PSNA
COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution)
Estd - 1984 AICTE | Anna University | NBA | NAAC A++

CENTER OF EXCELLENCE IN ROBOTICS & AUTOMATION

ROBOTICS CLUB
WE BUILD THE FUTURE

PSNACET ROBITICS CLUB

PSNACET-ROBOCLUB Proudly presents

GIZMO

EDITION-3

PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY

Kothandaraman Nagar, Dindigul – 624622

CENTRE OF EXCELLENCE IN ROBOTICS

AND AUTOMATION

ROBO CLUB

PROUDLY LAUNCHES

THE MAGAZINE

"GIZMO Edition- 3"

On 19-10-2022

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

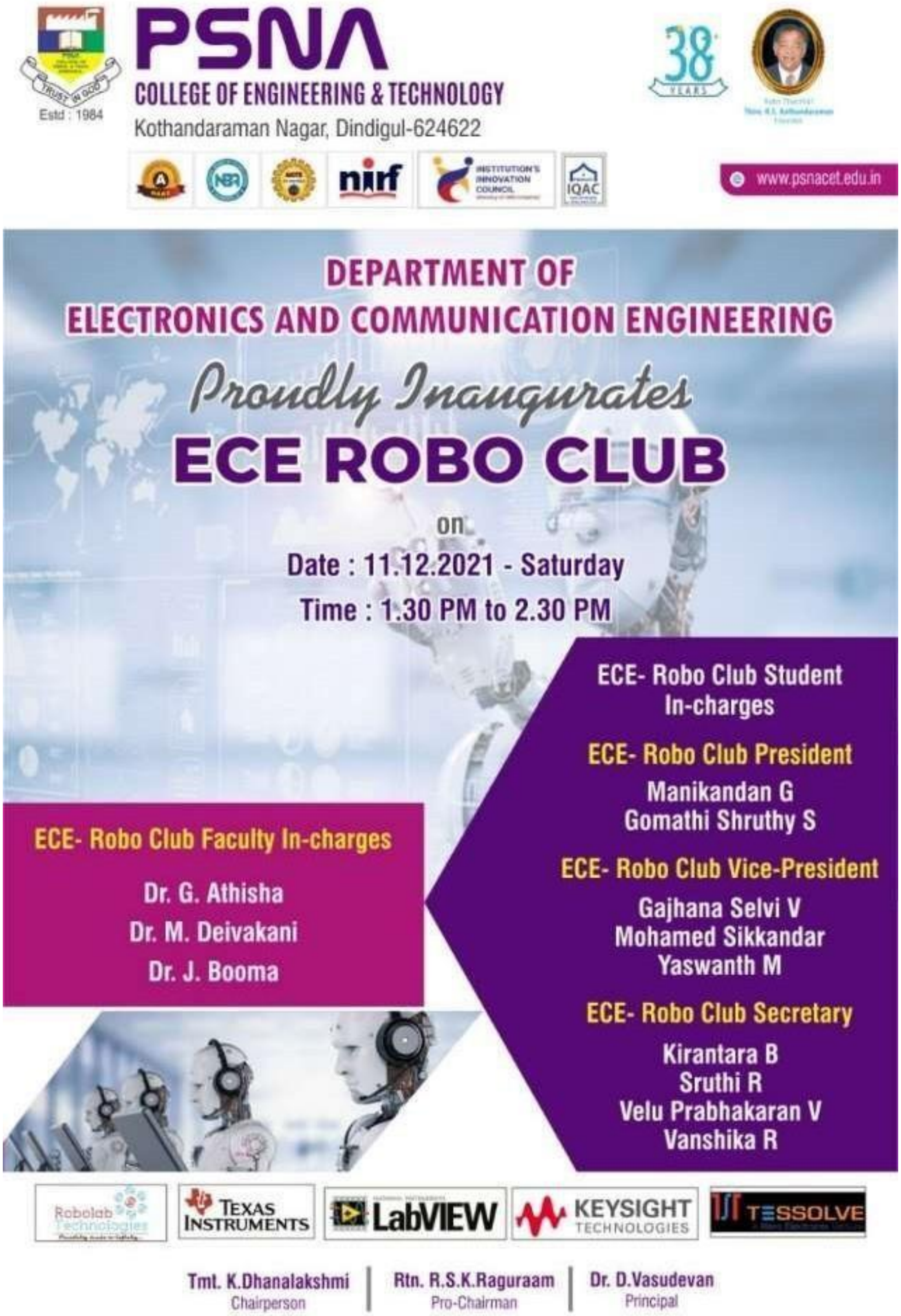
Robot Study platforms :

- 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

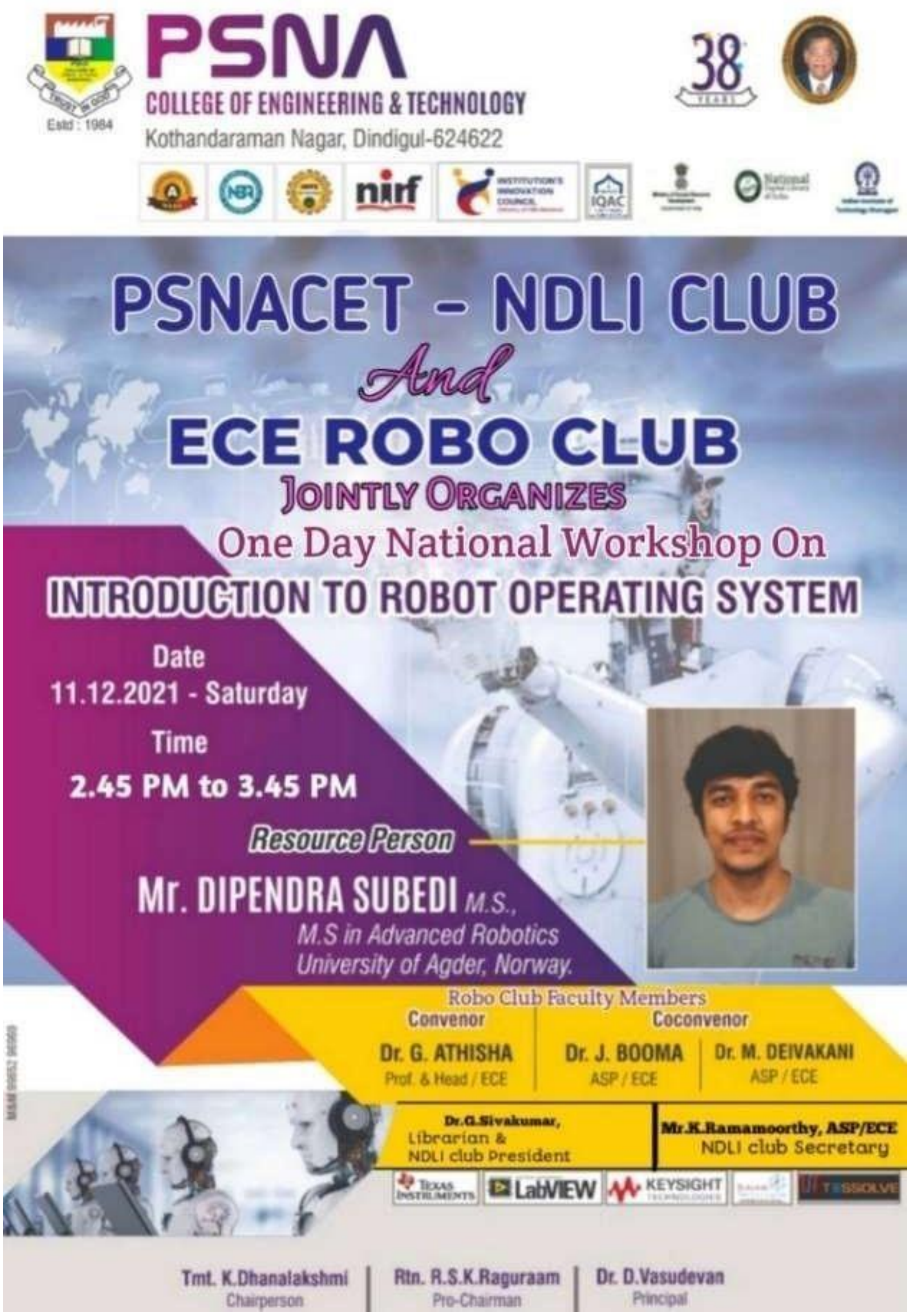
Department of Electronics and Communication and Engineering - PSNACollege of Engineering and Technology organized inauguration ceremony of ECE ROBO CLUB on 11.12.2021.




ECE ROBO CLUB


LabVIEW

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




PSNA

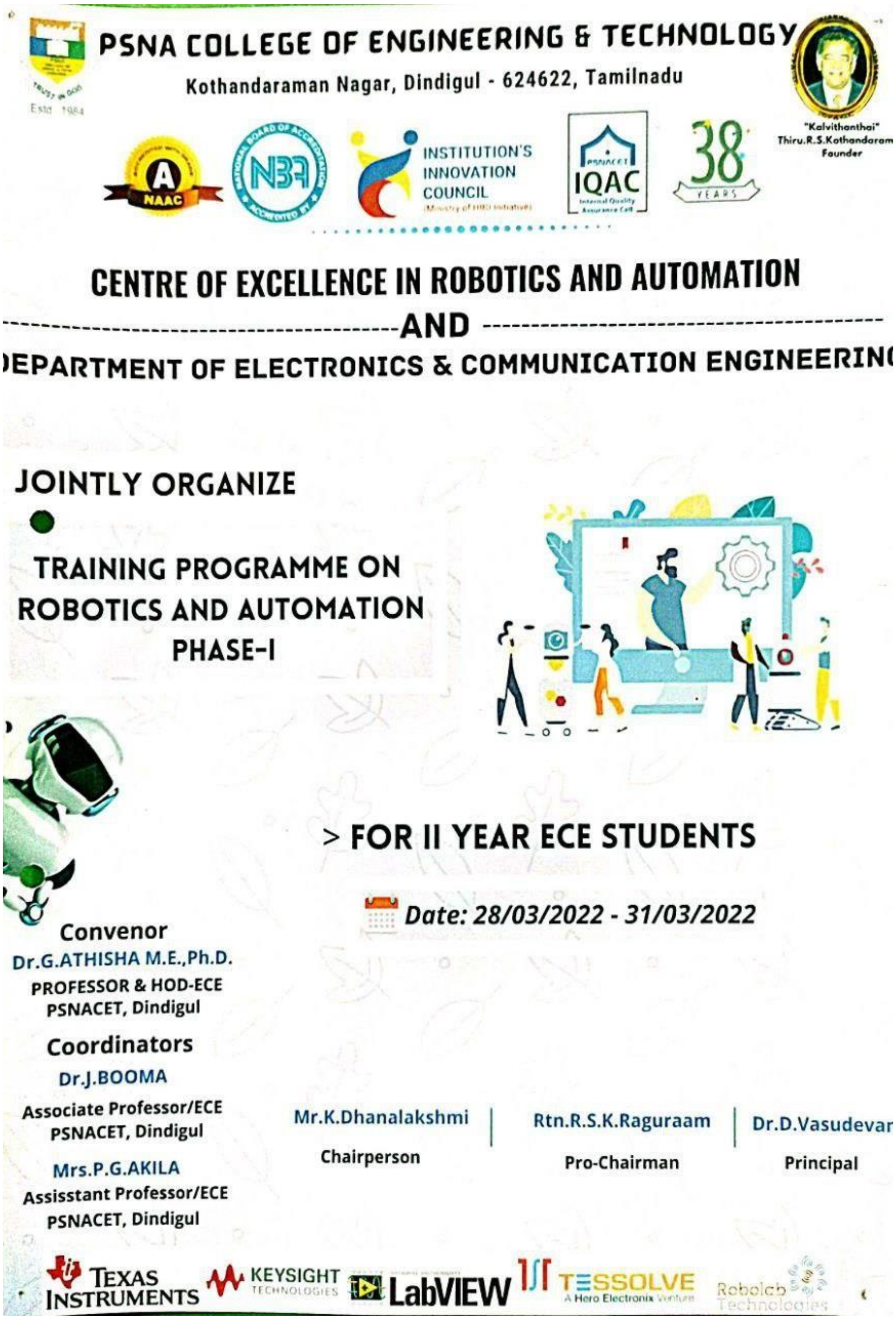

வழி
EXIT

Title: Training Programme on Robotics and Automation Phase – I

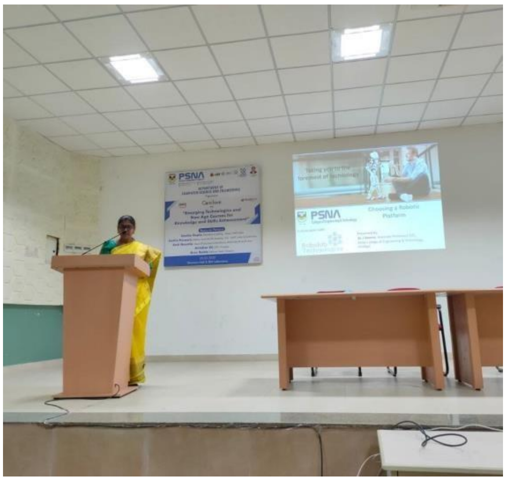
Date(s) : 31 – 03 - 2022

Event Coordinators: Dr.J.BOOMA and Mrs. P. G. Akila.

Total Participants: 52




PSNA
DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
PSNA
College of Engineering & Technology
Introduction to Basic
Electronic Components


PSNA
PSNA
Choosing a Robotic
Platform


PSNA


PSNA
Field winding
Pole shoe
Yoke or frame
Shaft
Commutator
Interpole
DC motor construction parts


PSNA

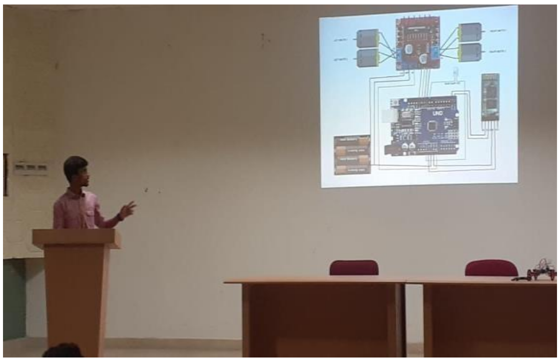
Title: Training Programme on Robotics and Automation Phase – I

Date(s) : 06 – 05 - 2022

Event Coordinators: Dr.J.BOOMA and Mrs. P. G. Akila,

Total Participants: 52


PSNA
Motors used in Robotics



Title: Robo Club Member's participated in PITCH DECK – Boot Camp held on 13.05.2021 at PSNA College of Engineering and Technology.

Title: Project Expo 2022 and GIZMO Edition 2 Release

Date(s) : 10-06 – 05 - 2022

Event Coordinators: Dr.J.BOOMA and Dr.M.DEIVAKANI,

Total Participants: 120

PROJECT EXPO-2022

Release of Gizm0(v-2.0)

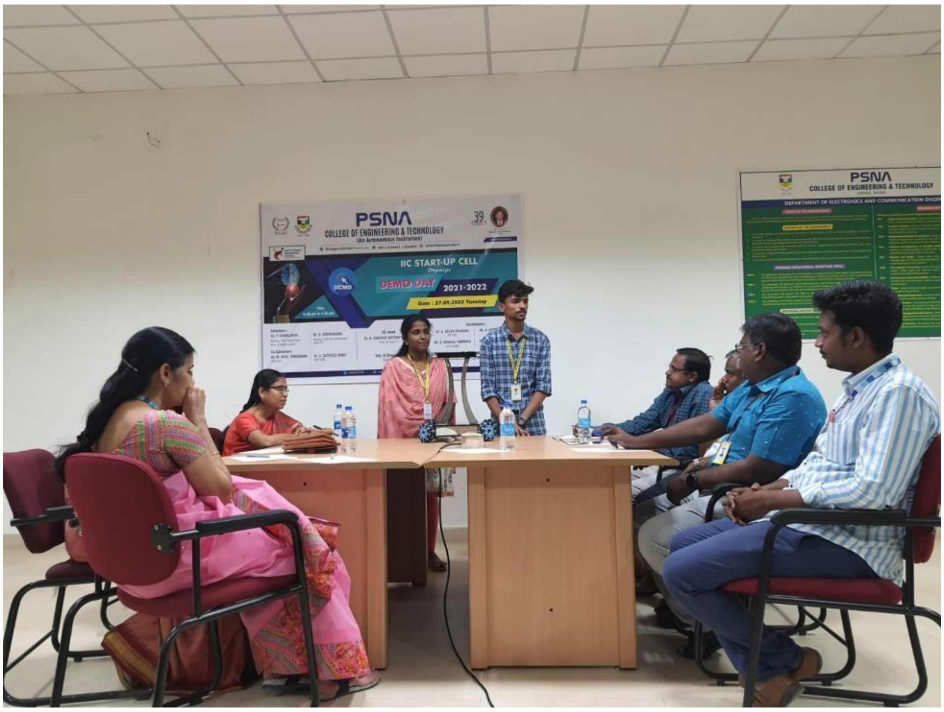




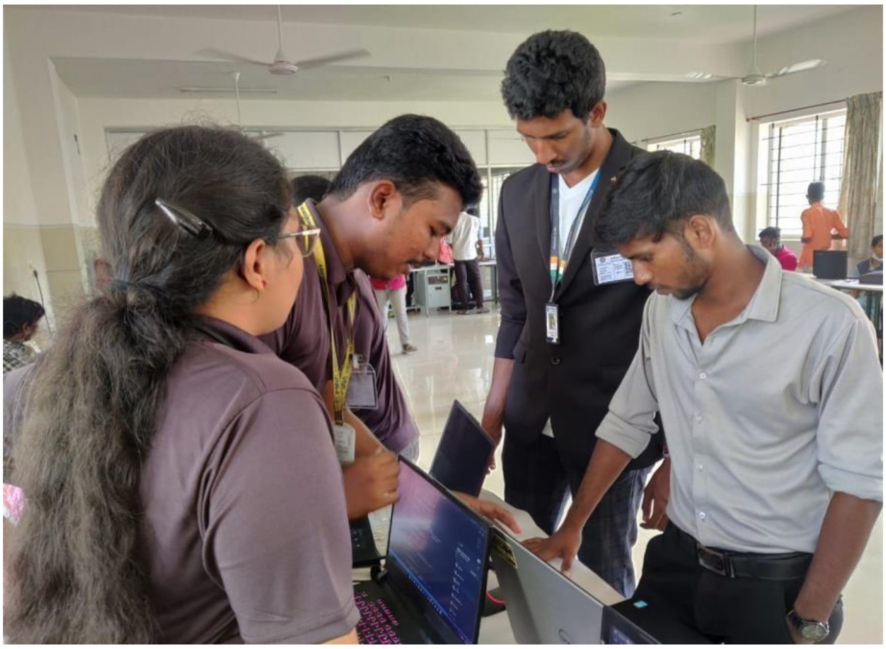
EXECUTIVE MEMBERS-ROBO CLUB-2022

Robo Club Member's participated in Institutions Innovation Council Regional Meet on 08th AUG 2022 at Innovation Exhibit Hall PSNACET, Dindigul

Robo Club Member's participated in Demo day organized by IIC Start up cell on 27.09.2022 under the proposal "Meds on wheels" was well appreciated by juries and selected as a "Best on Deck".



Robo Club Member’s participated in KSI's IDEATHON 2022 in Kangeyam Builders Engineering College , Thirupur.



Title: Training Programme on BIPED ROBOT

Date(s) : 17– 10 – 2022 to 18-10-2022

Event Coordinators: Dr.J.BOOMA

Total Participants: 60

ROBO CLUB OFFICE BEARERS

ROBO CLUB FACULTY TEAM:

- Dr.G.Athisha, HOD/ECE
- Dr.J.Booma, ASP/ECE
- Dr.M.Deivakani, ASP/ECE

2021-2022

Robo club President:-

- Manikandan.G
- Gomathi shruthy .S

Robo club vice-President:

- Gajhana Selvi.V
- Mohamed Sikkandar.M
- Yaswanth.M

Robo club secretary:

- Velu Prabhakaran.V
- Pragatheeswari.K

Robo club coordinator:

- Shridhar.J
- Amrisha Vivinya.P.M

Technical Heads:

- Gowtham.K
- Ariharan.S
- Rishikeshvar Ram.V
- Vignesh.S

Magazine Incharges:

- Santhosh Kumar.P
- Rajkishore.G

Social media Incharge:

- Sriharan.S
- Supraja.R
- Yazhini

Department Student Coordinators:

- M.Mohamed Sikkandar-ECE
- M.Selvaganesh-CSE
- A.K.Sanjeetha-IT
- S.Logesh-AI&DS
- M.Parthiban-BME

2022-2023

Robo club Executive coordinator:

- Shridhar.J
- Rishikeshvar Ram.V

Robo club President:

- Mohamed sikkandar.M
- Pragatheeswari.K

Robo club Vice president:

- Vithula.R
- Nimaleshwaran.M
- Logesh.S
- Sudhan kumar.K

Secretary:

- Kanika.V
- Karim Suhail.S
- Divya.K
- Mathan.M

Magazine Incharge:

- Monisha.G.K
- SaiKrithika.S

MOC Incharge:

- Ranjani.S

Social media Incharge:

- Sri haran.S
- Subash Kondal.K.S

VIP VISITED OUR LAB

ANAND A

Founder & CEO of ***IBIT GLOBAL***

********INDIA* ********US* ********UK* ********SINGAPORE*

ACHIEVEMENTS OF ROBO CLUB MEMBERS

*** PITCH DECK:**

1.Mohamed Sikkandar.M

2.Vithula.R

Has participated in Demo day organized by IIC Start up cell on 27.09.2022 under the proposal "Meds on wheels" was well appreciated by juries and selected as a "Best on Deck".

*** IDEATHON 2K22:**

1. Mohamed Sikkandar.M

2.Nimaleshwaran.M

3.Srinekathon

Has participated in Ideathon 2K22 National level design contest for innovation in defence electronics in Hyderabad conducted by Kalam's Institute of youth Excellence Foundation in Association with 2G Tech under the project "Miniature radar".

Mohamed Sikkandar.M has offered the position of IoT Developer in a Start up, An MSME Company for IOT Technologies and Applications as remote worker from October 2022 onwards.

COMPETITION:

Project EXPO : Theme [Agriculture Development]

* 1.Mohamed Sikkandar.M

2.Vithula.R

3.SaiKrithika.S

Has participated in Project EXPO 2022 on 10.06.2022 at Centre of Excellence in Robotics and Automation PSNACET Dindigul, won the Best Project Award under Agricultural Development.

*1.Hari Haran.RC.

2.V.S.Gopika

Has participated in Project EXPO 2022 on 10.06.2022 at Centre of Excellence in Robotics and Automation PSNACET Dindigul, won the Best Project Award under BUSINESS PRODUCT. Also participated in CSE UTSAV'22 and won first prize in paper presentation.

*1.Shrinithi.S.C

2.Vidhya Raani.R

3.Sudhankumar.K

4.Velu Prabakaran.V

Has participated in Project EXPO 2022 on 10.06.2022 at Centre of Excellence in Robotics and Automation PSNACET,Dindigul,won the Best Project Award under WEARABLE GADGETS.

*1.Monisha.G.K

2.Pragatheeswari.K

3.Nithish Kumar.K

4.Prajeeth Roshan.E

Has participated in Project EXPO 2022 on 10.06.2022 at Centre of Excellence in Robotics.

IIC MEET:

* 1. Shridhar.J

2.Mohamed Sikkandar.M

3.Vithula.R

4.Janani Bhaarathi.KM

5.Rajkishore.G

Has participated in Institutions Innovation Council Regional Meet on 08th AUG 2022 atInnovation Exhibit Hall PSNACET ,Dindigul.

*Rishikeshvar Ram.V

Has participated in KURUKSHETRA 2022 workshop on Hand Gestures Robotics.

*1.Rishikeshvar Ram.V

2.Gopika.V.S

3.Karthick Kumar

4.Sudharshan

5.Dharshana

Has participated in SIH inter College Hackthon

*1.Rishikeshvar Ram.V

2.Ariharan

Has participated in ICETEVST 2022 international paper Conference.

* 1.Logesh.R

Has participated in the Technical Symposium held at Kumaraguru College of Engineering and Technology ,Coimbatore.Also participated at PAPYRUS CSEUTSAV’21 held at PSNA College of Engineering and Technology,Dindigul.

* 1.Monisha.G.K

2.Pragatheeswari.K

3.Nithish Kumar.K

4.Priyadharshini.R

They have done a Smart Packing Unit with cost efficient and have selected for second round.

*1.Monisha.G.K

2.Pragatheeswari.K

3.Nithish Kumar.K

4.Priyadharshini.R

5.Ramkishore.V

6.Muthu Roghinth.R

Have designed to present “Smart Warehouse Automation Robot” at PITCH DECK – Boot Camp held on 13.05.2021.

BOOT CAMP –PITCH FEST

1. V.Dishvanthini
2. U. Navis fathima
3. J. Remi praka
4. S.Ranjani
5. K.M.Divya
6. K.Harshini

had won BEST IDEA OF THE DEPARTMENT in Pitch Festival 2022 organised by

PSNA START-UP CELL from 28.02.2022 to 01.03.2022.

1. V.Dishvanthini
2. U. Navis fathima
3. J. Remi praka
4. S.Ranjani
5. K.M.Divya
6. K.Harshini

participated in the CAMPUS BOOTCAMP-1 organized by the PSNA START-UP CELL associated with NATIVELEAD from 10.05.2022 to 13.05.2022.

PROJECT DESIGN USING IOT &TECHNIQUE:

1. V.Dishvanthini
2. A.Aruthra

Has participated in Enthu Technology Solutions India Pvt Ltd jointly organizes Two days Workshop on Innovation and Project Design Using IoT & Arduino : Tools & Technique

Date: 6th & 7th October 2022.

TESSASLT 2K22:

1. V.Dishvanthini
2. A.Aruthra
3. P.Dhesigashree

Had participated in paper presentation at TESSASLT 2K22 2022 organised by ssm institute of engineering and technology , Dindigul.

1. V.Dishvanthini

Had participated in technical quiz at TESSASLT 2K22 2022 organised by ssm institute of engineering and technology , Dindigul

1.V.Rishikeshvar Ram
2.V.S.Gopika
3.B.Gokul kumar
4.R.Logesh

Robo Club Member's participated in KSI's IDEATHON 2022 in Kangeyam Builders Engineering College , Thirupur.

ROBO CLUB MEMBER LIST

Department	Total Members
ECE	335
CSE	210
IT	133
BME	15
AI&DS	77

ARTICLE SUMMARY

Total No.of articles:24

Department	Number of Articles submitted	Number of Articles selected
ECE	64	14
CSE	15	2
AI&DS	12	8

ROBOTICS IN DEFENCE SECTOR

ABSTRACT :

- Robot usually refers to a machine that can be electronically programmed to carry out a variety of physical tasks or actions.
- Robotics and artificial intelligence is combination of technology and cognitive intelligence for simulation, processing of information and knowledge to build capability in a machine to imitate human behaviour.

KEY WORDS :

- Surveillance and security
- Gladiator TUGV
- RSTA

THE USE OF ROBOTICS IN MILITARY :

- Military and battlefield applications continue to grow at autonomous vehicles used for surveillance and security.
- Robots can neutralize suspicious objects that may explode. The platform has a robot arm to pick up explosives or suspected hazards in military or civilian settings.

- The robot is equipped with a camera to see within a building without sending in people. If the structure is without light, the mobile platform's camera is equipped with infrared or night vision.
- The Gladiator TUGV is a robust, compact, unmanned, tele-operated, multi-purpose ground reconnaissance, surveillance, and target acquisition (RSTA) vehicle system possessing a scouting and direct engagement capability.
  - Use of robotics and emerging technology, military units can be ready for anything, while preserving the safety of their troops.
  - The future is definitely based on the robotics.

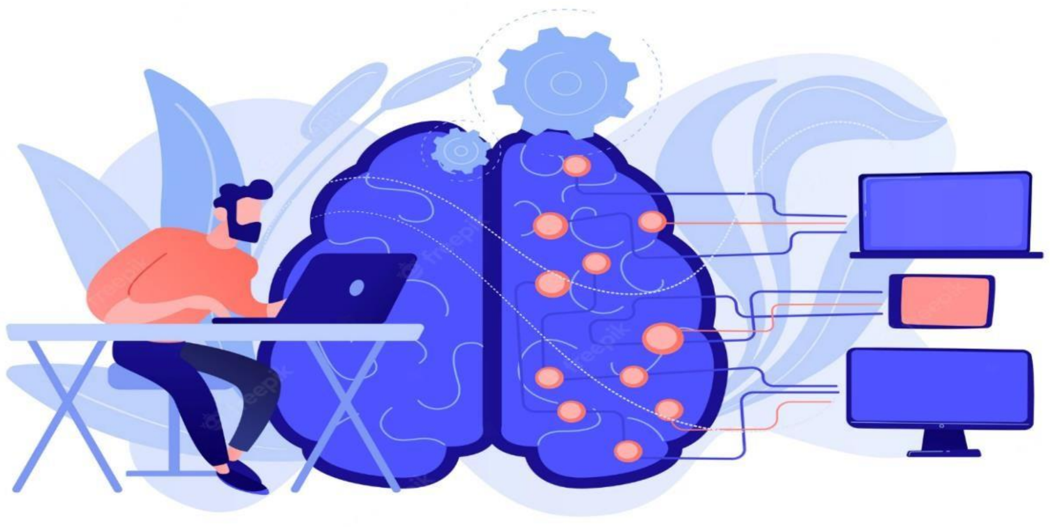
Name : MATHAN.M

Year : 2

Section : A

Department : ECE

Role of machine learning and artificial intelligence in robotics



Robotics was fundamentally developed in the early 1950s, and it is now widely recognised as a self-operating machine with accurately taught and learnt inputs. Since its creation, robotic intelligence has developed at a variety of hierarchical levels. Robotics was developed to be utilised in factories for industrial purposes, and today it is difficult to find a field where it is not in use. Robots were initially only intended to carry out a predetermined list of monotonous chores. At that point, only machine learning and artificial intelligence were used in robotics. Artificial intelligence began to be used in industrial robots that were digitally programmed in the 2000s. Since then, a lot has changed in the world. Robotics and machine learning (AI) have been skillfully combined to expand the purported capabilities of robotic intelligence, giving it the ability to build a clear human vision and recognise powerful stimuli. Huge algorithms and datasets are used in this process to transform robotics' potential into a vision that is similar to that of a human

As was mentioned above, AI and ML increase the effectiveness of robotics, and in the current global environment, they have affected every industry. Here is a quick look at various industries where robots is benefiting from AI and ML.

HEALTH CARE

Healthcare market disruption and transformation are being accelerated by AI robotics. Function testing, surgery, research, data integration, etc. are all already heavily reliant on ML-driven robotics in the healthcare system. AI robots is frequently used to keep tabs on patients' health, establish a constant supply of medications and other necessities around the hospital, and create unique health duties for patients. By offering assisting robots, precise diagnosis, and remote therapy, AI and robotics are assisting the healthcare industry. Robotic proactive analysis enables the identification of subtle and intricate trends in a patient's health graph. For micro-surgeries like unclogging blood arteries, hospitals are actively using robots powered by machine intelligence. AI robots' use in the healthcare sector is one of the largest gifts it has given.

AGRICULTURE

Agronomists can increase their farm output by integrating AI, ML, and robotics because these three technologies offer practical and actionable insights. Farmers can secure good yields and minimal operating costs by obtaining this information, taking a step toward successful farming. The main goal of using robotics in farming is to reduce the amount of backbreaking work required by automating tasks like irrigation, seed distribution, pest management, and harvesting. The growers now have a lot more time to devote to chores that are productive. Robotics' ability to ensure precision is one of its key advantages since it prevents the potential for land to be used effectively from being wasted. The automation of the green economy can support the monitoring of environmental protection, quality improvement, and other factors. The agricultural colony is increasingly moving in the direction of these technologies, ensuring massive farm success overall.

AUTOMOBILES

The automotive sector has a wide range of applications for robotics, including designing, supply chain, and production tasks, as well as a broad range of management tasks. In the transportation and automotive industries, systems including driver assistance, autonomous driving, and driver risk assistance are being used. Robotic intelligence has been used in the auto industry for more than 50 years. The only significant difference between then and today is the rapid growth of AI and ML in this field. Numerous benefits of robotics in vehicles include.

- Robotics provide a precise vision for finding the necessary components. Robots can easily complete simple tasks like installing door panels, fenders, etc.
- putting together mechanical components like pumps, motors, screws, etc.
- It is possible to use robotic arms for coating and painting.
- Robots may transfer the separated parts, including loading and unloading, in addition to assembling them.

In practically every industry, including those in agriculture, healthcare, education, transportation, and many others—the list is rather long—innovations like artificial intelligence, machine learning, and robots are now commonplace. This implies that even in the most remote places, greater inventions and proper awareness are constantly needed. Robotics advancements using AI and ML are accelerating rapidly. In the future decades, artificial intelligence will become a necessity rather than a luxury. Robotics, assisted by AI and machine learning, is about to upend every industry, from pins to rockets.

Name:B. Gugan Raj

Year: 2nd Year
Section: A
Department: ECE
RoboLab ID:

HOW ROBOTICS IS IMPORTANT IN SHAPING THE FUTURE OF INDIAN YOUNGSTERS?

So what is robotics? Robotics is a branch of engineering that involves the conception, design, manufacture and operation of robots. The objective of the robotics field is to create intelligent machines that can assist humans in a variety of ways. It is said that by the year 2030 this mind-blowing sector of wonders will have a market value of around $500 billion.

Some people believe the Development of Robotics is will eradicate Manual Labour. But, this is not completely true, is it? Certainly Not. There will still be the human presence, it’s just that the nature of the jobs will be different. This is just a means to an end for making life easier.

Indian Robotics Sector is at boom. It is not just left for the future to see growth in Robotics and the ample application it withholds; it is happening in the present scenario. Robotics in India has gained popularity in varying sectors like healthcare, education, manufacturing, and entertainment. The Indian Government is collaborating with several robotics organizations, to facilitate communication between Indian researchers and their international counterparts. Robotics has begun to replace people in risky and tiresome industrial tasks, becoming part of our daily lives.

As a result of this widespread boom of Robotics in our country the knowledge of robotics has also increased to a lot including to a layman who don’t even understand those technical terms but sure they would know about robots and its branch of engineering.

Up next when we look about the scope of robotics in our country Robotics is a dynamic and competitive sector with several prospects for advancement in position and earning. The job of the robotic engineer is to design, maintain, upgrade and perform a routine inspection of robotics models and their production line. Robotics Engineers can secure lucrative job offers even at entry-level positions. Hence kids need to look at Robotics Engineering as a career option in India. Designing complicated robotics systems to tackle unique issues is the focus of a robotics engineer. Within the constraints of the project requirements, individuals can express themselves freely and solve social issues. This provides a sense of accomplishment and happiness in your work. Problem Solving requires a particular set of skills with a creative mind set.

To sum up it is safe to say that the future of Robotics in India will be a force to reckon with. Robotics has the ability to improve people’s lives and work habits by increasing efficiency and safety while ensuring superior service. In a nutshell, it is becoming crucial to introduce children to robotics since it increases the fun factor and enables children to learn more quickly. Therefore, with the necessary skills, knowledge, and training in robotics, Sky is the Limit for your children.

Name: Barathvignesh S

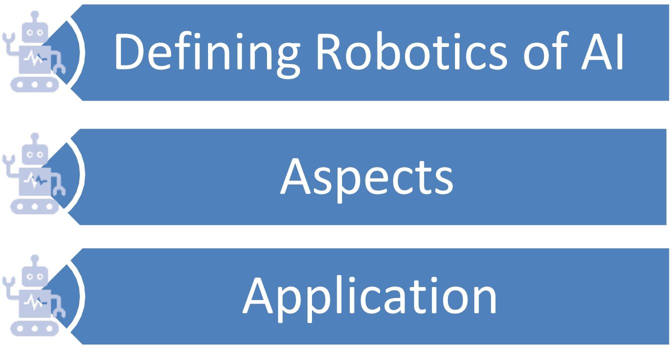
Year: II Year Ece

Roboclub Id: Ecerobo-127

APPLICATION OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE IN ROBOTICS

Robots have always been our point of fascination. The swiftness with which they do the work of 100 human beings keeps our eyes wide open. The Asimov robot by Honda introduced the humans of the 21st century to modern-day robotics. AI has recently seen a significant rise in its demand as well as its development in varied fields of jobs. This has led to a surge in demand for machine learning companies in India. It is a common perception that AI and Robotics are the same or somewhat similar. In layman's language, AI is the brain while Robotics is the body. Robots have existed without AI in the past. And will continue to do so. As without Robots, the implementation of AI is nothing but software interaction. An artificially-intelligent robot is a term for the combination of these two technologies as it is still under research work. The augmentation of both will do wonders. But until then one needs to clear the concept that both AI and Robotics serve different purposes. This is where the need for machine learning consulting arises.

Artificial Intelligence vs Robotics: The Background



Defining Robotics and AI

Robotics is the branch of science that deals with the development of robots. Robots aim to complete the work done by human in much lesser time with better efficiency. The robots can be automatic or need some initial instructions from humans.AI is a computer science branch and it helps in developing software that can do the task that needs personal discretion, decision-making, and intelligence as these qualities cannot be otherwise programmed in a computer. AI Development services can help the machine learn and perceive surroundings to adapt as per the situation. AI can even solve different problems, tackle logical reasoning and also learn languages.

Aspects

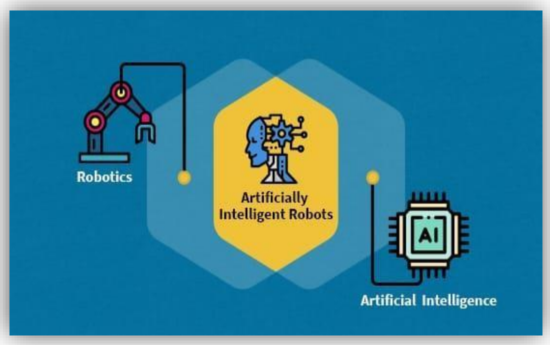
Robots are programmable and interact with the surrounding using sensors. They might be automatic or semi-automatic depending on the area of their application.

AI is a science that depends on machine learning and algorithms. If explained in limited words, AI works on its own decision making and reasoning.

Application

A robot aims to simplify lifestyle and increase work productivity. A robot that can improvise the methods to work will be more than welcome. But a clear definition of the robot doesn't imply anywhere about learning. Designing a robot undergoes a lot of physical building, external designing, and coding (or AI), which aims to enhance its decision-making capacity.But AI is all about humanizing the technological experience. AI engines found use in GPS trackers, better navigation systems, customer care chatbot, and others. There are few cases where an AI program powers robots.There's a separate type of robot powered by AI, i.e., Artificially-Intelligent Robot. Control of Robot is through an AI program developed in a tightly knit environment. AI development companies along with Robotic development firms perform this task. AI robots have a varied spectrum of application. They found use in several departments of the same factory whereas a simple robot performs repetitive tasks with a set of programmed movements. It does not need any intelligence.

Artificially Intelligent Robots



There are specific examples of artificially-intelligent robots:

Cobot (Non-artificially-intelligent)

A Cobot can do work by itself after programming. It does not need any human help until turned off. Cobot is a collaborative robot and in this case, will do a work assigned repetitively as it is a non-AI robot.

Cobot (Artificially-intelligent)

The Cobot mentioned above can be further developed by the addition of AI. The addition of AI adds a perception to the robot. It also adds decision-making instincts that need a decorated algorithm. For example, a heat receptor to prevent the robot from entering furnaces while operating as the robot would be handling heat-sensitive items. Also, a camera can add a perceptional vision to the robot. This will prevent it from colliding from different elements in the factory.

Software Robot: A software robot is a computer program which performs a task on various software and websites by itself. They are also known as bots as they have no existence in reality and are actually computer programs. For example, a web-crawler scans the website and categorizes them for search. It might include AI engines for better performance.Software robots are not robots in real. But the work done falls in the category of robots, thereby it makes an entry in the list here.

Conclusion

The difference that makes the AI stand out is the ability to make decisions. It can make the software yield better results, i.e., improvisation. AI is a technological brain with wires and programming. Robots need prior instructions or codes of instruction to perform autonomously or semi-autonomously.

The world looks for the amalgamation of these two principles in a much more confident manner as that might help humankind to achieve the goal untouched from centuries. Humankind has invented for the sole purpose of satisfying curiosity. Curiosity took us to the moon and is now about to take us to the mars in search of a peaceful and better habitat. This curiosity should never die as the day it will, our will to live might. Robotics is the ever-developing branch of science, from pay loading shelves to drones, the science is developing micro-drones, unmanned aeronautical vehicles (UAV) to get to the edge of the curiosity. Betterment of everything depends on the dedication of the development team, and in case of a sole leader, his motivation. The potential offered by this technology has given rise to the demand for AI consulting services around the world.

Name: RAJA SUDHARSHANA GOVIND R

Year: II YR BTech ADS

Roboclub Id:

APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

ARTIFICIAL INTELLIGENCE:

Artificial intelligence is the stimulation of human intelligence processes by machines and computer system. Artificial intelligence is a way of making a computer controlled of robot, a software think intelligently.AI is a branch of computer science that deals with the automation of intelligent behaviour.

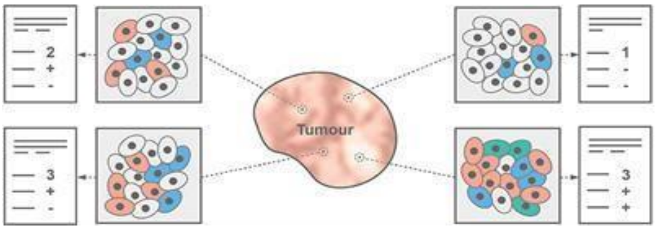
ARTIFICIAL INTELLIGENCE AND ROBOTICS:

Robotics is a branch of engineering that involves the conception, design and manufacture and operation of intelligent robots. The applications of Artificial intelligence in robotics boosts enterprise potential. The combination of AI and robotics allowed companies to tackle more complex and to give high level tasks with their robots. What makes a robot powerful is to think on its own. This is where the artificial intelligence and the robotics come together.Artificial intelligence can help a robot to do a lot of works by perceives the environment and take actions with maximize its chance of success.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE IN ROBOTICS:

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. Data science has many applications in robotics.it is used to detect Fraud and Risk detection. Many banking companies learned to divide and conquer data via customer profiling, past expenditures, other essential variables to analyze the probabilities of risk and default. Data science is used in Healthcare sector. It is used to analyze the medical images .i.e. analyzing the procedures such as detecting tumors, artery stenosis, organ delineation etc… and it is used as a virtual assistance for patients and customer support.



Data science has additional progress in advanced image recognition by making specific note of their advances in image recognition accuracy and capacity. It is used in facebook, face lock in androids etc…

Speech recognition is one of the basics of the robots. Data science provides this speech recognition feature which is very useful and helpful for robots to understand the language and it is very useful for the communication the robots. Some of the speech recognition products are google voice, siri, cortana etc.

Games are now designed using machine learning algorithms that improve/upgrade themselves as the player moves up to a higher level. In motion gaming also, your opponent (computer) analyzes your previous moves and accordingly shapes up its game. EA Sports, Zynga, Sony, Nintendo, Activision-Blizzard have led the gaming experience to the next level using data science.

Augmented Reality

This is the final of the data science applications which seem most exciting in the future. Augmented reality.

Data Science and Virtual Reality do have a relationship, considering a VR headset contains computing knowledge, algorithms and data to provide you with the best viewing experience. A very small step towards this is the high-trending game of Pokemon GO. The ability to walk around things and look at Pokemon on walls, streets, things that aren't really there. The creators of this game used the data from Ingress, the last app from the same company, to choose the locations of the Pokemon and gyms.

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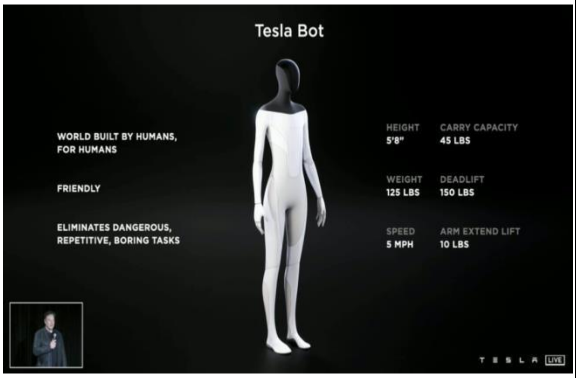
APPLICATIONS OF ARTIFICAL INTELLIGENCE AND DATA SCIENCE IN ROBOTICS

Optimus:

Tesla CEO Elon Musk unveiled the humanoid robot “Optimus” at the 2022 AI Day on Friday.Tesala’s bot is designed to “Built the world for humans,by humans” and Elimate Dangerous,boring task. Musk said, he hopes these robots can be used to assist in day-to-day tasks.He plans for them to be tested by working in his Tesla factories and one day run errands for human buyers, such as picking up groceries.

AUTOMATED GUIDED VEHICLES

The introduction of the latter two in robotization is a gift of AI that ensures safety through a better perception of the surrounding. In a nutshell, these sensors are the decision-making body of the robots. Automated guided vehicles (AGVs) or automated guided carts (AGCs) are utilized for transporting stock from one place to another in a warehouse. The corporate world today works day and night and therefore the presence of systems like AGCs sustains 24*7 working with similar costs.



HARVEST AUTOMATION:

Harvest Automation was founded by ex-employees of iRobot .Their primary product is called the HV-100 robot and its function centers on spacing various types of plants and container crops during the harvest season.This technique is particularly useful for greenhouses as plants in this ecosystem need to be evenly spaced to prevent overlapping of growth and build resilience. The special feature of this robot is that it is capable of working in nurseries that often grow specially produce and ornamental plants.

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ROBOTICS

Introduction :

Robotics and artificial intelligence are two related but entirely different fields. Robotics involves the creation of robots to perform tasks without further intervention, while AI is how systems emulate the human mind to make decisions and 'learn. '

What are Robots ?

Robots are automatically operated machine that replace human effort.

Asimov's famous law of robotics:

A robot may not injure a human being or though inaction ,allow a human to come to harm. A robot must obey the orders given it by human beings , unless such orders would conflict with the first law. A robot must protect its own existence , as such protection does not conflict with the first or second law.

Artificial intelligence:

Artificial intelligence (AI) is a branch of computer science. It involves developing computer programs to complete tasks that would otherwise require human intelligence. AI algorithms can tackle learning, perception, problem-solving, language-understanding and/or logical reasoning.

Parameters of comparison	Human	Robot
Adaptivity	High	Depends on design, but limited
Speciality	Genetic (depending on training)	Specialised
Accuracy	Biologically Limited	Designed to exceed human scales
Stable performance	Degrades rapidly by the time	No degradation
Exposure	Susceptible to infection and radiation	Unsusceptible to environment hazards

How Robots And Artificial Intelligence Are Connected ?

Artificially intelligent robots are the bridge between robotics and AI. These are robots that are controlled by AI programs. Most robots are not artificially intelligent. Up until quite recently, all industrial robots could only be programmed to carry out a repetitive series of movements which, as we have discussed, do not require artificial intelligence. However, non-intelligent robots are quite limited in their functionality.

Artificial Intelligence

AI algorithms are necessary when you want to allow the robot to perform more complex tasks. A warehousing robot might use a path-finding algorithm to navigate around the warehouse. A drone might use autonomous navigation to return home when it is about to run out of battery. A self-driving car might use a combination of AI algorithms to detect and avoid potential hazards on the road. These are all examples of artificially intelligent robots.

Example: Artificially intelligent cobot

You could extend the capabilities of a collaborative robot by using AI.

Imagine you wanted to add a camera to your cobot. Robot vision comes under the category of "perception" and usually requires AI algorithms.

Say that you wanted the cobot to detect the object it was picking up and place it in a different location depending on the type of object. This would involve training a specialized vision program to recognize the different types of objects. One way to do this is by using an AI algorithm called Template Matching.

Conclusion:

In general, most artificially intelligent robots only use AI in one particular aspect of their operation. In our example, AI is only used in object detection. The robot's movements are not really controlled by AI (though the output of the object detector does influence its movements).

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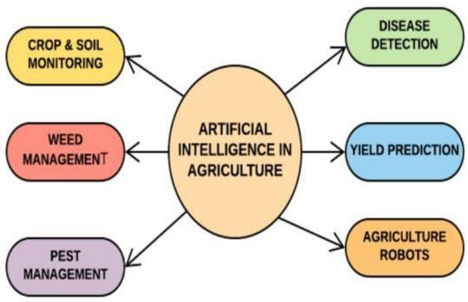
Artificial Intelligence in Agriculture

The United Nations Food and Agriculture Organization asserts that the whole world's population would rise by an additional 2 billion in 2050, whereas at that time, the increased land area for farming will solely account for 4%. In the aforementioned situation, more coherent cultivation practices need to be accomplished by utilizing modern technological advancements and unravel the ongoing barriers in farming. An undeviating use of Artificial Intelligence and its subsets in agriculture can serve to be an embodiment of a shift in the way that farming is exercised during the present time. The agricultural domain faces countless obstacles for instance disease, improper soil analysis, pest infestation, irrigation, and inadequate drainage, and a lot more. These challenges lead to dangerous environmental hazards and intense crop loss as a result of using redundant chemicals. The realm of Artificial Intelligence along with its meticulous learning abilities has evolved to form a key approach for dealing with diverse farming-related issues. This paper emphasizes the applications of Artificial Intelligence practices in different domains of agricultural science, the industry insights, and the challenges to adopting AI in agriculture

INTRODUCTION

The machines were deployed during the industrial revolution as a substitute for human labour in the 19th century. Eventually, with the growth in Information Technology in the 20th century, after the advent of computers, the innovation of Artificial Intelligence powered machines was initiated. In the ongoing era, it is an actuality that Artificial Intelligence is slowly but strongly replacing human labour

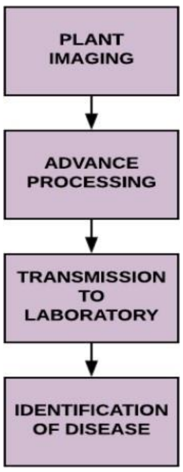


Generally, the universal crop management system delivers an interface for the global management of crops that cover every feature of agriculture. The first Artificial Intelligence technique in the management of crop was first recommended by McKinion and Lemmon in 1985, in the paper "Expert Systems for Agriculture". Additional expert system was planned by Boulanger for the corn crop protection in his own thesis. An expert system named POMME was proposed by Roach in 1987, which was made for the apple plantation management. COTFLEX was another expert system developed by Stone and Toman for the management of the crop. A new rule-based expert system proposed by Lemmon which was also developed for the management of cotton crop is called COMAX. 3-D Laser scanning, hyperspectral imaging, and Remote Sensing techniques are important to create metrics of crops over acreages of land that can be cultivated. It is capable to bring an innovative shift in how the lands are supervised by the farmers from the viewpoints of both time and effort. Robinson and Mort proposed a multifaceted feed forward neural network-based system which was designed to guard crops which were citrus from any kind of damage in the Sicily Island of Italy. The parameters of the input and output were coded in the binary format for the training and testing of the network. Dissimilar patterns of inputs were used by authors to achieve a prototype with maximum precision. The finest prototype achieved so far had a 94%

precision with six inputs and two output classes. The unsurpassed network that was achieved contained five concealed layers that were educated up to 300000 reiterations and attained 85.9% accuracy on average. The management of the soybean crop proposed by Prakash was based on Fuzzy Logic and delivered guidance about selection of crop, pest issues and fertilizer application.

DISEASE MANAGEMENT

A major risk to the global economy, environment, consumers, and farmers can be caused by plant diseases. In India alone, 35% of the crops are destroyed because of pests and pathogens triggering a major loss to the farmers. The unselective practice of pesticides is a threat to human health as some of them are biomagnified and toxic. These effects can be evaded by surveillance of the crop, detecting the disease, and providing the applicable treatment. Substantial experience and expertise are needed to recognize an indisposed plant and then take the required action for its recovery. Computerized systems are utilized worldwide to analyse the disease and then recommend methods to control it. For detection of disease, the sensing, and analysis of the image is done to ensure that imageries of the leaves are partitioned to the external regions like the non-diseased area, background, and diseased area of the leaf. The infected part of the leaf is then reaped and sent to the lab for additional analysis. This helps in the assistance for the recognition of pests and then sensing nutrient deficiency



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BLOCKCHAIN ON HEALTHCARE

Healthcare

Activities done, especially by educated and qualified professionals, to preserve or restore one's physical, mental, or emotional well-being.

Health Information Exchange

By enabling appropriate access to and secure sharing of a patient's critical medical information electronically, health information exchange (HIE) helps to increase the efficiency, effectiveness, safety, and affordability of patient care.

For instance, when sending their patients to a specialist, they should send them straight electronic care summaries that include drugs, issues, and lab results.

Types of Health Information Exchange

- Directed Exchange - Directed exchange can be compared to a secure email exchange between two providers who are familiar with and trust one another.
- Query-Based Exchange - This type of HIE is most frequently used by providers to give unanticipated care, like in an emergency.
- Consumer-Mediated Exchange - Patients can simply and securely access their own medical information online through consumer-mediated interaction.

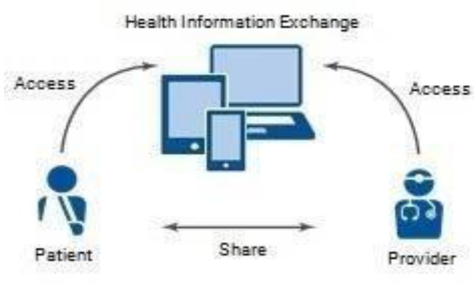
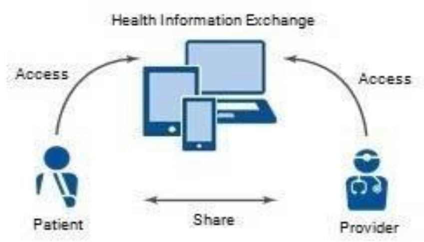


Diagram on Health Information Exchange



Pros And Cons Of HIE

Reporting and monitoring of public health, quality of results.Transitioning and educate electronics without enabling the system.How To Go About Itissue still remains: Where can we actually use it? We already know that cryptocurrency (Bitcoin, Ethereum) is a popular use for blockchain, but what about other uses? Healthcare is one of the best applications for blockchain, after allIn the event that an accident occurs or you become ill, you visit the hospital, and the doctor asks you a few questions.

In addition to asking your name, they may also inquire as to whether you have diabetes or any medication allergies. What if you have diabetes and a medication allergy? If you respond "no," there will be a serious problem. Why don't they establish a central database where all hospitals may exchange data? The second major issue is determining whether or not the medication you are taking is authentic. In order to use blockchain in this situation, it must first be emphasised that it is a distributed ledger.

So, in essence, all data will be stored decentralizedly, making it impossible for anybody to possess it. Instead, it will be shared among entities and nodes, and because it is immutable, it cannot be altered. All hospitals can share data on a decentralised database by simply changing or gaining access to the data.

Either a public blockchain or a private blockchain can be used

Conclusion

HIE is intended to ensure that a patient's health records are accurate and comprehensive rather than to replace essential provider-patient communication, as was previously indicated. The rise of new approaches to provider payment that emphasise coordination of care, meaningful use requirements for using certified EHR technology, and financial incentives from the federal government, among other motivators, are pushing an increasing number of providers and practises to investigate and use HIE.

There is hope that healthcare will become more efficient, safe, and affordable as this type of digital health becomes more prevalent.

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NANO ROBOTICS

Abstract

Advances in technology have increased our ability to manipulate the world around us on an ever-decreasing scale. Nanotechnologies are rapidly emerging within the realm of medicine, and this subfield has been termed nanomedicine. Use of nanoparticle technology has become familiar and increasingly commonplace, especially with pharmaceutical technology. An exciting and promising area of nanotechnological development is the building of nanorobots, which are devices with components manufactured on the nanoscale. This area of study is replete with potential applications, many of which are currently being researched and developed. The goal of this paper is to give an introduction to the emerging field of nanorobotics within medicine, and provide a review of the emerging applications of nanorobotics to fields ranging from neurosurgery to dentistry.

Introduction

Progression in science and medicine has been marked by the ability of researchers to study and understand the world around us on a progressively smaller scale. With each order of magnitude of access to smaller dimensions, new therapeutic possibilities and frameworks of understandings were developed. These developments included the germ theory and microbiology

The next phase in the ever-decreasing size of operation is the development of nanotechnology, where researchers are able to work on the scale of nanometers. The scale of nanotechnology is defined by the National Nanotechnology Initiative (NNI), a United State government initiative to promote the development of nanotechnology research and development, as "science, research, and technology conducted on the nanoscale." The NNI defines this scale as approximately 1 to 100 nanometers. To give a practical idea of the nanoscale, a cell surface receptor is approximately 40 nanometers[1], a strand of DNA is about 2 nanometers in diameter, and a molecule of albumin is about 7 nanometers.

Microbiology

The field of microbiology has been successfully used as a springboard for the initial development of robotic functions in nanobiotechnology. Although microrobots and nanorobots can be constructed and have function, their use within the vascular system is limited by challenges with transportation and propulsion. An effective strategy for enabling propulsion of microrobots and nanorobots is coupling them to magnetotactic bacteria such as Magnetococcus, Magnetospirillum magnetotacticum or Magnetospirillum magneticum. The largest componenet of these nanorobots integrated into magnetotactic bacteria would be the bacterial cell component. The smallest known species of magnetotactic bacteria is the marine magnetotactic spirillum, which is 0.5 μm (500 nanometers), just above the upper limit of the NNI's definition of the nanoscale. However, the marine magnetotactic spirillum's usefulness is limited by their speed, and magnetotactic cocci are more useful for intravascular function.

Hematology

There is a rich base of research and potential applications for nanomedicine and nanorobotic applications in the field of hematology. From uses ranging to emergency transfusions of non-blood oxygen carrying compounds to restoring primary hemostasis, there is a wide array of applications under study for nanorobotics in hematology.

One of these devices currently under design is a nanorobot dubbed a respirocyte. This robot is equipped to have three functions as it travels through the bloodstream. First, collecting oxygen as it passes through the respiratory system for distribution throughout the bloodstream. Second, collecting carbon dioxide from tissues for release into the lungs. And finally, metabolizing circulating glucose to power its own functions. The total size of the robot would be about one micron, or 1,000 nanometers. However, the contained components would be constructed on the nanoscale. These include an onboard computer of 58 nm diameter, and oxygen and carbon dioxide loading rotors with a maximum 14 nm diameter in any one dimension. The respirocyte is designed to carry 236 times more oxygen per unit of volume compared to red blood cells. Development and use of this technology could provide an effective and lower risk alternative to blood transfusions.

Dentistry

A field in which nanorobots can have significant routine and specialized use is the field of dentistry. Virtually all the elements of dental care and treatment could incorporate nanorobots and benefit from their use by providing a higher level of care. These uses range from a routine cleaning, to cosmetics and teeth whitening, hypersensitivity, and even orthodontics.

Nanorobots can be incorporated into almost every aspect of dental care, including the initial analgesia a dentist may give at the start of a visit. A suspension containing millions of nanorobots is administered orally to the patient. These robots are small enough to enter the gingival sulcus, and eventually travel through the micron sized dental tubules to reach the pulp. Central control of these nanorobots would allow activation of analgesic activity in highly specific areas in proximity to where the dentist will be providing care.

Neurosurgery

Nanotechnology has progressed from a theoretical proposal to a rich area of proposals and ideas, and now is an active area of practical research and developments. As a field that frequently functions on a microscopic level, neurosurgery is uniquely suited to benefit from many of the innovations nanotechnology has to offer. These benefits include improved detection of pathology, minimally invasive intracranial monitoring, and pharmaceutical delivery, amongst many others. The increase in our ability to work on an ever-decreasing scale has been greatly accelerated by advances in manufacturing microelectomechanical systems. These advances may allow manipulation on the scale of individual cells, and potentially on the molecular scale in the near future.

Oncology

Improving the treatment quality and clinical outcomes of cancer patients, and reducing the mortality and morbidity associated with oncological conditions and their treatment has been identified as a goal by the Institute of Medicine. This need is underscored by the increasing number of seniors in the population, and the increasing number of cancer diagnoses that comes with an aging population. Nanotechnology has already shown much promise in improving the management of cancer. Increasing the sensitivity of cancer imaging tools, overcoming drug resistance, and improved treatment of metastasis are some examples of nanoparticle technology's increasing role. There have also been some promising developments in the subfield of nanorobotics for the treatment of cancer, which will be discussed below.

Conclusion

The scientific community is in the midst of a breakthrough in developing technology on a scale orders of magnitude smaller than ever before. As our technology advances, and as we explore on smaller and smaller scales, we are able to gain increased control of the world around us and ourselves. In the past, developing the ability to manipulate the world on a smaller scale brought transformative changes to the scientific community, and the world at large. Whether it was the age of microscopes ushering in the area of bacteriology, or the beginning of the atomic age with the study of particle physics, nanotechnology is poised to change many of the paradigms with which we think about disease diagnosis, treatment, prevention, and screening. Outside the bounds of medicine, nanotechnology will affect our lives in countless other ways through industries such as telecommunications and agriculture.

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LATEST ADVANCEMENTS IN MATERIAL CUTTING ROBOTICS

Automated finishing tools have advanced in precision and flexibility over the last ten years. Because of the accuracy and speed offered by robotic cutting tools, companies are relying on automation for processes that traditionally use CNC machining or manual methods. Popular tooling includes laser cutting, water jet cutting, and routing. All these tools perform cutting tasks using different techniques and are tailored for cutting specific materials. Industries interested in material cutting applications usually manufacture parts that demand accuracy or output beyond what is capable of manual processes. Research and investments using artificial intelligence and 3D vision lead to advancements in these techniques, allowing better precision, flexibility, and output.

Advancements in Laser Cutting Tooling

Laser-cutting robots have evolved considerably since their introduction in the 1960s. This equipment offers greater performance that comes close to matching the precision offered by CNC machines at a higher production speed. Laser cutting is used for trimming steel structures, die-cast aluminum, automotive panels, and more. Laser cutting can be achieved using various methods such as vaporization cutting, melt and blow, thermal stress cracking, and reactive cutting. All these methods use a high-power laser to slice through the material in a small spot, causing a smooth cut through the piece. Attached to a six-axis robot, the tool can cut along any desired edge, creating a finished-shaped part. Some companies are creating an even more flexible production line by combining welding robots with laser-cutting tooling, specifically, the automotive industry. Manufacturers looking to speed up the secondary and finished-cutting process for parts without compromising precision should consider laser-cutting robotics. They offer a faster output than manual cutting and CNC. With new technology, laser cutting offers a higher level of flexibility and precision. Companies are taking advantage of automated laser cutting equipment to eliminate product waste and maximize the output of product-cutting processes.

Advancements in Water jet Cutting Technology

Robotic water jet cutting has been used in manufacturing applications for almost 70 years. Waterjet cutting uses a high-velocity stream of water to cut or drill through the material, and unlike laser cutting, it involves no thermal process. Manufacturers opt to use waterjet cutting to eliminate the need for grinding or smoothing down cut edges and applications that cannot use heated cutting techniques such as food, paper, and certain fabrics.Abrasive waterjet cutting is a newer technique that mixes garnet particles into the water stream to erode harder materials. Companies use this cutting technique to work with dense materials such as stone, metal, and ceramics. The versatile use of wate rjet cutting allows it to be extremely flexible in production. A manufacturer can choose to switch from a softer material such as paper to something as hard as titanium with no problem.

This cutting technique can be used with a wide variety of materials; however, it is not suited for everything. Certain materials, like tempered glass, risk shattering when cut with a waterjet. Before choosing a cutting process, it is ideal for companies to invest in research and development to select the application best suited for their task.

Advancements in Routing Technology

Automated routing is used in manufacturing for material removal and trimming of parts. It is used with tasks that require precision beyond what is capable of manual processes. The repeatability of a robot arm allows the parts to be drilled and trimmed the same way each time, improving the final product and increasing product output. These robots are usually found in the automotive, aerospace, marine, and prototype industries.

Routing robots use a six-axis robotic arm with a spindle and routing bit attached as the end effector. It then uses programming and visual software to drill through material or trim around the edges of the product. One company uses its automated routing system to drill fiber glass boat parts, cutting their production time by half. The parts produced by the company must be drilled and cut in an exact way. The process was previously done by hand, taking a lot of time to make sure the job was done correctly. With the new automated tooling, workers can direct their time to more valuable tasks, and parts are finished faster.

Conclusion

When it comes to material cutting applications, there are multiple options with automation. However, to successfully improve the cutting task, options must be weighed carefully. A company should always research which cutting technique would fit their task best; considering the size, material, and thickness of the product and the flexibility and fixtures needed to cut it. When integrated properly, automated material cutting offers incredible benefits such as higher production output, fewer product errors, and more flexibility in operations. With new technology like artificial intelligence and network connection on the horizon, the possibilities of robotic material cutting are bound to expand into new territory.

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EMERGING 3D VISION TECHNOLOGIES FOR INDUSTRIAL ROBOTS

As more industries come to terms with the need for robots in their operations, the number of industrial robots installed worldwide will experience positive growth within the next five years. With this developing interest in automation comes more investments into research and development. The outcome is leaner robotic systems with more advanced components. A growing trend for robotic workcells is 3D automatic vision. This technology allows the robot to identify an object's position, size, depth, and color. Sectors like logistics, food processing, life science, and manufacturing are finding ways to automate their processes using visual components.

What are the different approaches to 3D vision?

Vision technology is not a "one size fits all" tool. Certain factors such as application, equipment, product, environment, and budget will determine how to integrate vision into the process. There is no standard when it comes to setting up real-time 3D imaging in a robotic system. However, there are a few standard techniques used by vision-integration experts, each tailored to benefit specific tasks. These techniques are stereo vision, time-of-flight (TOF), laser triangulation, and structured light.

Laser Triangulation

Objects pass through a beam of light emitted by a laser scanner. A camera positioned at a specific angle records an image of the laser line as the item passes through, distorting the beam and creating a profile of the object.

Structured light

A projector creates a thin band of light to project a pattern on an object. Cameras from different angles observe the various curved lines from the light to develop a 3D image of the object.

Time of Flight (ToF) A camera uses a high-power laser scanner to emit light reflected from the object back to the image sensor. The distance from the camera to the object is calculated based on the time delay between transmitted and received light.

Stereo vision The robotic system uses two cameras to record the same 2D view of an object taken from two different angles. The software then uses the established position of the two cameras and compares corresponding points in the two flat images to identify variations and produce an image.

What applications are using 3D robotic vision?

There is a need for the modern industrial robot to detect objects, recognize parts, and grip components at the right angle. While traditional robots are perfect for locating parts consistently, modern robotics can coordinate corrections to detect where the piece is. Instead of an entire production line coming to a stop because subsequent actions are not indefinite order, the system quickly recognizes a change and adapts to it. As a result, an array of industrial applications across industries invest in 3D robotic vision. These include the logistics, food processing, life science, manufacturing, and automotive industries. With so many sectors automating, the use of vision technology is expanding into new territory. Depalletizing applications use 3D vision components to scan pallets filled with various types of shipping boxes for sorting. They use scanners to send the image to software to allow the robot to detect box types based on texture patterns and send them to designated areas. A food processing plant uses multispectral vision tech and special lighting to inspect the product and detect spoilage. Applications that have traditionally used vision technology are upgrading to more innovative equipment. An aerospace company replaced traditional inspection tools with 3D scanning to inspect turbine blades for imperfections, reducing inspection time from 18 hours to 45 minutes. Vision technology will continue to expand, with future trends predicted in logistics applications, multispectral machine vision, adaption using machine learning with 3D vision, and liquid lenses to allow more precise images from greater distances.

Crucial subsystems and components for vision applications

The most coordinated automation systems have more than a single automated control system and components integrated to make an efficient workcell assembly. When it comes to incorporating advanced 3D vision options like object tracking, product profiling, and bin picking into a process line, the system should generate 3D imagery data. The use of 3D vision in robotic systems requires integrating various components to facilitate adequate power supply, real-time processing, and safety. Another critical component of successful automation is communication capability. It is good practice in the digital age to have connectivity ports to digitally connect a system to other pieces of equipment for data sharing. Emerging robot technologies facilitate Wi-Fi connectivity for the same purpose. At the design stage, driving a risk assessment study is the only way to identify and remove problems from a system that could risk malfunction. A 3D vision-enabled robot can safely stop equipment to prevent injury and damage to equipment. If buyers invest in the research and upfront planning, the result will be a flexible and easy-to-use automated system.

Conclusion

Modern manufacturing demands more out of less, with leaner production lines needing to provide greater output. The influence of robotic vision will continue to expand into different production areas and find brand-new ways to improve automated processes. Expect more 3D visual components to become common in automatic systems in the future.

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AMAZON SMART DASH CART

INTRODUCTION :

In 1967, Jim Muellner was commissioned to design and build one of the first self-serve luggage cart vending machines. In 1970, smart Cart was established and started its first operations in Salt Lake City, Minneapolis, and Los Angeles. Amazon introduced Smart grocery carts called dash carts. Dash cart have embedded cameras, sensors and smart display. They automatically track shoppers order . Shoppers must have an account and a smart phone to use smart cart. To do shopping they have to scan the QR code in the Amazon app. That signs them into the cart and connect their Amazon account. Amazon is building on its cashier less technology through dash carts

AMAZON SMART DASH CART:

It is the mind blowing feature that we can buy things in the store without cashier with the use of Amazon smart dash cart. We can use our phone to scan the cart which hooks it up to our Amazon account. The cart is surrounded by four cameras and it will scan items if they have a barcode. we will see the lights blinking to note the barcode of the items once we signed the cart will show us the items which we bought previously on Amazon and it faces the information where the items are located. When we leave the store by exiting a green line which is the stores dash cart lane your card will be automatically charge

ADVANTAGES OF DASH CART:

- It makes our shopping Quick without time complexity.
- It is secured that we don't need to pay money with cash ,we can pay with amazon account which has more security and privacy compared to cash payment.
- We can able to buy the items earlier with the help of the cart which it tells us the location of the product we needed to buy without any struggle.

DISADVANTAGES OF DASH CART:

The shoppers who wish to shop on Amazon grocery must have an account and smartphone.
The sensors in the cart will sometimes not scan the barcode of the items clearly, it was the biggest disadvantage of dash cart. The payment method is only by the auto detect payment method it is also considered as the biggest disadvantage.The smart dash cart technology is still not implemented in India

TO IMPLEMENT DASH CART IN INDIA:

We need to Use a combination of computer vision algorithms and sensor fusion to identify items we put in the cart. We need to update the data's which all are in our grocery shop to make the shoppers by locating them without any struggle.We should not use dash cart only by Amazon we should try another product without the help of Amazon account by net banking Or card swiping or card tapping or by cash paymentWe should add the set of algorithms to change the payment method as before 10 metre In dash cart lane the cart should ask us that are you willing to pay with cash or Net banking or card Swipping or tapping

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CLASS:CSE-D

YEAR:2ND YEAR

ROBOLABID:CSROBO-92

FUTURE ROBOTICS

1. Robotics in public security

Artificial technology for predicting and detecting crime might seem far-fetched, but it's quite possible for the future we're looking at. Drone footage, for instance, will make that happen soon. In addition, automatic recognition of suspicious activities is already a reality for camera-based security systems. This technology will change society in a very important way: it will allow law enforcement officials to act quickly whenever a suspicious behavior has been spotted.

2. Robots in education

The line between classrooms and individual learning settings is already starting to blur. As Kendra Roberts, an educational expert from Essays. Scholar Advisor, explains, "A single teacher does not have the capacity to meet the needs of personalized learning for every single student in the classroom. Computer-based learning is already changing things in that matter. It's not replacing the teacher, but it enables students to learn at their own pace."

Robots will boost the process of personalized learning. NAO, the humanoid robot, is already forming bonds with students from around the world. It comes with important senses of natural interaction, including moving, listening, speaking, and connecting.

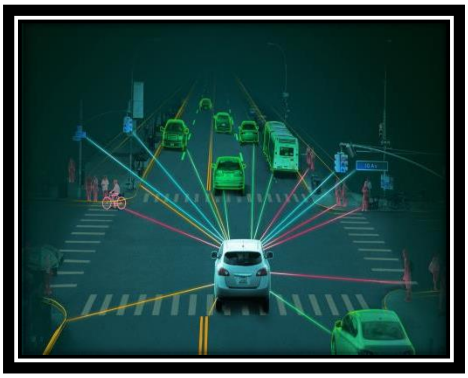
3. Robots at home

Cloud-connected home robots are already becoming part of our lives. We can set up the vacuum cleaner to do the chore for us, and we can schedule a warm home-cooked meal to be ready by the time we're finished with work. Multi-function robotic cookers are able to fry, steam, bake, slow cook, and perform any other action without our intervention. We just set them up. These cloud-connected robots are likely to evolve into more advanced version.

4. Robots as coworkers

Robots will have a profound effect on the workplace of the future. They'll become capable of taking on multiple roles in an organization, so it's time for us to start thinking about the way we'll interact with our new coworkers. The machines will likely evolve more in terms of voice recognition, so we'll be communicating with then through voice commands.

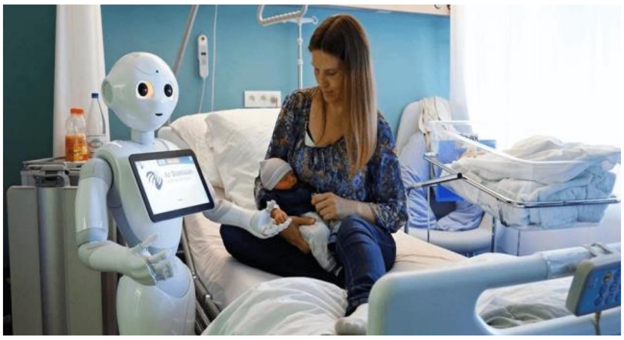
5. Autonomous cars



Self-driving cars still require some human intervention, but we’re getting closer to the day when they won't

Waymo, the company that arose from the self-driving car project by Google, no longer has a monopoly on this industry. Instead, every significant automobile producer is pursuing this technology, with Uber being one of the strongest players. The users of this service can now get matched with a self-driving Uber when they request the service, so they can get a glimpse of the future.

6. Healthcare robots



We’re looking into a different future for healthcare, too. Instead of visiting a primary care physician who will give us a check-up with a simple stethoscope, we’ll have intelligent robots performing these tasks. They will interact with patients, check on their conditions, and evaluate the need for further appointments.

Pharmabotics will bring more huge changes. They'll be like ATMs for medicines, so we can get the medications we need while avoiding the inconvenience of talking to a stranger about our health issues.

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ROBOTIC PROCESS AUTOMATION

Robotic process automation is the software which integrates artificial intelligence and machine learning. It can be used to handle high volume, repetitive tasks which previously required man power. RPA can be used in performing tasks like addressing queries, making calculations, maintenance of records, and performing transactions. One of the most popular and quickly developing technologies for enhancing real-time business operations and procedures is RPA.

Some Of The Real World Examples Of RPA:

Website Scrapping : Website data and content extraction using RPA software is commonplace. Data extraction from popular websites, trade websites, items, and other sites with known data is frequently done with RPA bots. This data is simple to get and examine afterwards.

Call center operations : Consumers of call centers can be assisted using RPA technology ,all the common queries and solutions raised by the consumers will be provided to the agents in a dashboard. When a customer raises questions all the information linked with client will be displayed in a single screen for flawless service

Credit card applications : Credit card applications mostly use RPA in the backend and they are set up to handle each step of the procedure like collecting data,checking background and deciding whether applicant is eligible in receiving credit card.

Scheduling systems: Appointment scheduling can be improved by RPA technology and it helps in collecting data regarding the person and display it in a clear table efficiently.

RPA is becoming one of the important technology and it is widely used in many companies and industries in a variety of ways.

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CSROBO-93

LEGGED ROBOTS

Legged robots are mobile robots that use mechanical limbs for movement, they are similar to wheeled robots, but their locomotion methods are more complicated compared to their wheeled counterparts, they perform much better than wheeled robots on uneven terrain, Legged robots are indispensable for most applications, such as One-legged robots, two-legged robots, three-legged robots, four-legged robots, six-legged robots and multi-legged robots.

They are walking robots, They use their legs to control their locomotion, They are used to offer movement in highly unstructured environments, Although they are complex to design, they have a greater edge over wheeled robots in terms of navigation on any kind of path or terrain, Legged robots are more versatile than wheeled robots, they can traverse many terrains, They can imitate legged animals, such as humans or insects, in an example of biomimicry.

Types

- One-legged robots (pogo stick robots)
- Two-legged robots (Bipedal robots)
- Three-legged robot (Tripodal robots)
- Four-legged robots (Quadrupedal robots)
- Six-legged robots (hexapods)
- Eight-legged robo

Advantages

They benefit from increased stability over bipedal robots, especially during movement. At slow speeds, a quadrupedal robot may move only one leg at a time, ensuring a stable tripod. Four-legged robots also benefit from a lower center of gravity than two-legged systems.Legged robots can navigate on any kind of surfaces which is inaccessible for wheeled robots, wheeled robots are designed to work on prepared surfaces like smooth surfaces, roads, rails, etc

Features

- Legged robots are a type of mobile robot which use articulated limbs, such as leg mechanisms, to provide locomotion. They are more versatile than wheeled robots and can traverse many different terrains.
- In addition to flying robots, legged robots can play a key role in helping a rescue team because of their ability to carry heavy payloads, to perform long-duration missions, to interact with the environment and to move in complex terrains.

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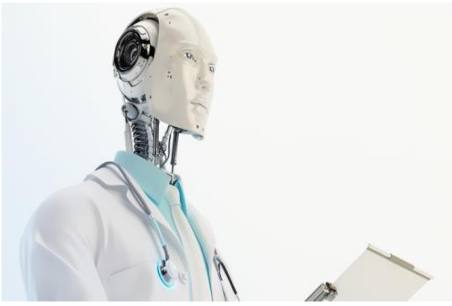
ROBOTICS IN HEALTHCARE

Classifications Of Robotics In Healthcare:



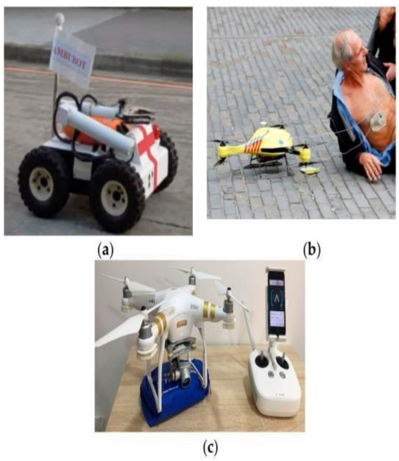
Robots are mainly classified with various applications in healthcare and related fields. These classifications are broadly designated such as receptionist robot area, nurse robots in hospital area, ambulance robot area, telemedicine robot area, hospital serving robot area, cleaning robot area, spraying/disinfestation robot area, surgical robot area, radiologist robot area, rehabilitation robot area, food robot area, and outdoor delivery robot area

Nurse Robots in Hospitals:

These robots are meant to assist doctors in the hospital in the same manner as that of human nurses. Nurse robots are commonly used in Japanese hospitals as Japan has the highest percentage of elderly (above 75 years) individuals among OCED countries. This poses a growing challenge for the medical facilities in the country. Without sufficient recruitment for elderly care, more Japanese citizens are socially bound in taking care of aging family members at home instead of doing a job . In addition, the nursing and healthcare individuals undergo high stress and exhaustion due to patient load.

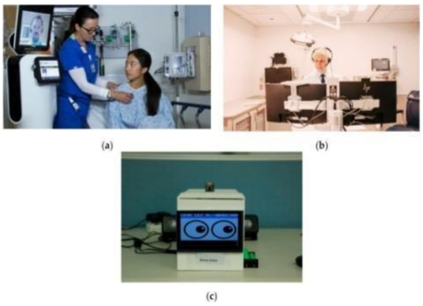
Ambulance robot:

As per statistics, around 800,000 people per year suffer from cardiac arrest in the European Union (EU), out of which only 8% survive this emergency [39]. The main cause of this large number of victims is due to the comparatively sluggish response time of emergency services (typically 10 min) whereas brainstem death commences in just 4–6 min after severe cardiac arrest.



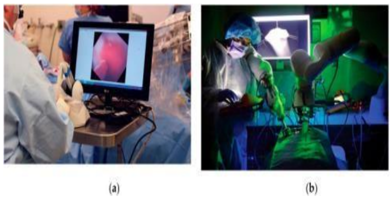
The immediate medical aid after an accident is critical in order to prevent intensification of trauma. Thus, by speeding up emergency response, more lives can be saved as a result of fast recovery. This is particularly factual for drowning, cardiac failure, shocks, and respiratory problems. Lifesaving strategies such as emergency medication, Cardiopulmonary Resuscitation (CPR), and Automated External Defibrillator (AED) aids can be designed lightweight and compact enough to be transported by a flying drone to the emergency site . Such robots are useful in providing emergency treatment with minimum response time to a mobile or a distant patient as shown in Figure 6a,b. A lightweight miniature payload is developed for the Ambulance Drone (TU Delft, Netherlands), containing essential medical supplies for life support.

Telemedicine Robots:



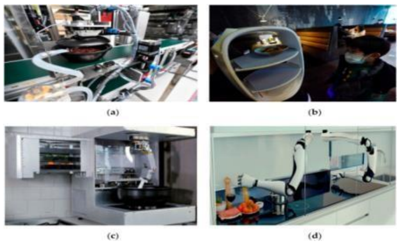
Such robots are helpful in telemedicine applications where a remote doctor takes all the physiological parameters and diagnoses a disease using audiovisual aids . Such systems are very helpful in the case of large-scale infectious epidemics in remote areas where hospitals and medical staff are not readily available.

Surgical Robots:



Surgical robots offer minimally invasive surgery (MIS) with precision and accuracy compared to human surgeons. Many tele-operators have been designed for remote surgeries . The Da Vinci robotic surgical system from Intuitive Surgical Inc.

Food Robots:



These robots are an integral part of a hospital's kitchen and pantry in order to deliver high quality food as per hygienic standards . From cooking to serving, various different types of automation and robotic systems have been designed by the roboticists.

Viewpoint on COVID-19 Management:

Healthcare facilities should prioritize only urgent and emergency visits to fight against COVID-19. All elective and non-urgent admissions must be rescheduled.

Preserving staff personal protective equipment (PPE) and patient care supplies for the safety of both is very important. Routine dental and eye-care visit must be postponed.All inpatient and outpatient elective surgical and procedural cases must be delayed to give priority to COVID-19 patients.Old age patients with underlying conditions are more vulnerable compared to young patients.Patients with underlying chronic medical conditions and pregnancy are at high risk due to this disease.Patients with mild clinical presentation may not initially require hospitalization.However, all patients with worsening signs and symptoms should be monitored closely with respect to the infection progress to the lower respiratory tract during the second week of illness.The decision to monitor a patient in the inpatient or outpatient setting is dependent on 2nd the clinical presentation.The estimated incubation period for COVID-19 is four days (interquartile range: 2–7 days) while some studies recommend a wider incubation of 2–14 days based on data from other coronaviruses (e.g., MERS-CoV, SARS-CoV).

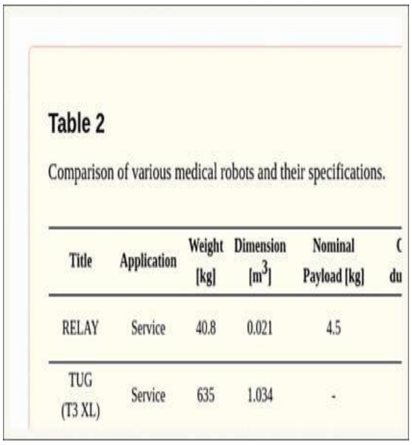


Table 2

Comparison of various medical robots and their specifications.

Title	Application	Weight [kg]	Dimension [m^3]	Nominal Payload [kg]	C… du
RELAY	Service	40.8	0.021	4.5	
TUG (T3 XL)	Service	635	1.034	-	

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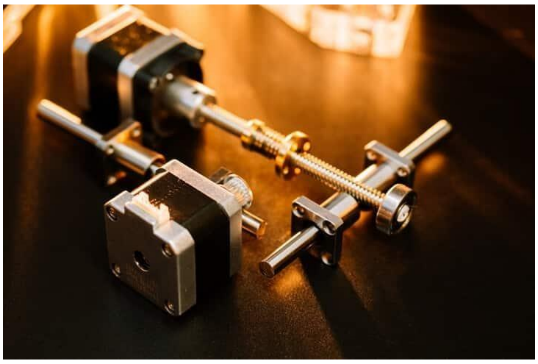
ACTUATOR

An actuator is a machine part that initiates movements by receiving feedback from a control signal. Once it has power, the actuator creates specific motions depending on the purpose of the machine.

Devices with Actuators

Machines and systems have featured actuators since their popularization back in World War II. The most well-known examples of actuators include:



- **Electric motors:** Any part of a piece of equipment or appliance that translates electrical energy into motion, such as those found in ventilation fans, blenders, or refrigerators, contains at least one actuator. Electric cars also use actuators.

- **Stepper motors:** These actuators are best known for receiving digital pulses and converting them into mechanical motion. Stepper motors are often seen in robots, smart tools, or automated cutting equipment.

- **Hydraulic cylinders:** These are linear-motion devices that operate using a tube, piston, and rod. Many vehicles operate using hydraulic motion, such as bulldozers, backhoes, or excavators.

Types of Actuators

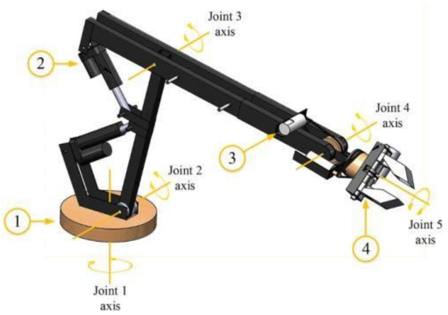
Actuators can be classified by the motion they produce and the power source they use.

Linear Actuators

Implied by their name, linear actuators are devices that produce movement within a straight path. They can either be mechanical or electrical and are mostly seen in hydraulic or pneumatic devices. Any machine, equipment, or gadget that requires some form of straight motion typically has a linear actuator.
In a simple linear actuator, there is a nut, cover, and a sliding tube. The sliding tube provides the space for the motion, whereas the nut and cover provide the interlocking movement that keeps the actuator in a straight path. Other complex linear actuators will have additional parts, but the system mentioned above is the foundation for straight movement.

Rotary Actuators

In contrast to linear actuators, rotary actuators create a circular motion. From the term “rotary,” most machines use these rotating parts to complete a turning movement. They are often used in conjunction with a linear actuator if a machine requires moving forward, backward, up, or down.
Many rotary actuators are electrically powered, but some are powered using a hydraulic or pneumatic system. You can find rotary actuators in windshield wipers, electric fans, or manufacturing machines that transport goods from one area to another.



1) Arm base 3) DC motor
2) Linear actuator 4) Robot gripper

Below are the most common actuators according to energy source:

Hydraulic Actuators

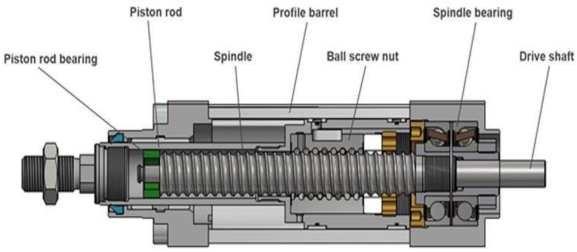
Hydraulic actuators operate by the use of a fluid-filled cylinder with a piston suspended at the center. Commonly, hydraulic actuators produce linear movements, and a spring is attached to one end as a part of the return motion. These actuators are widely seen in exercise equipment such as steppers or car transport carriers.

Pneumatic Actuators

Pneumatic actuators are one of the most reliable options for machine motion. They use pressurized gases to create mechanical movement. Many companies prefer pneumatic-powered actuators because they can make very precise motions, especially when starting and stopping a machine.

Examples of equipment that uses pneumatic actuators include:

- Bus brakes
- Exercise machines
- Vane motors
- Pressure sensors
- Pneumatic mailing systems



Electric Actuators

Electric actuators, as you may have guessed, require electricity to work. Well-known examples include electric cars, manufacturing machinery, and robotics equipment. Similar to pneumatic actuators, they also create precise motion as the flow of electrical power is constant.

The different types of electrical actuators include:

- **Electromechanical actuators:** These actuators convert electric signals into rotary or linear movements and may even be capable of a combination of both.
- **Electrohydraulic actuators:** This type of actuator is also powered electrically but gives movement to a hydraulic accumulator. The accumulator then provides the force for movement, usually seen in heavy industrial equipment.

Thermal and Magnetic Actuators

Thermal and magnetic actuators usually consist of shape memory alloys that can be heated to produce movement. The motion of thermal or magnetic actuators often comes from the Joule effect, but it can also occur when a coil is placed in a static magnetic field. The magnetic field causes constant motion called the Laplace-Lorentz force. Most thermal and magnetic actuators can produce a wide and powerful range of motion while remaining lightweight.

Mechanical Actuators

Some actuators are mostly mechanical, such as pulleys or rack and pinion systems. Another mechanical force is applied, such as pulling or pushing, and the actuator will leverage that single movement to produce the desired results. For instance, turning a single gear on a set of rack and pinions can mobilize an object from point A to point B. The tugging movement applied on the pulley can bring the other side upwards or towards the desired location.

Supercoiled Polymer Actuators

Supercoiled polymer actuators are a relatively new addition to the different types of actuators. They are used in robotics and prosthetic limbs as they can replicate the motion of human muscle via a coil that contracts and expands when heated or cooled.

Selection of Right Actuator

Understanding the different types of actuators is a crucial step in making the best selection for your equipment. Since each kind has its unique purpose and energy requirements, we'll go over factors that will help you arrive at the best decision.

Power Source Availability

The first thing you have to consider is the compatibility of your power source. If you own an industrial site with an electrical source, perhaps the best choice—and the option with the most selections—would be electric actuators. If there are no electrical sources in the area, or you want a piece of fully functional equipment without electricity, you can opt for pneumatic or hydraulic types.

Required Movement

Another important factor when choosing an actuator is the range of movement that you need for your equipment. Is it linear, rotary, or an integration of both? Custom-made actuators can combine or chronologically create these motions to help you concretize the final equipment.

Precision

Some actuators are more precise than others. For example, air brakes are created through pneumatic actuators because air pressure is known to be efficient in the start and stop movements. Other actuators have a larger margin of movement variations, such as those operated through hydraulics.

Any industry that requires a high level of precision for safety and success of operation should consider actuator types that have specific movements.

Safety and Environmental Concerns

Safety is another factor to consider when choosing an actuator for your equipment. Electrical or thermal actuators should be used with caution in areas with extreme temperatures or conducting hazards. For example, operating electrical actuators close to a water body without sealing or other safety measures may create an occupational hazard.

If your company is also committed to a reduced carbon footprint, you'll need to note each actuators' environmental impact. Typically, electrical actuators have little to no carbon footprint.

Harikrishnakumar.V

3 rd year A

Robotic spacecraft

A **robotic spacecraft** is an unscrewed spacecraft, usually under telerobotic control. A robotic spacecraft designed to make scientific research measurements is often called a space probe. Many space missions are more suited to telerobotic rather than crewed operation, due to lower cost and lower risk factors. In addition, some planetary destinations such as Venus or the vicinity of Jupiter are too hostile for human survival, given current technology. Outer planets such as Saturn, Uranus and Neptune are too distant to reach with current crewed spacecraft technology, so telerobotic probes are the only way to explore them.

The first robotic spacecraft was launched by the Soviet Union (USSR) on 22 July 1951, a suborbital flight carrying two dogs Dezik and Tsygan. Four other such flights were made through the fall of 1951.

The first artificial satellite, Sputnik 1, was put into a 215-by-939-kilometer (116 by 507 nmi) Earth orbit by the USSR on 4 October 1957. On 3 November 1957, the USSR orbited Sputnik 2. Weighing 113 kilograms (249 lb).Sputnik 2 carried the first living animal into orbit, the dog Laika.Since the satellite was not designed to detach from its launch vehicles upper stage, the total mass in orbit was 508.3 kilograms (1,121 lb).

In a close race with the Soviets, the United States launched its first artificial satellite, Explorer 1, into a 357-by-2,543-kilometre (193 by 1,373 nmi) orbit on 31 January 1958. Explorer I was an 205-centimetre (80.75 in) long by 15.2-centimetre (6.00 in) diameter cylinder weighing 14.0 kilograms (30.8 lb), compared to Sputnik 1, a 58-centimeter (23 in) sphere which weighed 83.6 kilograms (184 lb). Explorer 1 carried sensors which confirmed the existence of the Van Allen belts, a major scientific discovery at the time, while Sputnik 1 carried no scientific sensors. On 17 March 1958, the US orbited its second satellite, Vanguard 1,which was about the size of a grapefruit, and remains in a 670-by-3,850-kilometre (360 by 2,080 nmi) orbit as of 2016.

Nine other countries have successfully launched satellites using their own launch vehicles: France (1965), Japan and China (1970), the United Kingdom (1971), India (1980), Israel (1988), Iran (2009), North Korea (2012) and New Zealand (2018).

Structure

An illustration's of NASA's planned Orion spacecraft approaching a robotic asteroid capture vehicle

This is the physical backbone structure.

It provides overall mechanical integrity of the spacecraft,ensures spacecraft components are supported and can withstand launch load.

Data handling

This is sometimes referred to as the command and data subsystem. It is often responsible for:

- command sequence storage
- maintaining the spacecraft clock
- collecting and reporting spacecraft telemetry data (e.g. spacecraft health)
- collecting and reporting mission data (e.g. photographic images)

Attitude determination and control

This system is mainly responsible for the correct spacecraft's orientation in space (attitude) despite external disturbance-gravity gradient effects, magnetic-field torques, solar radiation and aerodynamic drag; in addition it may be required to reposition movable parts, such as antennas and solar arrays.

Importance and uses of robots in space, Robotic spacecraft & Space robots

Robots in space are devices which used to aid, augment and substitute for the astronauts to do difficult tasks such as repairs in dangerous environments, and they capture videos and pictures, All space robots are similar, they have the controller, actuators, the sensors, the power supply, and the radio communications.

Space robots are in all shapes and sizes, they have different functions, they work automatically or by remote control, and they are under development for the International Space Station.

The sensors provide the information about the robot and its environment, and the controller processes the information from the sensors, the ground control provides the radioed instructions, and it sends appropriate command signals to the actuators which convert the command into actions.

Space probes can explore places that are not accessible to humans, they operate in the vacuum of space, they withstand exposure to the extremes of temperature and radiation, and they can perform programmed tasks over long periods without direct human supervision.

The outer planets such as Saturn, Uranus, and Neptune are too distant to reach with the current crewed spaceflight technology, and the telerobotic probes are the only way to explore them.

Telerobotics Servicer helps the astronauts assemble the Space Station that which was growing bigger and more complex with each redesign.

Robotic spacecraft is a spacecraft with no humans on board, and they are under telerobotic control, they are designed to make scientific research measurements and is often called space probe.

Many space missions are more suited to telerobotic rather than crewed due to their lower cost and lower risk factors and man can not make research on Jupiter or Venus.

BY:

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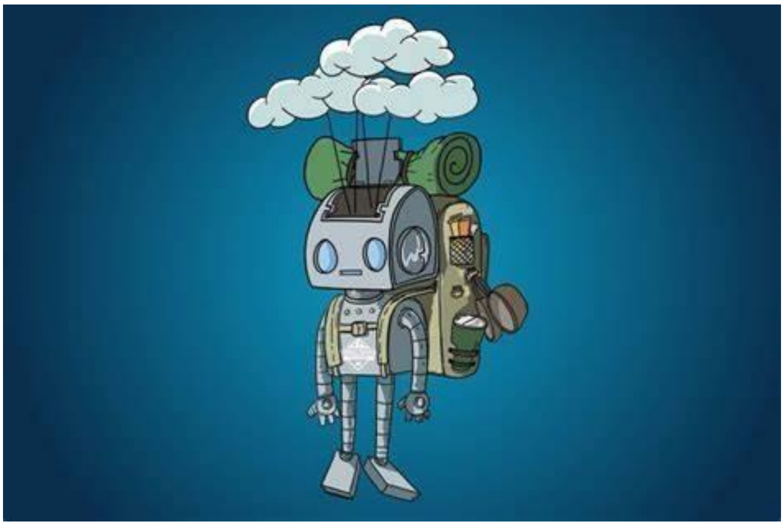
ECE-C

Cloud Robotics

Cloud robotics is a field of robotics that attempts to invoke cloud technologies such as cloud computing, cloud storage, and other Internet technologies centered on the benefits of converged infrastructure and shared services for robotics.

When connected to the cloud, robots can benefit from the powerful computation, storage, and communication resource of modern data center in the cloud, which can process and share information from various robots or agent (other machines, smart objects, humans, etc.).

Humans can also delegate tasks to robot systems to be endowed with powerful capability whilst reducing costs through cloud technologies. Thus, it is possible to build lightweight, low-cost, smarter robots with an intelligent "brain" in the cloud. The "brain" consists of data center, knowledge base, task planners, deep learning, information processing, environment models, communication support, etc.



COMPONENTS

A cloud for robots potentially has at least six significant components:

- Building a "cloud brain" for robots. It is the main object of cloud robotics.
- Offering a global library of images, maps, and object data, often with geometry and mechanical properties, expert system, knowledge base (i.e. semantic web, data centers);

- Massively-parallel computation on demand for sample-based statistical modelling and motion planning, task planning, multi-robot collaboration, scheduling and coordination of system;
- Robot sharing of outcomes, trajectories, and dynamic control policies and robot learning support;
- Human sharing of “open-source” code, data, and designs for programming, experimentation, and hardware construction;
- On-demand human guidance and assistance for evaluation, learning, and error recovery;
- Augmented human-robot Interaction through various way (Semantics knowledge base, Apple SIRI like service etc.).

❖ **APPLICATION**

i. Mobile robot

Google’s self-driving cars are cloud robots. They are also mobile robot. A mobile robot is an automatic machine that is capable of locomotion. Mobile robotics is usually considered to be a subfield of robotics and information engineering. The cars or robots use the network to access environment model (Streetview) and combines it with streaming data from GPS, cameras, and 3D sensors to monitor its own position within centimeters, and with past and current traffic patterns to avoid collisions. Each car can learn something about environments, rods, or driving, or conditions, and it sends the information to the Google cloud, where it can be used to improve the performance of other cars.

Cloud medical robots

A medical cloud (also called a healthcare cluster) consists of various services such as a disease archive, electronic medical record, a patient health management system, practice service, analytics services, clinic solution, expert system, etc. A robot can connect to the cloud to provide clinical services to patients, as well as deliver assistance to doctors (e.g., a co-surgery robot). Moreover, it also provides a collaboration service by sharing information between doctors and care givers about clinical treatment.

ii. Assistive robots

A domestic robot can be employed for healthcare and life monitoring for elderly people. The system collects the health status of users and exchange information with cloud expert system people life, especially for those with chronic diseases, for example, the robots are able to provide support to prevent the elderly from falling down, emergency healthy support such as heart disease, blooding disease. Care givers of elderly people can also get notification when in emergency from the robot through network.

iii. Industrial robots

As highlighted by the German government's Industry 4.0 plan, "industry is on the threshold pf the fourth industrial revolution. Driven by the Internet, the real and virtual worlds are growing closer and closer together to form the Internet of Things. Industrial production of the future will be characterized by the strong individualization of products under the condition of highly flexible (large series) production, the extensive integration of customer and business partners in business and value-added processes, and the linking of production and high-quality services leading to so-called hybrid product. In manufacturing, such cloud-based robot system could learn to handle tasks such as threading wires or cables, or aligning gaskets from a professional knowledge base. A group of robots can share information for some collaborative tasks. Even more, a consumer is able to place customized product orders to manufacturing robots directly with online ordering system. Another potential paradigm is shopping-delivery robot system. Once an order is placed, a warehouse robot dispatches the item to an autonomous car or autonomous drone to deliver it to its recipient.

Harrish Siva. S

ECE-II-Year

A-sec

Robo club ID - ECEROBO-197

PROJECT PRESENTED AT INVESTITURE

ENERGY CONSERVATION USING IOT

PSNACET – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (3 RD YEAR)

MEMBERS :

CP.GOWTHAM

S.SURYA PRAKASH

T.M.KEATHARESWAR

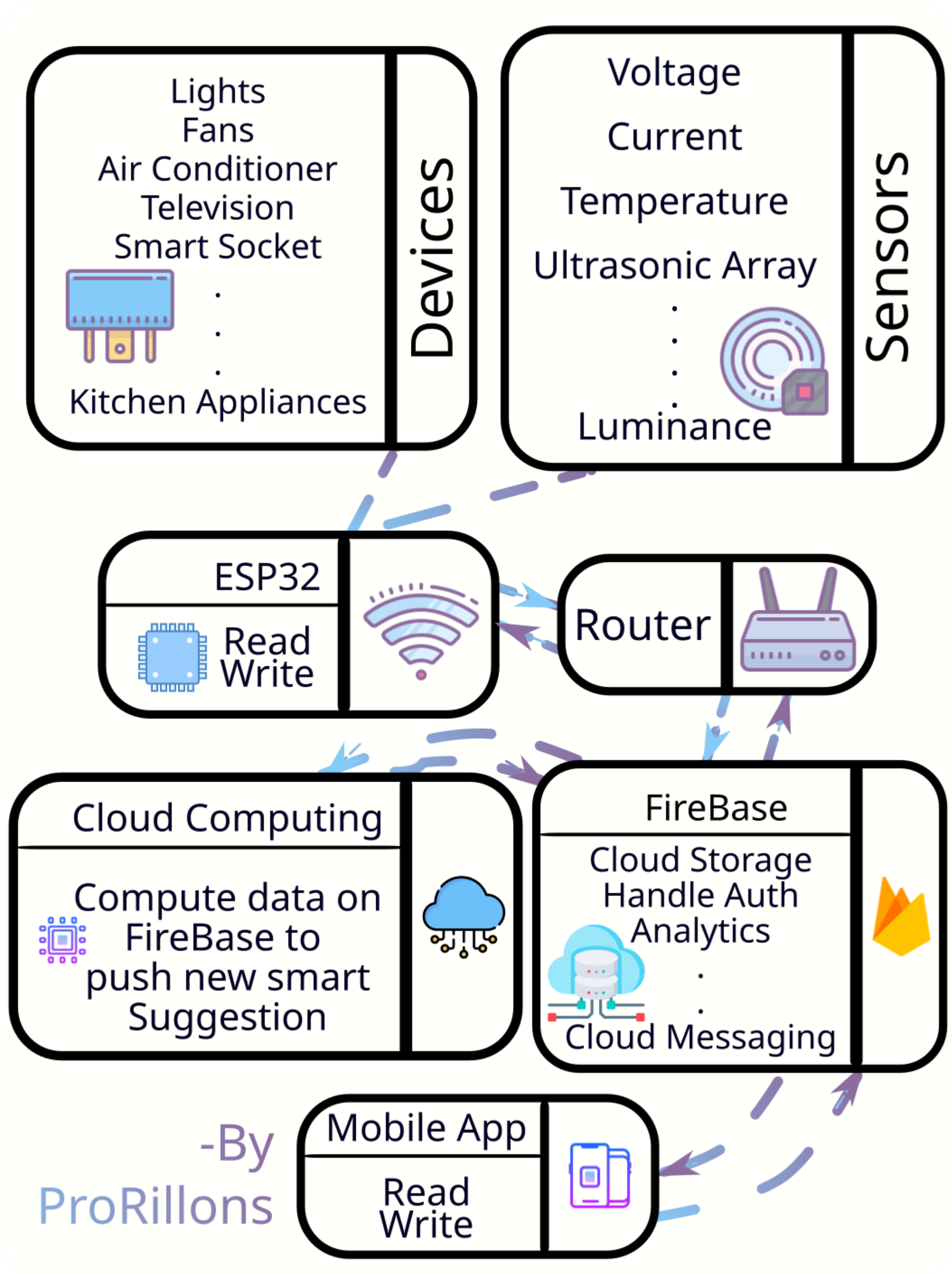
S.LOGESH

P.DIVYA

S.SHRI GURU VARSHINI

To create a software-based solution with modern IoT to conserve energy and reduce carbon footprints.The system forecasts real-time power consumption and electric bills, and it makes smart recommendations such as advising the user to turn off the lights when there is enough light. Notify when a television or other exploiting device is left on for an extended period of time. Daily device usage statistics with time and total power consumption, as well as it predicts future power conception using the LSTM algorithm.

Here, an ESP-32 is a Wi-Fi and Bluetooth enabled microcontroller connected with feedback sensors and a router for internet connection to perform CRUD operation on cloud database. Our mobile application retrieves data from the cloud to display the status of home appliances and power consumption, and the app can also toggle switches by changing data in the cloud database.


Lights
Fans
Air Conditioner
Television
Smart Socket
.
.
.
Kitchen Appliances
Devices
Voltage
Current
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ROBOTIC THREAD

PSNACET – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE (3 RD YEAR)

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ABSTRACT

Researches have created a thread-like robot that can be magnetically guided through constrained , curving passageways, much like the small blood veins in the brain.

INTRODUCTION

A thread-like robot that can be magnetically guided through constricting,winding passageways, resembling the labrythine vasculature of the brain,has been created by engineers.Future endovascular technology may be combined with this robotic thread to allow medical professionals to remotely manoeuvre the robot through a patient's brain veins and quickly treat blockages and lesions, such as those that result from aneurysms and stroke.

Robotic thread is intended to pass through the blood artetries in the brain.In reaction to a stroke or other types of brain blockages,a magnetically operated device cloud clot-reducing therapy.

ROBOTICS PROCESS AUTOMATION(RPA)

The Robotics Process Automation is a top emerging robotics trend in 2022. The expansion of RPA is expected to accelerate in 2022 and is predicted to be a key enterprise technology. RPA is often used in repetitive industries and organizations.

The ROBOTICS PROCESS AUTOMATION(RPA) Increasing production at lower costs creates obvious advantages for any manufacturer. The cost of the investment can be recouped in a relatively short period of time, and the profit from that point is very small. One of the biggest concerns surrounding the introduction of robotic automation is the impact on jobs for workers. The fear is that if a robot can operate at a faster, more consistent rate, humans may become unnecessary. While these concerns are understandable, they are not necessarily accurate. Even though using robotic automation to tackle repetitive tasks makes complete sense. Robots are designed to make repetitive movements. Humans, not by design. The introduction of automation into your manufacturing process has various productivity benefits. Giving employees the opportunity to expand their skills and work in other areas creates a better environment that benefits the business as a whole. With higher energy levels and greater focus on their work, the product can only improve, leading to more satisfied customers.

RPA have some stumbling block similarly initial investment cost. RPA is still in its nascent phase, so it will present challenges that may have unintended consequences. Therefore, it is not easy for companies to decide whether to invest in robotic automation or wait for its expansion. A comprehensive business case must be developed when considering the implementation of this technology.

RPA has both the potential to reduce errors and improve efficiency and, moving forward, will be critical to creating a seamless operational environment. Repetitive tasks can be completed quickly and efficiently, so humans are free to focus on human-centric strengths such as reasoning, judgment and emotional intelligence

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MILITARY ROBOT

Military robots are autonomous robots or remote-controlled mobile robots designed for military applications, from transport to search & rescue and attack.

Some such systems are currently in use, and many are under development.

Broadly defined, military robots date back to World War II and the Cold War in the form of the German Goliath tracked mines and the Soviet teletanks. The MQB-1 Predator drone was when "CIA officers began to see the first practical returns on their decade-old fantasy of using aerial robots to collect intelligence".

The use of robots in warfare, although traditionally a topic for science fiction, is being researched as a possible future means of fighting wars. Already several military robots have been developed by various armies. Some believe the future of modern warfare will be fought by automated weapons systems. The U.S. military is investing heavily in the RQ-1 Predator, which can be armed with air-to-ground missiles and remotely operated from a command center in reconnaissance roles. DARPA has hosted competitions in 2004 & 2005 to involve private companies and universities to develop unmanned ground vehicles to navigate through rough terrain in the Mojave Desert for a final prize of 2 million.

Artillery has seen promising research with an experimental weapons system named "Dragon Fire II" which automates loading and ballistics calculations required for accurate predicted fire, providing a 12-second response time to fire support requests. However, military weapons are prevented from being fully autonomous; they require human input at certain intervention points to ensure that targets are not within restricted fire areas as defined by Geneva Conventions for the laws of war.

There have been some developments towards developing autonomous fighter jets and bombers. The use of autonomous fighters and bombers to destroy enemy targets is especially promising because of the lack of training required for robotic pilots, autonomous planes are capable of performing maneuvers which could not otherwise be done with human pilots (due to high amount of G-force), plane designs do not require a life support system, and a loss of a plane does not mean a loss of a pilot. However, the largest drawback to robotics is their inability to accommodate for non-standard conditions. Advances in artificial intelligence in the near future may help to rectify this.

In 2020 a Kargu 2 drone hunted down and attacked a human target in Libya, according to a report from the UN Security Council's Panel of Experts on Libya, published in March 2021. This may have been the first time an autonomous killer robot armed with lethal weaponry attacked human beings.

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Effects and impact

Advantages

Autonomous robotics would save and preserve soldiers' lives by removing serving soldiers, who might otherwise be killed, from the battlefield. Lt. Gen. Richard Lynch of the United States Army Installation Management Command and assistant Army chief of staff for installation stated at a 2011 conference:

As I think about what’s happening on the battlefield today ... I contend there are things we could do to improve the survivability of our service members. And you all know that’s true.

Major Kenneth Rose of the US Army's Training and Doctrine Command outlined some of the advantages of robotic technology in warfare:

Machines don't get tired. They don't close their eyes. They don't hide under trees when it rains and they don't talk to their friends ... A human's attention to detail on guard duty drops dramatically in the first 30 minutes ... Machines know no fear.

Increasing attention is also paid to how to make the robots more autonomous, with a view of eventually allowing them to operate on their own for extended periods of time, possibly behind enemy lines. For such functions, systems like the Energetically Autonomous Tactical Robot are being tried, which is intended to gain its own energy by foraging for plant matter. The majority of military robots are tele-operated and not equipped with weapons; they are used for reconnaissance, surveillance, sniper detection, neutralizing explosive devices, etc. Current robots that are equipped with weapons are tele-operated so they are not capable of taking lives autonomously. Advantages regarding the lack of emotion and passion in robotic combat is also taken into consideration as a beneficial factor in significantly reducing instances of unethical behavior in wartime. Autonomous machines are created not to be "truly 'ethical' robots", yet ones that comply with the laws of war (LOW) and rules of engagement (ROE). Hence the fatigue, stress, emotion, adrenaline, etc. that affect a human soldier's rash decisions are removed; there will be no effect on the battlefield caused by the decisions made by the individual.

Risks

Human rights groups and NGOs such as Human Rights Watch and the Campaign to Stop Killer Robots have started urging governments and the United Nations to issue policy to outlaw the development of so-called "lethal autonomous weapons systems" (LAWS).] The United Kingdom opposed such campaigns, with the Foreign Office declaring that "international humanitarian law already provides sufficient regulation for this area".

In July 2015, over 1,000 experts in artificial intelligence signed a letter calling for a ban on autonomous weapons. The letter was presented in Buenos Aires at the 24th International Joint Conference on Artificial Intelligence (IJCAI-15) and was co-signed by Stephen Hawking, Elon Musk, Steve Wozniak, Noam Chomsky, Skype co-founder Jaan Tallinn and Google DeepMind co-founder Demis Hassabis, among others.

Psychology

American soldiers have been known to name the robots that serve alongside them. These names are often in honor of human friends, family, celebrities, pets, or are eponymic. The 'gender' assigned to the robot may be related to the marital status of its operator.

Some affixed fictitious medals to battle-hardened robots, and even held funerals for destroyed robots. An interview of 23 explosive ordnance detection members shows that while they feel it is better to lose a robot than a human, they also felt anger and a sense of loss if they were destroyed. A survey of 746 people in the military showed that 80% either 'liked' or 'loved' their military robots, with more affection being shown towards ground rather than aerial robots. Surviving dangerous combat situations together increased the level of bonding between soldier and robot, and current and future advances in artificial intelligence may further intensify the bond with the military robots.

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ROBOTS IN AEROSPACE APPLICATIONS

The role of robotics in the manufacture of aerospace products is importantalthough not as pervasive as in the automotive industry. While robotics play animportant function in the fabrication of aircraft engines, aerospace companies areincreasingly investing in robots to perform drilling, painting and other tasks onairframes. Robot’s ability to repeatedly position very large aerospace components with a high degree of precision ensures that flexible automation has potential market growth.“Traditional robots that have worked so well in Detroit for the last 30 years do not work well in Everett,” begins Erik Nieves, Technology Director with the Motoman Robotics Division of Yaskawa America Inc. (Miamisburg, Ohio). “Today’s new robots have become more capable and accurate, bringing them within the performance levels required for aerospace applications” Drill, Robot, Drill Drilling holes into components is the largest use of robotics in the aerospace industry. Precision requirements of this application gives end-users an incentive to look at robotics as a means to quickly and consistently undertake this chore. “A fuselage needs thousands of holes drilled and drilling them manually is not feasible,” says Chris Blanchette, National Account Manager with FANUC Robotics America Corp. (Rochester Hills, Michigan). “Vision systems allow the robot to accurately locate where on the airframe that robot will be drilling.” Drilling is not only the most common job robots are called on to do, but has the longest track record within the aerospace industry. “Robots do a wide variety of jobs in the aerospace industry but drilling holes is far and away the number one application robots do. Robots drill, put fasteners into the holes and assemble the parts,” says Curtis Richardson, Associate Technical Fellow at Spirit AeroSystems Inc. (Wichita, Kansas). Richardson says “Robots fill the middle void between manual labor and hard automation. Spirit AeroSystems’ approach is to use the right tool for the job. Robots drill holes very efficiently, precisely, repeatedly and to a very high degree of quality.” Manual drilling is difficult to do by hand. “Drilling manually takes a tremendous amount of skill and experience to get to the level of quality that a robot can.”

Tooling costs are reduced using robotics for drilling. “Manual drilling requires expensive tooling such as jigs and fixtures. Powerful drilling equipment can be costly and robots are often a good alternative,” says Richardson. Likewise, “Robots have been used extensively for over 30 years to drill fastener holes. Drilling is the primary application Lockheed Martin uses robots for in our Fort Worth, Texas facility. Drilling fastener holes is an extremely redundant and difficult task, particularly when working on titanium parts,” says David Siedal, a Technical Fellow with Lockheed Martin. “When done manually, drilling requires multiple steps, such as drilling a pilot hole, drill to the final diameter, then reaming it.”
While manual drilling may take up to four operations, robotic drilling can be accomplished in a single pass, says Siedal. “Robots drill the hole to its full diameter and depth, including the countersink, in a single pass. Robots are a huge time-saver in a job impossible for people to do in one pass”
Largely Precise The need for highly repeatable and accurate robots is generally associated with tiny electronic components or assembly applications. Despite their large size aerospace products demand similar levels of repeatability, says Nieves. “In automotive spot welding applications, using a teach pendant to drive the robot to its final position is okay because automotive end-users expect to touch up the robot’s path. That process does not work in the aerospace industry,” says Nieves. “That accuracy is achieved by applying secondary encoders.” Blanchette also speaks of secondary encoding to facilitate robot accuracy and repeatability in aerospace applications. “If the end-user needs more accuracy, integrators put in secondary encoders onto the robot to monitor the true jointposition. That allows better

control of the robot by minimizing backlash to achieve a higher level of accuracy. Secondary encoders reduce settling time because the robot can react more quickly in drilling applications." David Masinick, Aerospace Account Manager with KUKA Robotics Corp. (Shelby Township, Michigan) outlines the differences between aerospace and more mainstream applications. "Aerospace applications typically have very tight tolerances, have high process repetition but relatively low volume throughput. The large size of some of the components present a challenge for a standard industrial robot and many aerospace applications require good path accuracy or point-to-point accuracy, tighter than a robot's native ability to perform."

Obtaining complete coverage on massive airframes with robotics comes through using multiple robots, putting a single robot on a servo-track or deploying a self-propelled mobile robot, Nieves explains. "Installing several fixed robots is not a tenable approach because utilization falls through the floor. The very large parts in aerospace applications would need a dozen fixed robots, but they would not all run at full efficiency." Nieves turns his attention to the concept of a robot conveyed around airframes on servo tracks to apply paint, remove paint, or drill holes. "Putting robots onto servo-tracks increases utilization but at the cost of flexibility. End-users do not like putting servo tracks on the floor of their manufacturing plant. Manufacturers in the aerospace industry try to keep their floor clean so they can easily reconfigure the production line." If servo-tracks are installed, the end-user is stuck with rails that must be torn up to reconfigure for a new product line, says Nieves. "End-users want mobile robots for aerospace applications," concludes Nieves. One mobile robot could move around a large airframe autonomously, achieving a similar throughput of several fixed robots.

Jerry Fox, Senior Engineer with Boeing Commercial Airplanes (Seattle, Washington), expressed a similar sentiment. "The aerospace industry is trending away from expensive fixed tooling. Modular tools and flexible systems are a growth area, as are mobile robots, that can adapt to different products." Boeing likes the idea of "re-deployable robots that move from one area to the next on large aircraft while maintaining accuracy." Boeing uses approximately 90 robots in its worldwide operations. Mike Melendez, Project Manager with ABB Inc. (Auburn Hills, Michigan) also says the process repeatability of robots can improve quality and reduce cycle times that result in cost savings and improved manufacturing efficiencies. "Aerospace parts are very large so the robot's work envelope has to expand to cover these very large parts. When done manually, painting aircraft requires extensive scaffolding that must be put into place before the painting begins." Robots can apply paint onto extremely large aerospace components describes Melendez. Applying paint is a hazardous job for people to perform. Using robots to paint airframes removes people from he hazardous environments associated with painting, Melendez adds. With large component size, comes high mass, says Robert Rochelle, Food and Packaging Industry Specialist at Stäubli Corp. (Duncan, South Carolina). "We applied a coating material to wing spars. The parts weigh over 9,000 pounds and are over 60 feet long. Handling a part of this size was a unique challenge to traditional robot system designers." Inspection While drilling holes and painting constitute the bulk of aerospace applications, robots also perform inspection tasks. "Robots do ultrasonic inspection of airframes. Inspection is becoming more demanding, especially of composite materials and validating that structures in the assemblies are sound," says Blanchette. "Robots look for cracks or de-lamination of composites and ensure rivets are intact." Blanchette says robots have an important role in maintaining aircraft after being in service for some time. "Key components of aircraft must be inspected periodically.

Keeping aging aircraft in service for longer times requires recurring inspection. Robots are a key element in enabling companies to cost-effectively perform those tasks.” Motoman’s Erik Nieves agrees, saying, “Robots automate the inspection process through ultrasonic and other non-destructive methods. Instead of destructive mechanical processes, robots use imaging to evaluate the integrity of composite materials.” Post-production inspection of composites is important says Nieves, as airframe materials change from aluminum to composites. Robotic non-destructive inspection is also on the mind of Jerry Fox. “Boeing uses robots for inspection operations, such as non-destructive ultrasonic testing to look at the quality of the part.” Tail Winds Robots are making inroads into the aerospace industry, says Richardson. “Since 2004, the biggest change has been the general attitude towards robotics. Prior to 2004, the attitude of the aerospace industry was very traditional.” The industry’s instinct was to continue using successful production systems of the past. “The industry’s attitude shifted to where robotics is the baseline approach of how we take on new work. Robotics are part of our basic tool set now, a core of how we do business. I see that trend continuing in the next five years.” Robotics have been added to existing production lines, Richardson adds. “We have a lot of legacy work because aircraft programs last 10 to 30 years. Putting robotics into legacy factories can be challenging due to the constraints of existing facility footprint and factory flow.” Spirit AeroSystems has retrofitted existing aircraft factories successfully, Richardson says.

David Siedal says, “Lockheed Martin builds about four planes per month, but will grow to twelve per month, over the next five years.” Robotics will be an essential component if Lockheed Martin is to triple its monthly output of aircraft by 2018. Blanchette also sees further robotic penetration into the aerospace market as demand for commercial aircraft continues to rise. “I see a dynamic change in the airframe assembly process where people cannot meet the rates required for future demand. Boeing has to produce up to 45 units per month and talks of going up to 60 units per month.” Meeting that production requirement is impossible without the use of flexible robotics. Blanchette goes on to say the demand for aircraft is rising significantly. “In 2011, the aerospace industry projected spending $3.25 trillion in the next 20 years. The 2012 projection for the next 20 years is $4 trillion.” The most cost-effective way the aerospace industry can increase production to that rate is through robotics.

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ROBOTS IN MEDICINE

Robots are poised to revolutionize the practice of medicine. Artificial intelligence, miniaturization, and computer power are contributing to the rise in design and use of robots in medicine.

Medical robots had their start about 34 years ago when an industrial robot and computed tomography navigation were used to insert a probe into the brain to obtain a biopsy specimen . This was followed by a number of robots that were capable of certain urological procedures and total hip arthroplasty. These fully autonomous robots, however, did not find favor with surgeons and subsequent robots were designed to be slaves to surgeon masters .

Today, medical robots are well known for their roles in surgery, specifically the use of robots, computers and software to accurately manipulate surgical instruments through one or more small incisions for various surgical procedures . A 3-D high-definition magnified view of the surgical field enables the surgeon to operate with high precision and control. One instrument, da Vinci, approved by the FDA in 2000, is said to have been used to perform over 6 million surgeries, worldwide. Patient benefits from robot-assisted surgery are largely those associated with the laparoscopic approach — smaller incisions, reduced blood loss, and faster recovery. Long-term surgical outcomes don't appear to be different from those of traditional surgery and the system has occasional malfunction. Surgeons benefit from improved ergonomics and dexterity in comparison with traditional laparoscopy. Major drawbacks are high cost and the need for training of surgeons and the surgical team. The base price of a da Vinci system is upwards of $1 million.

Various companies are developing surgical robots designed for a single specific procedure such as knee or hip replacement. Other companies are seeking to build systems that incorporate artificial intelligence to assist surgical decision-making . In neurosurgery, Modus V is an automated robotic arm and digital microscope built by a Toronto company and based on the space shuttle Canadarm technology . The arm tracks surgical instruments, automatically moves to the appropriate area in which the surgeon is working, and projects a magnified, high resolution image on a screen.

Prostheses are benefitting considerably from new structures and control systems . Robotic limbs with bionic skin and neural system are allowing a remarkable degree of user control. Robotic exoskeletons (orthoses) are finding use in rehabilitation, assisting paralyzed people to walk and to correct for malformations . Robots are also finding a place in keeping hospitals clean as hospital rooms are being disinfected with the use of high intensity UV light applied by a robot .

Traditional endoscopy may soon be replaced by small robots that can be driven to specific locations to carry out various tasks such as taking a biopsy or cauterizing a bleeding blood vessel. Microrobots may be employed to travel through blood vessels and deliver therapy such as radiation or medication to a specific site. Robotic endoscopic capsules can be swallowed to patrol the digestive system, gather information, and send diagnostic information back to the operator. Then there are robotic nurses designed to assist or replace overworked nurses with tasks such as digital entries, monitoring patients, drawing blood, and moving carts. A really exciting area of medical robotics is in replacement of antibiotics. The concept is that nanorobots with receptors to which bacteria adhere can be used to attract bacteria in the blood stream or in sites of local infection.

Do any of these grand developments have a place in veterinary medicine? Robots are currently being used in simulations for training veterinarians and can be used for tasks such as lifting animals. Until robot-assisted surgical equipment becomes far less expensive and proves to add value to current laparoscopic procedures it seems unlikely to become incorporated into veterinary practice. However, robot assistants, robotic prostheses, hospital disinfectant machines, and microrobots that conduct endoscopic examinations or treat patients are distinct possibilities for the veterinary practice of the future. Indeed, it may not be long before there are robotics veterinarians who provide care for animals with prosthetic limbs or implanted chips or for robotic animals that are used in a variety of settings.

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