second, when moving toward advanced autonomous systems, the systems should themselves be able to do ethical decision making to reduce the risk of unwanted behaviour.

Most engineers would probably prefer not to develop systems that could hurt someone. Nevertheless, this can potentially be difficult to predict. We can develop a very effective autonomous driving system that reduces the number of accidents and save many lives, but, on the other hand, if the system takes lives because of certain unpredictable behaviours it would be socially unacceptable. It is also not an option to be responsible for creating or regulatory approve a system where there is a real risk for severe adverse events. We see the effect of this in the relatively slow adoption of autonomous cars. One significant challenge is that of automating moral decisions, such as the possible conflict between protecting a car’s passengers relative to surrounding pedestrians.

ETHICAL SOCIETY CHALLENGES ARISIND WITH ROBOTS

• Future jobs: How much and in what way are we going to work with increased automation? If machines do everything for us, life could, in theory, become quite dull. Normally, we expect that automating tasks will result in shorter working hours. However, what we see is that the distinction between work and leisure becomes gradually less evident, and we can do the job almost from anywhere. Mobile phones and wireless broadband give us the opportunity to work around the clock.

• Technology risk: *Losing human skills due to technological excellence*. The foundation for our society for hundreds of years has been training humans to make things, function, work in and understand our increasingly complex society. However, with the introduction of robots, and information and communication technology, the need for human knowledge and skills is gradually decreased with robots making products faster and more accurately than humans. Further, we can seek knowledge and be advised by computers.

GUIDELINES FOR ROBO DEVELOPERS

Subsequently, his three rules have often been referenced in the science fiction literature and among researchers who discuss robot morality:

***** A robot may not harm a human being, or through inaction, allow a human to be injured.

***** A robot must obey orders given by human beings except where such orders would conflict with the first law.

***** A robot must protect its own existence as long as such protection does not conflict with the first or second law.

• Safety. There must be mechanisms control and limit a robot’s autonomy.

• Security. There must be a password or other keys to avoid inappropriate and illegal use of a robot.

• Traceability. As with aircraft, robots should have a “black box” to record and document their own behaviour.

• Identifiability. Robots should have serial numbers and registration number similar to cars.

• Privacy policy. Software and hardware should be used to encrypt and password protect sensitive data that the robot needs to save.

CONCLUSION

The article has presented some perspectives on the future of AI and robotics including reviewing ethical issues related to the development of such technology and providing gradually more complex autonomous control. Ethical considerations should be taken into account by designers of robotic and AI systems, and the autonomous systems themselves must also be aware of ethical implications of their actions.

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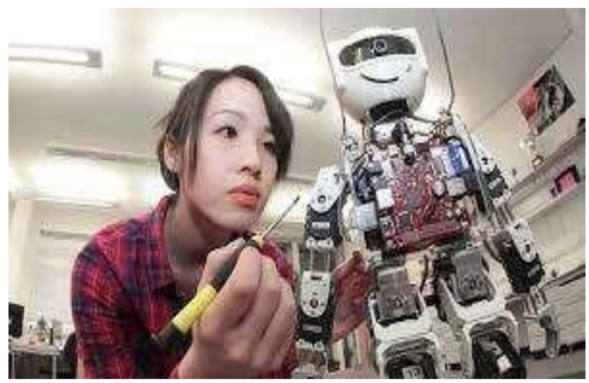
CAREER OPPORTUNITIES IN ROBOTICS

INTRODUCTION:

"MACHINE INTELLIGENCE IS THE LAST INVENTION THAT HUMANITY WILL EVER NEED TO MAKE"

As the quote suggest we can't even imagine a future without robots or it's applictions, so choosing a carrer in the field of robotic would be a nourishing idea. Robotics is a branch of engineering which deals with the making of robots. Robotsare Programmed machines Which are able to carry Out tasks autonomously or semi- autonomously for the better working Of the company. It involves designing, Building and Programming of phsycial robots, to Troubleshoot the problems in many domains of operations and manufacturing. This is very useful in fields including transporation, manufacturing, production, medical, army .it is an interdisciplinary branch of mechanical and electrical Engineering.



Career Opportunities in Robotics

- Space Research

Robotics Engineer can work in space research organizations like ISRO, NASA, etc, which makes uses of robotic technology and Artificial Intelligence

- ❖ Medical

Robots are majorly used in surgery and rehabilitation sector of medicine. They also specialize in human treatment through therapeutic robotic devices.

- ❖ Entertainment

Robotics specialists are sought after in the gaming industry, making video games enthralling the audience with artificial intelligence embedded with robotics

- ❖ Private Organizations

Robotics engineers build, design and test robotic systems and software for private companies for the automization of the activities of a company

- ❖ Investigation

Robots are widely used in investigation agencies and police departments. They use artificial intelligence and robots to detect hazardous material like bombs and even defuse them

- ❖ Banking

Robots are also used in banking sector for managing operations, stocks, etc

How to Pursue a Career in Robotics

	Stream	Graduation	After Graduation	After Post Graduation
Path 1	Clear Class XII with Science with Maths stream	Pursue B.Tech/B.E in Robotics/Mechatronics Engineering	Pursue M.Tech in specialized branch of robotics	Ph.D in the area of specialization.
Path 2	Clear Class XII with Science with Maths stream	Pursue B.Tech /B.E in Electronics /Mechanical /Electrical /Computer Science and Engineering/ Instrumentation & Control Engineering/ Electrical and Electronics Engineering	Pursue M.Tech in Robotics/Mechatronics/ or any other specialized field	Ph.D in the area of specialization.

Important Facts:

- Robotics engineering is rarely taught and sought in India , be it a NIT or IIT. Mechatronics is the most related and sort field for people interested in robotics.
- You can also work in the field of robotics, with a associate degree(2 year) in robot technology or similar field, and work as an assistant to robotics engineer.
- Most college have eligibility criteria of minimum 50% aggregate marks in Class XII / and some of minimum 60%. Some colleges/universities also have an age limit.
- Most colleges require JEE score as minimum eligibility for Under graduation degree.

Work Description

- They perform engineering activities in planning and designing tools, engines, to create / programmed machines and robots.
- Develop, co-ordinate, or monitor all aspects of production or operation of product designs.
- They do extensive research in various mechanical and robotic technologies to update their robot with upcoming technology.
- They modify computer controlled motion of robots and automated machines.
- Develop, test and evaluate robot designs.
- Install and test robots for defects after assembly.

PROS & CONS OF A CAREER IN ROBOTICS

Pros

- **Job security:** Since this career has less entrants, the demand of robotic professionals is high. Innovation has no stop in the technology journey, making the job opportunities highly rewarding, and satisfying.
- **Prestige:** They generally innovate and improve the existing process, working on various models, with like-minded educated people, creating a name in the world of technology. This makes the profession highly demanded and unique, where the work is attached with prestige.
- **Diverse:** The application of this industry is spread across various areas being production, manufacturing, power maintenance, mining, nuclear power, medical, automobile industry and many more. This gives the added benefit to switch fields, and accelerate growth.

Cons

- **Geographical Restraint:** Robotics job are specific and professional opportunities would not be in abudance in small cities.
- **Long work hours, high stress and patience :** The job is very demanding. It requires physical, mental and emotional involvement and drains his/her energy.
- **Continuing Education:** A master's degree is required for better job opportunities in this field. Also, continuing upgradation of your knowledge and skills for the job, requires you to look for short term/long term certification to gain expertise.

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REAL-LIFE ROBOTS THAT WILL MAKE YOU THINK THE FUTURE IS NOW

We know that day is a long way off, but technology is getting better all the time. In fact, some high-tech companies have already developed some pretty impressive robots that make us feel like the future is here already. These robots aren't super-intelligent androids or anything - but hey, baby steps. I've rounded up real-life robots you can check out right now, with the purpose of getting you excited for the robots of tomorrow

Z-Machine A team of Japanese roboticists created a music-performing band of robots called Z-Machines. It has a guitarist with 78 fingers and a drummer with 22 arms.Recordlabel Warp Records said last autumn it would release an album performed by the band. Composer Squarepusher also promised to make music with it.

Kuri

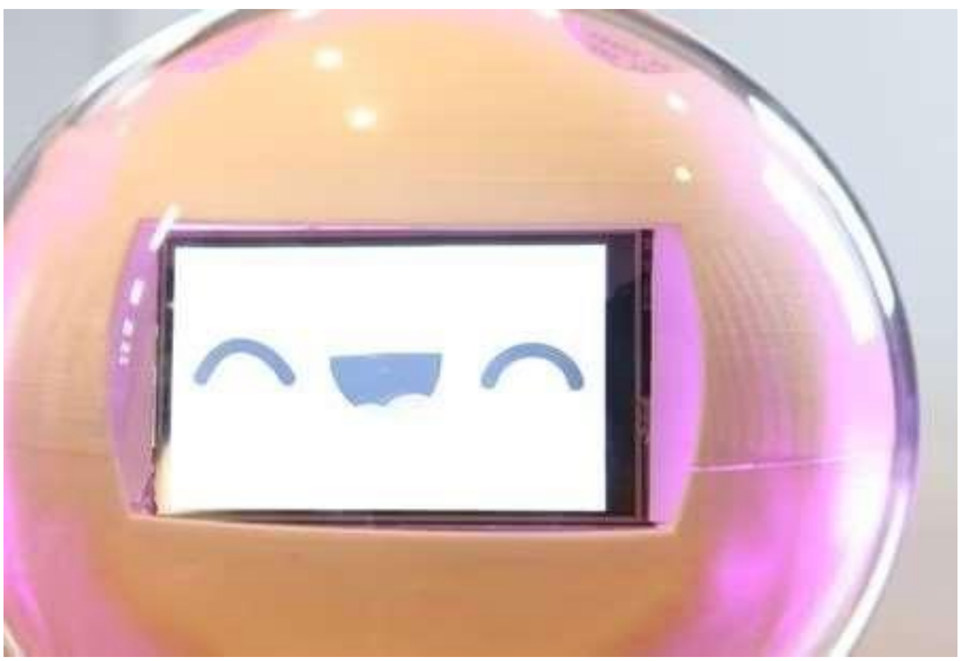
Kuri by Mayfield Robotics is a $700 robot companion described as “an intelligent robot for the home”.

This robot features Wi-Fi, Bluetooth, a 1080p camera, facial recognition, microphones, speakers, touch sensors, a “laser-based sensor array”, sturdy wheels, and speech recognition. Kuri makes beeping noises and can move its head and eyes to communicate.

Leka

Leka is a $390 robot for special-needs children. It helps them to better understand social and visual cues. It’s shaped like a ball and face that changes expressions. It also uses sound, light, and colours to interact.

Leka responds with positive images and sounds, such as a smiling face, and it features customizable, multiplayer games based around colour identification, picture matching, hide-and-seek, etc.



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ROBOTICS TOMORROW

We’re fascinated with robots because they are reflections of ourselves.”-Ken Goldberg

Historically, the role of robotics in space exploration has been significant due to the uninhabitable conditions of non-terrestrial planets in the solar system. According to AZO Robotics, a robot is defined as “a self-controlled device consisting of electronic, electrical or mechanical units that can function in place of a living agent.” In this post, you'll learn some basic history about robots in space exploration and 5 of the most popular robotics systems used in space history.Before scientists began sending robots to space, animals such as dogs or monkeys were often sent to complete tasks and conduct experiments in order to increase human knowledge of conditions on other planets and the Moon.As robotic technology has improved, more of these experiments and tasks have been delegated to robots rather than to living beings; in this way robotics preserves lives.The first robot ever sent to space was Sputnik 1, sent by the USSR on October 4, 1957, according to NASA. Sputnik 1 was the first artificial Earth satellite and the first object created by humans to orbit Earth. The launch of Sputnik 1 marked the beginning of the notorious “space race” between the United States and the USSR. Thereafter, engineers increasingly began constructing robots to be sent to non-terrestrial planets for a variety of purposes ranging from close-up photography of planets to determination of whether other planets sustain life.According to Universe Today, on December 14, 1962, the American space probe Mariner 2 became the first robotic space probe to complete a successful Venus flybyMariner 4, the first orbiter sent to space, then took the first proximal photos of Mars on July 14, 1965. While the role of landers is primarily to detect signs of life on planets, the role of orbiters is primarily to take photos for scientists to observe and analyze.Nearly a year later, on July 20, 1976, Viking lander

1 became the first United States spacecraft to land on the surface of Mars, specifically landing in a region known as Chryse Planitia. On September 3, 1976 the Viking 2 lander touched down at a different region of the planet, known as Utopia Planitia. While the Viking mission was only expected to last 90 days after each lander touched down, both landers overstayed beyond their designed lifetimes. Viking Orbiter 1 completed 1,489 orbits, ending its mission on August 7, 1980 while Viking Orbiter 2 concluded its mission on July 25, 1978. Both landers were powered by radioisotope thermoelectric generators which enable them to transmit information to Earth for longer time spans. Viking Lander 1's final transmission to Earth was on November 11, 1982 while Viking Lander 2's last transmission was April 11, 1980.More recently, the Canadian Space Association launched Dextre, a robotic arm designed to "install and replace small equipment such as exterior cameras or the 100-kg batteries used on the Space Station,Dextre is currently operated by ground control teams from both the Canadian Space Association and NASA. Dextre's hands alone are complete with a motorized wrench, a retractable power connector, data and video connection, camera and lights. Dextre's hands are designed to be able to grip bulky and fragile equipment alike, making Dextre adaptable to varying conditions and projects. In 2008, Dextre was installed on the International Space Station and thenlaunched onboard Space Shuttle Endeavour.As technology progresses, robots increasingly serve as humans' contemporary window to the world beyond Earth.

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ROBO (TICS) – AUTOMATICS

INTRODUCTION:

YES! SIR JOSEPH F ENGELBERGER , an engineer credited with creating the world's first industrial robot. Robotics and automations are both eyes of today modern world , Automation with robotics finds its major role in Industrial applications.

Robotics and industrial automation refers to use of control systems, computers and information technology in handling various processes and machinery in industry. The ultimate aim is to replace manual labor and increase efficiency, speed and overall performance

Typical applications of robots include welding, painting, assembly, dis-assembly, pick and place for labelling, palletizing, product inspection and testing; all accomplished with high endurance, speed and precision. They can assist in material handling.

COMPONENTS OF INDUSTRIAL ROBOTS:

Let's see what's inside this industrial bots,

There are mainly consists of **Five** parts,

- **CONTROLLER**
- **SENSORS**
- **ROBOT ARM**
- **END EFFECTOR**
- **DRIVE**

CONTROLLER:

The robot controller is computer that is connected to robot and serves as its **“BRAIN”.** The controller is used to instruct the robot on how to operate through**CODE** , which is more commonly referred to as **PROGRAM.** Robotics commands are given as input into controller through the use of teach pendant. Once program uploaded into controller the **CPU** allows the robot to process and run the program.


fig shows Controller unit

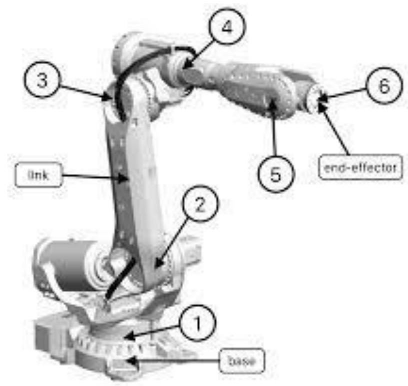
SENSORS:

The most common types of sensors includes vision system and microphones as these acts as eyes and ears of a robot. It allows robot to their work environment by sending signals to the robot’s CPU.

ROBOT ARM:

An industrial robot arm is used to position the robot’s end effector. Robotic arms are designed to mimic the human arm with **shoulder, elbow** and **wrist** like parts. These parts allow robot to position and effector in order to perform an application. The parts of robots arm each serves as an individual degree of freedom or axis.

END-EFFECTOR:



End effectors are attached to the end of a robot arm and act as the robot's hand.

These are commonly referred to as end of arm tooling (EOAT) and vary depending upon the application type. In the strict definition, which originates from serial robotic manipulators, the end effector means the last link of the robot.

figure shows various kinds of end effector tools, which attach to its end.

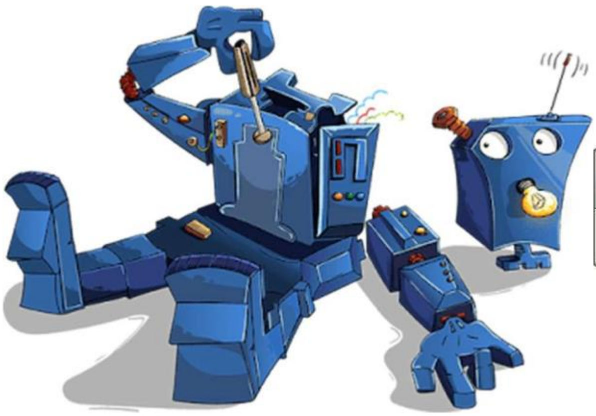
DRIVE:

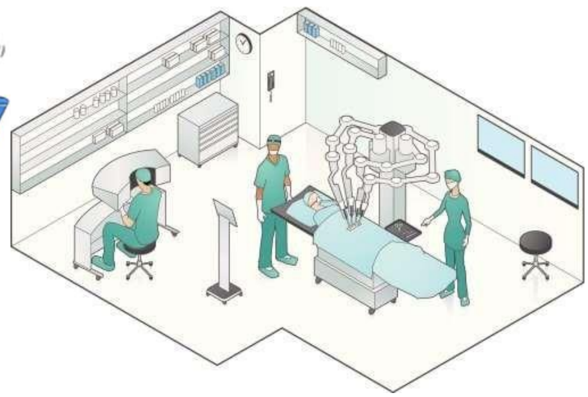
The drive of an industrial robot is the engine or motor which moves the different robot parts around. Robot drives are typically powered hydraulically, electrically, or pneumatically. Hydraulic drives can provide increased power and speed, while electric drives tend to be less powerful. Smaller robots typically utilize pneumatic drives.

fig shows Drive of industrial robot

CONCLUSION:

Robotics has to mainly capture the many industries like pharmaceutical, manufacturing, FMCG, inspection, and packaging, and the other promising sectors also include defense, education, and more than the scope of robotics and automation have to faster-growing world-wide. There is no doubt that robotics technologies can change the whole world in the future.





-fig shows the future scope of robotics

"BE INNOVATIVE, BE FUTURISTIC"- ARIHARAN & NAGASUBRAMANIAN

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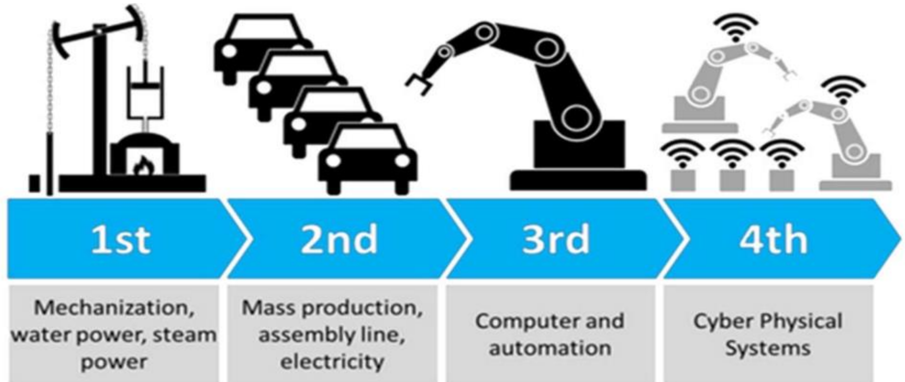
FOURTH INDUSTRIAL REVOLUTION

(IR 4.0)

The **Fourth Industrial Revolution (IR 4.0)** is a term that describes present technological age. It is the fourth industrial era since the inception of the initial Industrial Revolution of the 18th century. The key



elements of the fourth revolution are the fusion of technologies ranging from the physical, digital to biological spheres. Prime Minister gave an institutional shape to the expression by launching the Centre for Fourth Industrial Revolution in India.

Characteristics of IR 4.0:

- It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.
- It brings together digital technology and the physical world to create a new range of products and services.
- The possibilities of billions of people connected by mobile devices, with unprecedented processing power, storage capacity, and access to knowledge, are unlimited.
- And these possibilities will be multiplied by emerging technology breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.

Agriculture Sector:

- AI can be used to predict advisories for sowing, pest control, input control can help in ensuring increased income and providing stability for the agricultural community.
- Precision agriculture uses AI technology to aid in detecting diseases in plants, pests, and poor plant nutrition on farms.
- Climate pattern and effects on different crops can be analysed using AI software which will help in prediction of the best crop for the season and the possible outcomes.

Manufacturing sector:

- Robots are being used for manufacturing since a long time now; however, more advanced exponential technologies have emerged such as additive manufacturing (3D Printing) which with the help of AI can revolutionize the entire manufacturing supply chain ecosystem.
- The predictive maintenance of machineries would lead to reduced operational cost
- IR technologies would be helpful in minimizing deterioration in the quality of the machinery.
- Robots can perform the tasks given by a human because of sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure.

CONCLUSION

Industrial Revolution that first began in Great Britain and later in United States (after end of Civil War) has helped nations in developing faster and easier means of mass production. It has transformed lives of people in many ways over about 250 years. India is also catching up with focussing on Industrial Revolution 4.0. Development of new technologies in this era can help the nations in many ways if these technologies are used effectively for the welfare of mankind.

Compiled by

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ECE III-C , Id:ECEROBO-094

ENGINEERS CREATE PERCHING BIRD-LIKE ROBOT

"It's not easy to mimic how birds fly and perch," said William Roderick, PhD '20, who was a graduate student in both labs. "After millions of years of evolution, they make take-off and landing look so easy, even among all of the complexity and variability of the tree branches you would find in a forest."

Years of study on animal-inspired robots in the Cutkosky Lab and on bird-inspired aerial robots in the Lentink Lab enabled the researchers to build their own perching robot, detailed in a paper published Dec. 1 in *Science Robotics*. When attached to a quadcopter drone, their "stereotyped nature-inspired aerial grasper," or SNAG, forms a robot that can fly around, catch and carry objects and perch on various surfaces. Showing the potential versatility of this work, the researchers used it to compare different types of bird toe arrangements and to measure microclimates in a remote Oregon forest.

A bird bot in the forest

In the researchers' previous studies of parrotlets -- the second smallest parrot species -- the diminutive birds flew back and forth between special perches while being recorded by five high-speed cameras. The perches -- representing a variety of sizes and materials, including wood, foam, sandpaper and Teflon -- also contained sensors that captured the physical forces associated with the birds' landings, perching and takeoff.

"What surprised us was that they did the same aerial maneuvers, no matter what surfaces they were landing on," said Roderick, who is lead author of the paper. "They let the feet handle the variability and complexity of the surface texture itself." This formulaic behavior seen in every bird landing is why the "S" in SNAG stands for "stereotyped."

Just like the parrotlets, SNAG approaches every landing in the same way. But, in order to account for the size of the quadcopter, SNAG is based on the legs of a peregrine falcon. In place of bones, it has a 3D-printed structure -- which took 20 iterations to perfect -- and motors and fishing line stand-in for muscles and tendons.

Each leg has its own motor for moving back and forth and another to handle grasping. Inspired by the way tendons route around the ankle in birds, a similar mechanism in the robot's leg absorbs landing impact energy and passively converts it into grasping force. The result is that the robot has an especially strong and high-speed clutch that can be triggered to close in 20 milliseconds. Once wrapped around a branch, SNAG's ankles lock and an accelerometer on the right foot reports that the robot has landed and triggers a balancing algorithm to stabilize it.

During COVID-19, Roderick moved equipment, including a 3D printer, from Lentink's lab at Stanford to rural Oregon where he set up a basement lab for controlled testing. There, he sent SNAG along a rail system that launched the robot at different surfaces, at predefined speeds and orientations, to see how it performed in various scenarios. With SNAG held in place, Roderick also confirmed the robot's ability to catch objects thrown by hand, including a prey dummy, a corn hole bean bag and a tennis ball. Lastly, Roderick and SNAG ventured into the nearby forest for some trial runs in the real world.

Overall, SNAG performed so well that next steps in development would likely focus on what happens before landing, such as improving the robot's situational awareness and flight control.

BACK TO NATURE

There are countless possible applications for this robot, including search and rescue and wildfire monitoring; it can also be attached to technologies other than drones. Snag's proximity to birds also allows for unique insights into avian biology. For example, the researchers ran the robot with two different toe arrangements -- anisodactyl, which has three toes in front and one in back, like a peregrine falcon, and zygodactyl, which has two toes in front and two in back, like a parrotlet. They found, to their surprise, that there was very little performance difference between the two.

For Roderick, whose parents are both biologists, one of the most exciting possible applications for SNAG is in environmental research. To that end, the researchers also attached a temperature and humidity sensor to the robot, which Roderick used to record the microclimate in Oregon.

"Part of the underlying motivation of this work was to create tools that we can use to study the natural world," said Roderick. "If we could have a robot that could act like a bird, that could unlock completely new ways of studying the environment."

Lentink, who is senior author of the paper, commended Roderick's persistence in what proved to be a years-long project. "It was really Will talking with several ecologists at Berkeley six years ago and then writing his NSF Fellowship on perching aerial robots for environmental monitoring that launched this research," Lentink said. "Will's research has proven to be timely because there now is a 10 million dollar XPRIZE for this challenge to monitor biodiversity in rainforests."

Mark Cutkosky, co-author on this paper, is the Fletcher Jones Professor in the School of Engineering and a member of Stanford Bio-X and the Wu Tsai Neurosciences Institute. David Lentink is co-chair of the Biomimetics group and associate professor of science and engineering at the University of Groningen in the Netherlands.

This research was funded by the Air Force Office of Scientific Research and the National Science Foundation.

The bird with feet and legs like a peregrine falcon.

engineers have created a robot that can perch and carry object.

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DEFENSE ROBOTS

DEFENSE ROBOTS KEEP SOLDIERS SAFE AND CONTRIBUTE TO MILITARY SUPERIORITY

Defense robots are professional service robots that are deployed by the military in combat scenarios. They're often intended to enhance a soldier's existing capabilities while keeping them out of harm's way as much as possible. Defense robots contribute to military superiority by giving troops an advantage at the ground level. Militaries as a whole gain a tactical advantage through the use of defense robots.

Defense robots will see a moderate gain in 2018, growing by 4% to about 12,500 installed units, according to the International Federation of Robotics World Robotics 2018 Service Robots report. In 2017, defense robots accounted for approximately 11% of all service robots, at a valumillion, and will continue to become a well-established technology as more and more units are sold.

Defense Robots Estimated Growth at 4% in 2018

Defense robots come in many shapes and sizes, but most serve the same basic functions of protecting and enabling soldiers in combat. The military has a long history with robotic exoskeletons for defense applications, which were built to enhance soldiers' endurance and agility. At various times, these have come in the form of:

- Full body exoskeletons;lower
- body-powered exoskeletons
- passive military exoskeletons;
- scavenging exoskeletons;
- stationary military exoskeletons.

Field robots, another form of professional service robot, are also becoming common in defense applications. These defense robots perform a variety of functions, including:

Carrying heavy equipment;operating in dangerous situations to keep soldiers at a safer distance;and rescuing wounded soldiers in combat zones.

Some field robots in defense applications are beginning to be equipped with weapons for offensive capabilities.

Defense robots are an increasingly common part of military campaigns, helping to keep soldiers safe and providing a tactical advantage in nearly any combat scenario. As the military continues to experiment and find success with different forms of defense robots, the market is expected to experience strong growth.

How robots are changing the defence sector

Governments are on a mission to evolve their defence capabilities to ward off the threats of today and tomorrow. Thanks to developments in robotics and AI, the possibilities for military applications are exploding.

At Grafenwoehr Training Area, Germany, on 6 April 2018, US and UK soldiers carried out an unprecedented exercise. Using remote-controlled diggers, they cleared explosives and filled in a trench while an unmanned armoured vehicle provided cover with a white smokescreen.

This is just one example of how the military is using robots today. Around the world, governments are investing billions in this type of tech because of its potential to reduce costs, boost capabilities, and most importantly, save lives. In fact, the value of the global military robot market is expected to increase from around US$ 1.3 billion in 2016 to US$ 2.6 billion by the end of 2024.

Humanoid robot soldiers

We’ve seen droids armed with guns in the movies, and now it looks like real-life technology has caught up. Russia’s humanoid robot FEDOR, dubbed the Terminator, has been trained to shoot from both hands. Although designed for rescue work, military uses have been suggested and it's possible to imagine an army of similar AI applications being sent into battle.

Russia is not the only one with this tech. Around the world, hardware and software is also being further developed to advance the ability of humanoid robots to move around, make decisions, pick up objects and carry out tasks. Valkyrie (Nasa) and Atlas (Boston Robotics) are two such humanoid robots with ever-broadening capabilities.

While the intention is not to send FEDOR style robots into combat at the moment, they have the potential to navigate our cities and buildings, use our weapons and work in teams.

The ethical and safety concerns surrounding robot soldiers are great, of course. Do we really want autonomous intelligent beings walking around wielding weapons? For the time being, unarmed mission assistance is likely to be the first scenario in which they'll serve.

Compiled by

R.K.Swetha

III - E

ECEROBO-017

TINY, UNDERWATER ROBOTS OFFER UNPRECEDENTED VIEW OF WORLD’S OCEANS

Robots the size of grapefruits are set to change the way scientists study the Earth’s oceans, according to a new study.

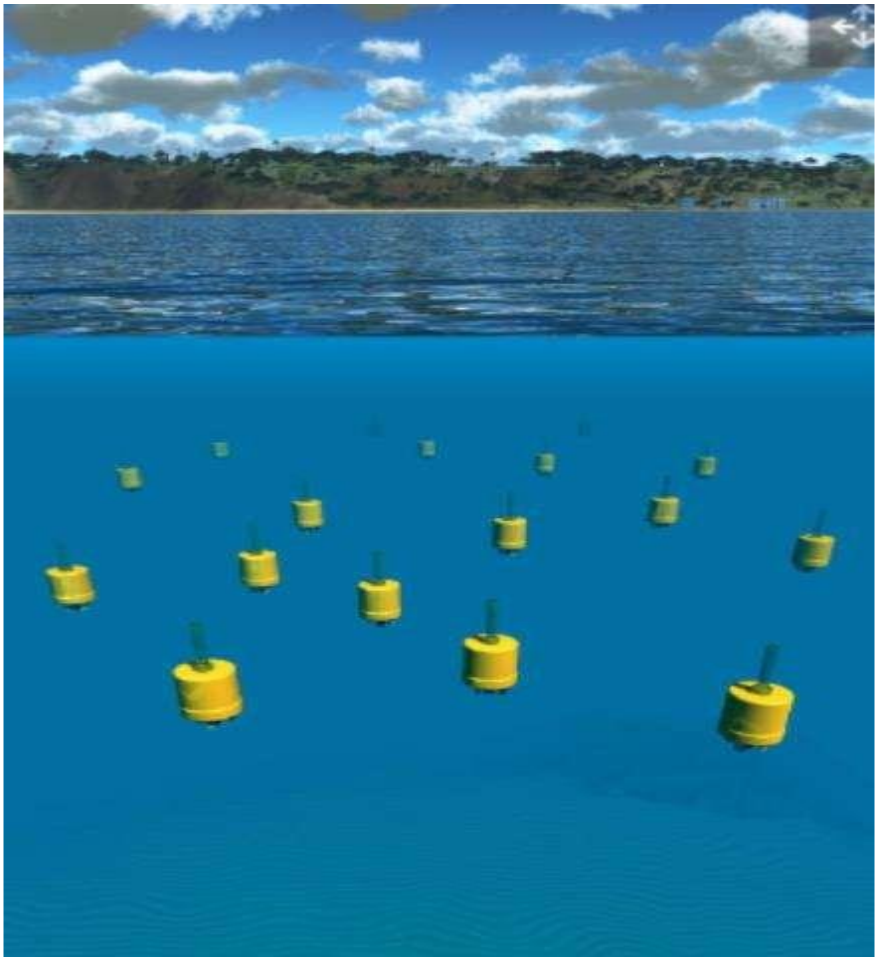
Though space is often known as the “final frontier,” the oceans of our home planet remain much of a mystery. Satellites have played a big role in that divide, as they explore the universe and send data back to

scientists on Earth. But now, researchers have developed a kind of satellite for the oceans — autonomous miniature robots that can work as a swarm to explore oceans in a new way.

For their initial deployments, the Mini-Autonomous Underwater Explorers (M-AUEs) were able to record the 3D movements of the ocean’s internal waves — a feat that traditional instruments cannot achieve. Study lead author Jules Jaffe, a research oceanographer at the Scripps Institution of Oceanography, said current ocean measurements are akin to sticking a finger in a specific region of the water

Each underwater robot is about the size and weight of a large grapefruit, Jaffe said. The bots are cylindrical and have an antenna on one end and measurement instrumentation on the other.

An artist's depiction of the near shore deployment of the robot swarm.



An artist’s depiction of the near shore deployment of the robot swarm. (Image credit: Scripps Institution of Oceanography)

The swarm’s first mission was to investigate how the ocean’s internal waves moved. One of Jaffe’s colleagues theorized that aspects of plankton’s ecology is due to ocean currents pushing plankton together and pulling it back apart. However, scientists did not have the three-dimensional instrumentation capabilities to be able to verify those theories. Over the course of a few afternoons, Jaffe and his team deployed the M-AUEs in hopes of proving (or disproving) the theory.

“We could see this swarm of robots be pushed by currents, getting pushed together and then get pushed apart,” Jaffe said. “It’s almost like a breathing motion, but it occurred over several hours.”

The theory was based on ocean physics, water density and internal wave dynamics, but the scientists had never seen the real-time movement of ocean water in 3D, Jaffe said.

And although their initial deployments were focused on the 3D mapping of internal wave dynamics, Jaffe said there are many other applications for the robot swarms.

For instance, with slightly different instrumentation, the robots could be deployed in an oil spill to help track the harmful toxins released. With underwater microphones, the swarm could also act as a giant ear, listening to whales and dolphins.

“We’re not yet churning them out like a manufacturing facility, but we think we can answer a lot of questions about global ocean dynamics with what we have,” Jaffe said of the couple of dozen robots the scientists have now. “And we are planning on a next generation, which hopefully would have more functionality and would maybe be even less expensive.”

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III yr ECE-D

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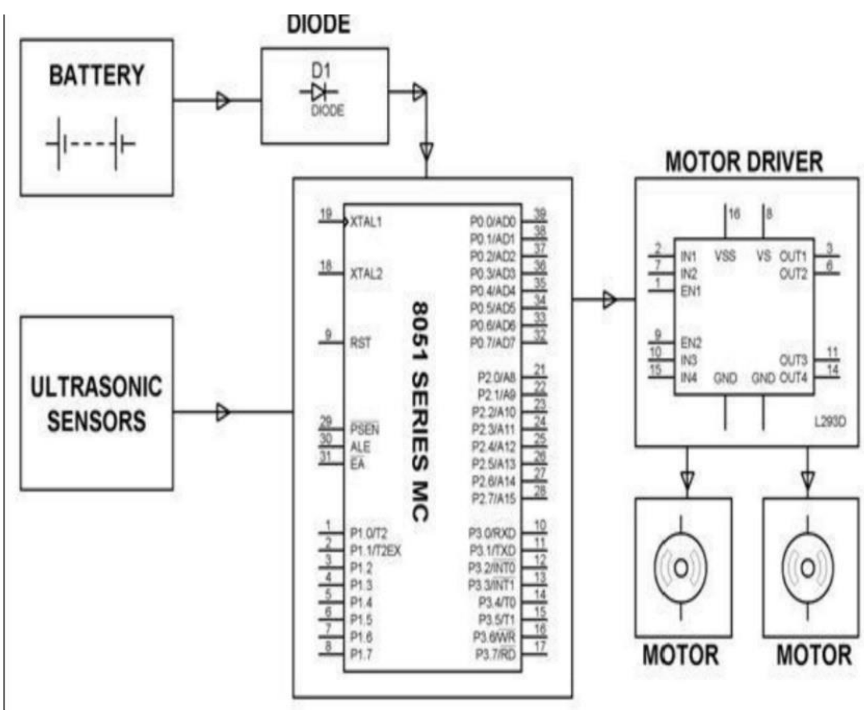
OA- Bot

OBSTACLE AVOIDERROBOT(OA BOT)

An Obstacle Avoiding Robot is a type ofAutonomous mobile robot that avoids collision with Unexpected obstacles.In robotics, obstacle avoidance is the task ofSatisfying some control objective subject to non-Intersection or non-collision position constraints. These kind of robots are used in military and defense.

Working Principle:

The obstacle avoidance robotic vehicle uses ultrasonic sensors for its movements. A microcontroller of 8051Families is used to achieve the desired operation. TheMotors are connected through the motor driver IC to theMicrocontroller. The ultrasonic sensor is attached in frontOf the robot.Whenever the robot is going on the desired path, theUltrasonic



sensor transmits the ultrasonic wavesContinuously from its sensor head.
Fig1.Circuit diagram of OA-Bot

Whenever an obstacleComes ahead of it the ultrasonic waves are reflected fromAn object and that information is passed to theMicrocontroller. The microcontroller controls the motorsLeft, right, back, front, based on ultrasonic signals. ToControl the speed of each motor pulse width modulation isUsed (PWM).

How it works in military?

•It is a robot that avoids the obstacle which Comes in its path Obstacle detection is the Primary requirement of this autonomous robot.

• The robot gets the information from the Surrounding area through mounted sensors on The robot.

• Some sensing devices used for obstacle Detection like bump sensors, infrared sensors, Ultrasonic sensors, etc.

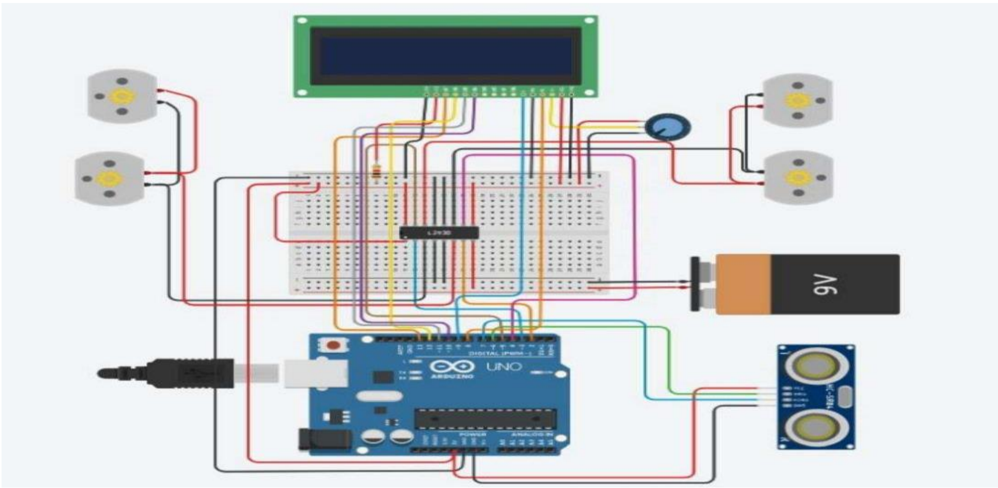
• The ultrasonic sensor is most suitable for Obstacle detection and it is of low cost and has a

High ranging capability.

• Obstacle avoidance robot is design to Allow robot to navigate in unknown environment By avoiding collisions in the border of the Country.

• Obstacle avoiding robot senses obstacles in The path, avoids it and resumes its running. We Have make use of sensors to achieve this Objective. We have used two D.C.MOTORS i.eBattery operated motors.

Simulation on Tinkercad software



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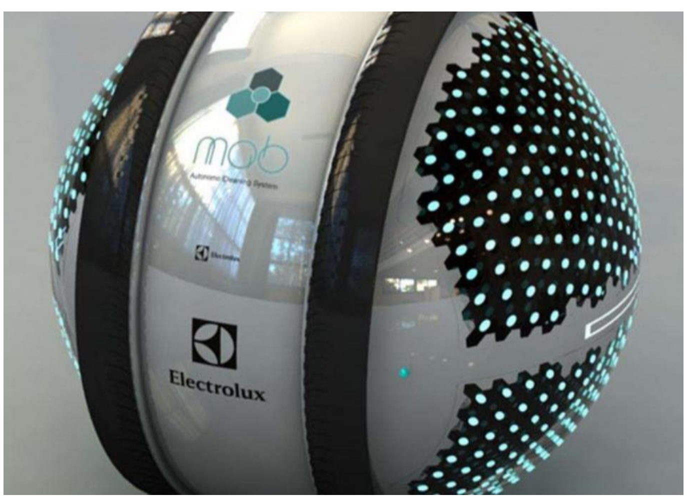
ECE- III year

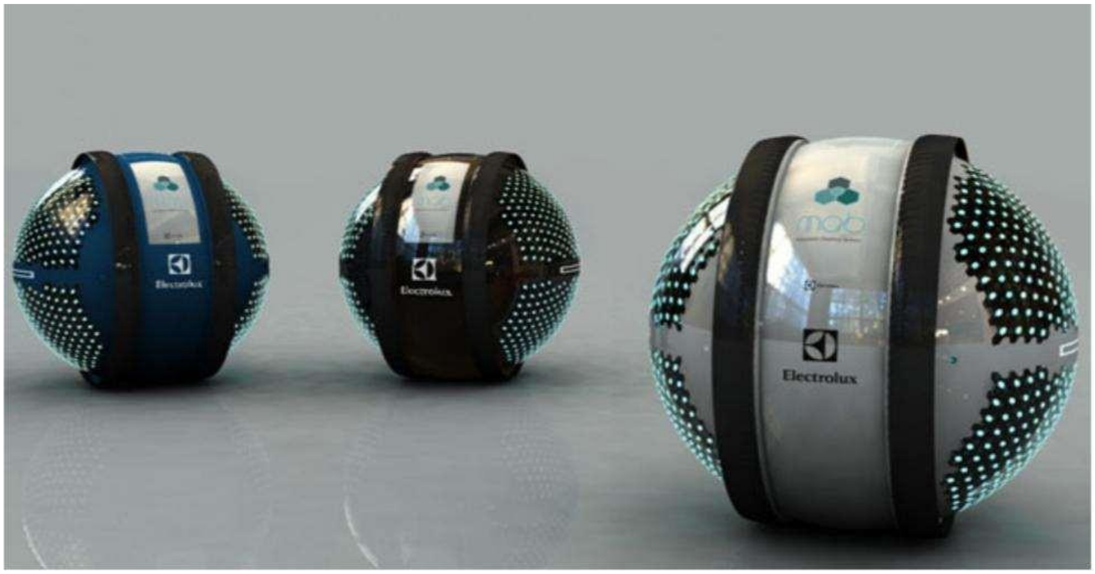
MAB : AN AUTOMATED CLEANING SYSTEM WITH HUNDREDS OF MICRO ROBOTS

Mab Automated Cleaning System is perfect for busy people who never have the time to clean their house. It features hundreds of micro robots (908 robots to be exact) that will fly around the house and clean every surfaces so that you can escape from everyday chores while experiencing a bit of magic. Each robot generates its own energy thanks to solar panels on its wings. After these robots clean the area of your house, they will fly back to the main machine, the central part that handles multiple tasks such as providing all robots with information, releasing pleasant odor, mixing water with an additive for higher surface tension, cleaning filters, and many more.

This is a perfect robot for people who have busy lifestyle, most of us don’t have the time to perform housekeeping activities or simply don’t want to do it. It only requires simple setup and works independently, it



automatically detects its global position and set the language for that region but you can custom choose another language if it’s not correct.



Mab Automated Cleaning System has 7 cleaning steps to keep your house/apartment clean:

1. Mixing water and substance for greater surface tension
2. The mixture is distributed to those micro robots
3. Once all those micro robots are provided with information needed to start cleaning, they will use their propeller to fly
4. These micro robots clean by touching surface with droplet of fluid
5. The droplet captures the dirt and carries it back to the main machine
6. The main machine filters all the dirt out
7. It will then recover highest possible percentage of water to restart the cycle.

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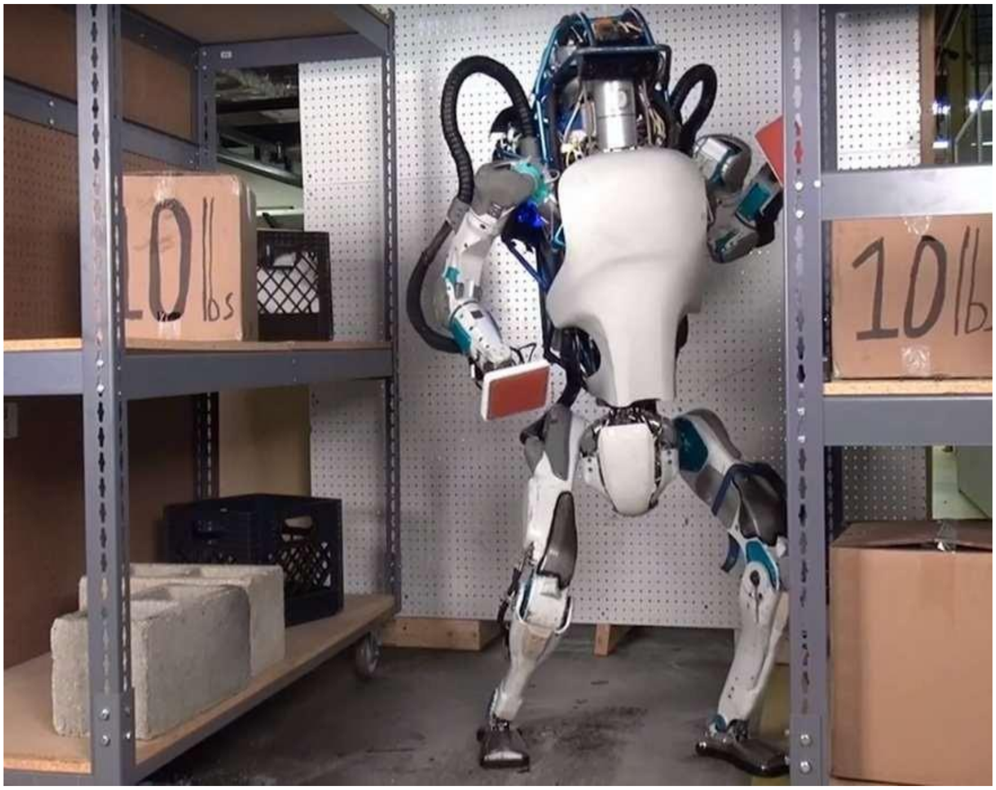
ECEROBO-025

Google robot is 'the end of manual labor'

Boston Dynamics' new "Atlas" robot is a game changer, not just for companies, but for society, Insider.com CEO Jason Calacanis said Wednesday.

"This is really the end of manual labor. When you watch this video, he's walking through the snow; he's wobbly, but he gets back up," the tech investor told CNBC's "Squawk Alley."

"Manual labor is going to end in our lifetime, and in this video you can see how close we really are. It's a huge societal issue with jobs, but it's going to be a huge lift in terms of efficiency of companies that nobody expected."



The Alphabet-owned robotics company released a video on Tuesday of the Atlas, in which it moves boxes and gets back up after being knocked down.

"It's super eerie. In 10 years, the idea is going to be 'would you let this [robot] put your kids to bed? Would you let it change your kid's diaper?'" Calacanis said. "That's how fast this is going to advance. It's picking up packages right now. These things are going to be walking down the street 10 to 15 years from now, delivering pizzas; they're going to be in your office moving packages around."

Calacanis also noted that Amazon.com's offices currently have robots executing simple tasks and "eliminating human jobs."

Amazon later reached out to CNBC and said: "Employees are still fulfilling the same roles of picking, packing and shipping at our fulfillment centers. Robots transport products in a facility and decrease the amount which employees must walk to gather items for customer orders. Amazon Robotics is making our associates' jobs easier."

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SEARCH ENGINE

What are search engines?

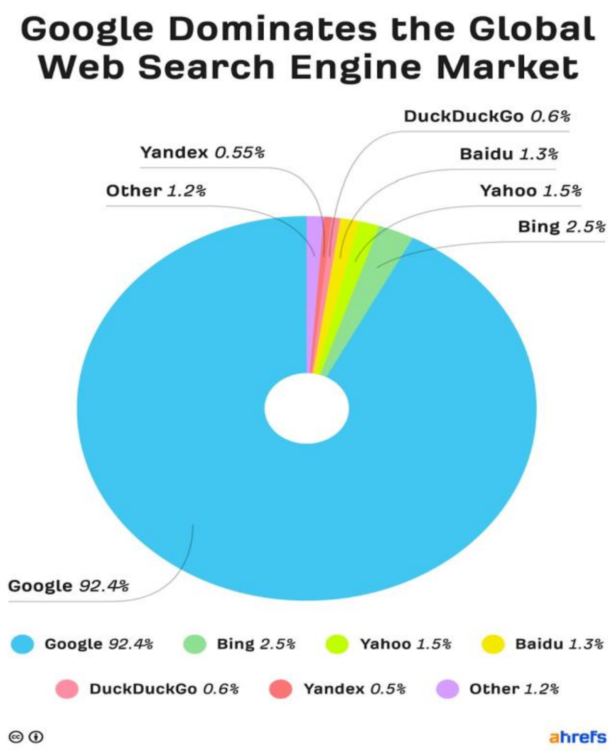
Search engines are tools that find and rank web content matching a user's search query.

Each search engine consists of two main parts:

1. **Search index.** A digital library of information about web pages.
2. **Search algorithm(s).** Computer program(s) that rank matching results from the search index.

Which is the most popular search engine?

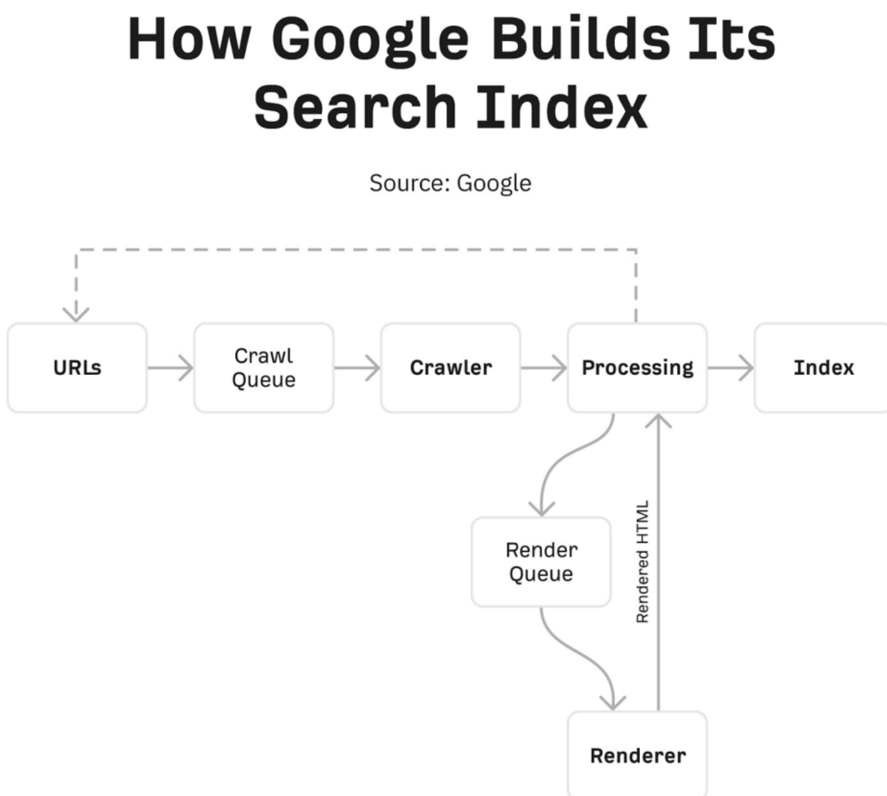
Google. It has a 92% market share.



How search engines build their index

Most well-known search engines like Google and Bing have trillions of pages in their search indexes. So before we talk about ranking algorithms, let's drill deeper into the mechanisms used to build and maintain a web index.

Here's the basic process:



How search engines personalize search results

Search engines understand that different results appeal to different people. That's why they tailor their results for each user.

If you’ve ever searched for the same thing on multiple devices or browsers, you’ve probably seen the effects of this personalization. Results often show up in different positions depending on various factors.

It’s because of this personalization that if you’re doing SEO(Search Engine Optimization), you’re better off using a dedicated tool like Rank Trackers to track ranking positions. The reported positions in these tools are likely to be closer to the truth because they browse the web in a way that doesn’t give search engines much useful information for personalization.

How do search engines personalize results?

Google states that “information such as your location, past search history and search settings all help [us] to tailor your results to what is most useful and relevant for you in that moment.”

Let’s take a closer look at these three things.

1. Location

If you search for something like “italian restaurant,” all the results in the map pack are local restaurants.

Google does this because you’re unlikely to fly halfway around the world for lunch.

But Google also uses your location to personalize search results outside of the map pack.

It’s a similar story for a query like “buy a house.” Google returns pages with local listings instead of national ones because you probably don’t want to relocate to a different country.Your location impacts results for local queries so dramatically that there’s virtually no overlap when searching for the same thing from two different locations.

2. Language

Google knows that there's no point showing English results to Spanish users. However, Google is somewhat reliant on website owners to do this. If you have pages in multiple languages, Google might not realize that's the case unless you tell them.

You can do this with an HTML attribute called hreflang.

Hreflang is a bit complicated and far beyond the scope of this guide, but basically it's a small piece of code indicating the relationship between multiple versions of the same page in different languages.

3. Search history

Perhaps the most obvious example of Google using search history to personalize results is when it 'ranks' a previously clicked result higher next time you run the same search.

It doesn't always happen, but it seems to be quite common—especially if you click or visit the page multiple times in a short period.

Let's wrap this up

Understanding how search engines work is the first step towards ranking higher in Google and getting more traffic. If search engines can't find, crawl and index your pages, you're dead in the water before you even start.

Complied By

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III ECE A

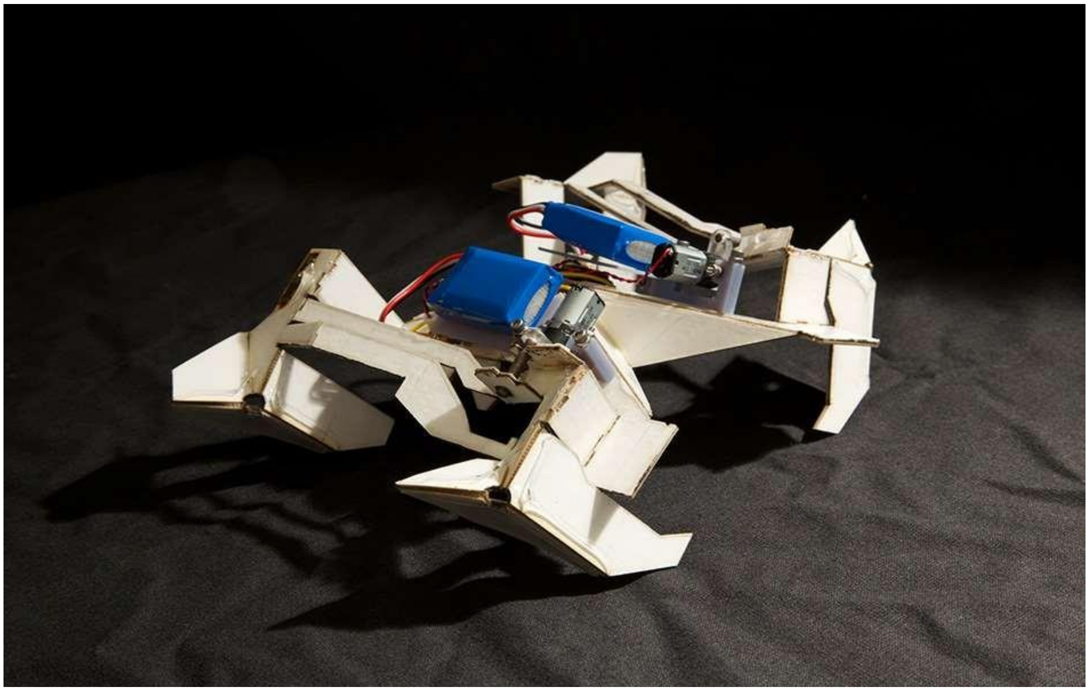
ECEROBO-001

SELF-FOLDING MINIROBOTS POSSIBLE WITH ORIGAMI-INSPIRED GRAPHENE

Origami-inspired graphene paper that can fold itself could be used to create anything from miniature robots to artificial muscles, according to a new study.

Scientists from Donghua University in China have demonstrated that gently heating a sheet of graphene paper, which is extraordinarily strong (about 200 times stronger than steel by weight), could make it fold into a device that is able to walk forward and backward. And, in a first for this kind of self-folding material, they showed it could also change directions.

The research could help scientists develop self-folding structures and devices for modern applications, including wirelessly controlled micro robots, artificial muscles and devices for tissue engineering, said Jiuke Mu, a Ph.D. student at Donghua University and one of the material's inventors



“In the near future, it even could bring changes to people’s lives,” Mu told Live Science, giving the example of smart clothing, “which could change its shape and style in response to body temperature, environmental changes or other gentle stimulations.”

The technology relies on specially treating sections of graphene paper so that they naturally absorb water vapor from the atmosphere, the researchers said. When the paper is heated, this water is released, causing those sections to shrink and bend. When the heating stops, this process is reversed.

Careful placement of these treated sections made it possible to create various self-folding objects, including the walking device, a self-assembling box and an artificial hand that can grasp and hold objects five times heavier than itself.

The researchers determined the 3D shape into which the paper folds simply by altering the placement and width of the specially treated areas, with wider sections bending more than narrower ones.

The caterpillarlike walking device was created by building a rectangular sheet of graphene paper with three treated bands running across it that got progressively wider from front to back. When the sheet was lit with a near-infrared light, the bending of these sections caused the sheet to curve into an arch.

But the varying widths of these sections meant the rear of the sheet curved more than the front, so when the light was switched off and the sheet relaxed, the device stretched forwards. The response of the material was so quick that five of these steps took only 2 seconds. By heating just one side of the sheet, the researchers were also able to make the device turn, because one side would bend more than the other.

Self-folding materials have become a major topic of research in recent years, with particular focus on so-called active polymers, materials that convert other forms of energy into mechanical work. But studies to date have often relied on electrical circuitry, unusual environmental conditions or complicated combinations of materials, which tend to be fragile.

By making their devices entirely out of graphene — a one-atom-thick sheet of carbon that is both incredibly strong and very stretchy — Mu and his colleagues created a device that was still 90 percent effective, even after being folded 500 times. The material also has an energy-conversion rate of 1.8 percent, which is considerably better than the 1 percent or lower achieved by other active polymers, Mu said. [7 Cool Uses of 3D Printing in Medicine]

In addition to having the potential to inspire self-folding devices, the researchers said graphene paper could eventually be used to create artificial muscles. The stress generated by one of the paper devices was nearly two orders of magnitude higher than that of mammalian skeletal muscles, the researchers said.

"Compared with other kinds of self-folding materials, the all-graphene-based structure is simpler, its response behavior is faster and the output is more efficient," Mu said. "More importantly, its origami and walking behavior is remotely controlled."

Pure graphene can be costly and time-consuming to create, though, so the researchers used graphene oxide (GO) to create their paper. This material, Mu said, costs as little 1 Yuan (or 16 cents in U.S. dollars) per gram.

The researchers used GO nanosheets as building blocks to construct larger sheets before carrying out what's known as a reduction reaction to remove oxygen atoms from the GO. This converts the material into reduced GO (rGO), which does not have such impressive properties as pristine graphene, but still shares many of the same characteristics.

Crucially, though, the scientists treated areas of the GO paper with polydopamine (PDA) before carrying out the reduction reaction, which prevented these sections of GO from being reduced. Unlike the rest of the paper, these specially treated areas readily absorb water vapor, giving them the ability to bend.

The team’s results were described in a paper published Nov. 6 in the journal Science Advances, but Mu said there is still a ways to go before any practical applications of the paper can be realized.

“We believe there is still room for improvement in the energy-conversion efficiency,” he said. “Secondly, we think that as the device scales down in size, especially to nanoscale, its properties and origami performance would change significantly. Therefore we are also interested in developing a nano-size all-graphene origami device.”

Compiled by

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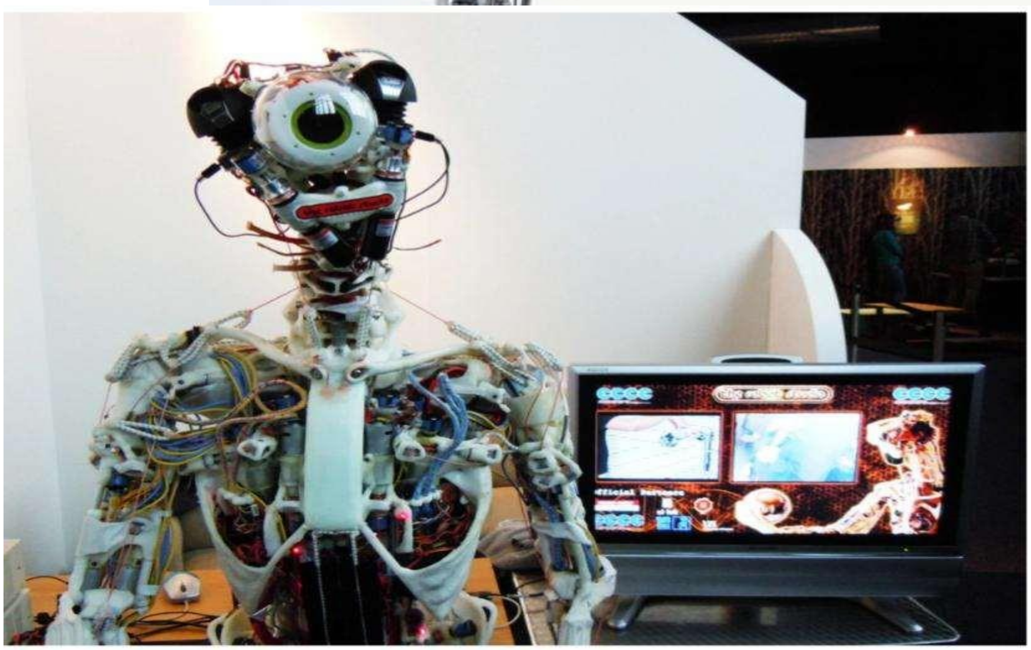
III yr-C

ECEROBO-012

LET'S USE HUMANOID ROBOTS TO GROW TRANSPLANT ORGANS

BIO-HYBRID ROBOTS COULD MAKE BETTER LAB-GROWN TISSUES

There is no better bioreactor than the human body itself," says study co-author and tissue engineer Pierre Mouthuy, "so the better we can copy that environment, the better our chances to obtain functional engineered tissues are going to be."



Robots like Kenshiro and Eccerobot replicate human anatomy in intricate detail, and the authors write that we might be able to use them to grow better tissue grafts that can be transplanted into ailing humans.

For tendons, ligaments, bone, and cartilage, humanoid robots could simulate lifelike architecture and movements of various types and directions. This could help more cells to develop and differentiate into complex tissues.

HUMANOID ROBOTS LIKE ECCEROBOT, SHOWN HERE, CLOSELY MIMIC HUMAN ANATOMY. SIMILAR ROBOTICS COULD BE USED TO GROW BETTER TISSUES AND ORGANS IN THE LAB.

Scientists are already growing muscles, bones, and mini-organs in the lab. But these tissues are generally small, simple, and kinda wimpy. That’s partly because a Petri dish is no match for the human body.

Take, for example, skeletal muscle. Bioreactors—typically warm, moist vats where cells are grown—might induce some simple movements in lab-grown muscles, but it’s nothing like the multidirectional bending and stretching of the human body, which helps our muscles grow and get stronger. That’s why two scientists from Oxford University are proposing that we use humanoid robots to grow engineered tissues instead.

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What might these bioreactors look like? Perhaps scientists could immerse the robotic body parts in a bioreactor's nutrient broth—but then you risk corroding the machine's metals or ruining its electronics, says Mouthuy. Another solution may be to encase the engineered tissue in a membrane or artificial skin, so that the developing tissue can have all the moisture and nutrients it needs, while the robot stays dry. Mouthuy and study co-author Andrew Carr are already working on some prototypes, and hope to soon find out whether the humanoid bioreactor concept is actually feasible.

If they work, humanoid bioreactors might eventually be able to nurture more complex tissues and organs, such as lab-grown hearts. Plus, they might lead to robots that are safer for humans to be around, the authors note, as well as other robots advances—such as "biohybrid humanoids," whose movements are controlled by cells instead of machinery.

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HOW AI AND MACHINE LEARNING ARE WORKING WITH ROBOTICS

What makes a robot powerful is an ability to think on its own. This is where artificial intelligence and robotics can come together. Companies are increasingly looking for robots
to move past automation and tackle more complex and high-level tasks.

AI can help a robot do a lot of tasks, from successfully navigating their surroundings, to identifying objects around the robot or assisting humans with various
tasks such as bricklaying, installing drywall or robotic-assisted surgeries.

Robots can benefit from AI and machine learning in different ways, and these AI-enabled capabilities include:

Computer vision:
AI and computer vision technologies can help robots to identify and recognize objects they encounter,
help pick out details in objects and help with navigation and avoidance.

AI-enabled manipulation and grasping:
Long considered a difficult task for robots, AI is being used to help robots with grasping items.
With the help of AI, a robot can reach out and grasp an object without the need for a human controller.

AI-enhanced navigation and motion control:
Through enhanced machine learning capabilities, robots gain increased autonomy, reducing the need for humans
to plan and manage navigation paths and process flows. Machine learning and AI help a robot analyze its surroundings and help guide its movement, which enables the robot to avoid obstacles, or in the case of

software processes, automatically maneuver around process exceptions or flow bottlenecks.

Real-world perception and natural language processing:
For robots to have some level of autonomy, they often need to be able to understand the world around them. That understanding comes from AI-enabled
recognition and natural language processing. Machine learning has shown significant ability to help machines understand data and identify patterns so that it can act as needed.

In the past, researchers have long thought about how to apply artificial intelligence to robotics but ran into limitations of computational power, data constraints and funding.
Many of those limitations are no longer in place, and as such, we now may be entering a golden age of robotics. With the help of machine learning,
robots are becoming more responsive, more collaborative, and integrated into other systems.

Likewise, many of the RPA vendors are adding intelligent process automation to their bots to help increase their usefulness. As such, they are
looking at AI technologies such as NLP or computer vision to help make these bots more intelligent. Bots that leverage machine learning and adapt
to new information and data can be considered intelligent tools that can significantly impact and increase the tasks performed rather than just bots.

compiled by,
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ROBOTIC APPLICATIONS THAT USE ARTIFICIAL INTELLIGENCE

In today's global manufacturing sector, there are a few main ways in which AI is deployed.

Assembly:

AI is a highly useful tool in robotic assembly applications. When combined with advanced vision systems,
AI can help with real-time course correction, which is particularly useful in complex manufacturing sectors like aerospace.
AI can also be used to help a robot learn on its own which paths are best for certain processes while it's in operation.

Packaging:

Robotic packaging uses forms of AI frequently for quicker, lower cost and more accurate packaging. AI helps save
certain motions a robotic system makes, while constantly refining them, which makes installing and moving robotic systems easy enough for anybody to do.

Customer Service:

Robots are now being used in a customer service capacity in retail stores and hotels around the world. Most of these robots
leverage AI natural language processing abilities to interact with customers in a more human way. Often, the more these systems can interact with humans, the more they learn.

Open Source Robotics:

A handful of robotic systems are now being sold as open source systems with AI capability. This way, users can teach
their robots to do custom tasks based on their specific application, such as small-scale agriculture. The convergence of open source
robotics and AI could be a huge trend in the future of AI robots.

When working together, robots are smarter, more accurate and more profitable. AI has yet to come close to reaching its full potential, but as it advances, so will robotics.

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Sruthi R

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