Maratha Vidya Prasarak Samaj's
Karmaveer Adv. Baburao Ganapatrao Thakare College Of Engineering Nashik-13.
(NAACACCREDITED INSTITUTE WITH 'A++' GRADE)

DEPARTMENT OF ELECTRONICS &TELECOMMUNICATION ENGG.

Departmental TeChronicle

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Department Vision:-

To be recognized as an excellent department offering competent technical education to create competent electronics & telecommunication engineers for the benefit of the common masses.

Department Mission:-

Committed to serve the needs of society through innovative teaching learning processes, promoting industry-institute interaction to provide competent and cultured electronics and telecommunication engineers.

Program Educational Objectives:-

1. *To impart state of art technical education in the Electronics & Telecommunication Engineering.*
2. *To promote society beneficial projects and activities.*
3. *To develop soft skill, team work, professional ethics and multidisciplinary approach for the carrier enhancement.*
4. *To bridge the gap between Industry-Institute through collaboration with Industries, Institutions and Universities.*
5. *To provide suitable infrastructure and facilities in tuned with advancing technological evaluation.*

Greeting,

Department of Electronics and Telecommunication Engineering is celebrating Engineers Day by unveiling technical newsletter "TeChronicle" VOL6, ISSUE-3 on 15th September 2024. The Government of India decided to mark the birth anniversary of Mokshagundam Visvesvaraya to remember his exceptional contributions in the field of Engineering.

❖ Industrial Robotics and Automation

[Tanmay Dhamane (3rd year) E&TC]

Industrial robotics and automation are revolutionizing manufacturing by improving productivity, precision, and efficiency. As industries face increasing demands for high-quality products at reduced costs, integrating robots and automated systems has become essential in the "Fourth Industrial Revolution," or Industry 4.0.

The Evolution of Industrial Robotics

Industrial robots, first introduced in the 1960s, have evolved significantly. Early robots handled basic tasks like welding, but modern ones perform complex operations, including assembly and material handling, thanks to advances in AI, machine learning, and computer vision. These technologies allow robots to adapt and make decisions in real time, boosting their versatility.

Today's robots are integral to industries like automotive, electronics, and aerospace. For example, Tesla's factories use hundreds of robots to build cars with precision, while Amazon relies on robotic systems for automated warehousing and order fulfillment.

Types of Industrial Robots

Industrial robots come in several forms, each suited to specific tasks:

1. **Articulated Robots**: Known for flexibility, these robots are used in tasks like welding and assembly.s
2. **Cartesian Robots**: With three linear axes, they excel in pick-and-place operations and material handling.
3. **SCARA Robots**: These are fast and precise, ideal for assembly and packaging tasks.
4. **Delta Robots**: Designed for high-speed pick-and-place operations, commonly used in the food and pharmaceutical industries.

Automation in Industry

Automation extends beyond robotics, incorporating control systems, sensors, and software to streamline production. Programmable logic controllers (PLCs) and distributed control systems (DCS) manage production lines by processing sensor data to control machinery in real time.

This combination of robotics and automation reduces human error, increases efficiency, and minimizes waste, allowing companies to monitor and optimize their processes.

Benefits and Adoption by Small Businesses

The benefits of robotics and automation are significant—higher throughput, improved quality, and lower labor costs. Large corporations have widely adopted these technologies, but small businesses can benefit as well. While initial costs can be high, small-scale automation solutions like cobots (collaborative robots) are becoming more affordable. Cobots, designed to work safely alongside humans, are ideal for small businesses, allowing them to automate repetitive tasks without expensive infrastructure changes.

The Future of Industrial Robotics

The future of industrial robotics lies in further advances in AI, machine learning, and connectivity. Robots will become more autonomous, capable of learning new tasks without human intervention. Cobots, in particular, are expected to grow in popularity, especially in smaller operations, increasing safety and efficiency in shared workspaces.

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❖ Industrial cobots

[Siddhart Kedare (2nd year) E&TC]

Cobots (collaborative robots) already play a part in scores of logistics processes taking place in warehouses. From goods transportation to order prep, this technology has made it possible to boost supply chain efficiency.

In fact, many sectors have implemented cobots, among them, the automotive and retail industries. So, why is this? A study by MIT (Massachusetts Institute of Technology) finds that, by 2022, e-commerce will record a turnover of over $6 billion. It also indicates that employees' non-productive time is reduced by 85% when they work together with robots.

We define cobots, their contribution to the supply chain, and their future in the warehouse.
What are cobots? What's their role in the warehouse?

Cobots, or collaborative robots, are machines created to interact with humans in a work environment in order to free workers from having to perform more repetitive, complex, or hazardous tasks. This innovation can be applied to warehouses thanks to two key technologies: AI and machine learning. In this sense, cobots don't replace operators — they learn from them to perform functions of the utmost accuracy without the slightest wear and tear.
What does the arrival of cobots mean for

logistics? Machines will take care of the most repetitive processes, helping humans to focus exclusively on tasks that add value to logistics: data analysis and strategic decisions, among others.
In large warehouses and distribution centers, cobots increase efficiency in picking, traveling around the installation so that pickers can remain in their work area.

A Deeper Dive into the Echo Cobot's Technologies

Building upon the foundational technologies discussed earlier, let's explore some of the more advanced features and capabilities of the Echo Cobot

3D Vision: Beyond 2D image analysis, the Echo Cobot can leverage 3D vision systems, such as stereo cameras or LiDAR, to perceive depth and create a more accurate representation of its environment. This enables tasks like precise object manipulation and navigation in complex spaces.

Machine Learning: The Echo Cobot can incorporate machine learning algorithms to improve its object recognition and task performance over time. By analyzing vast datasets, the robot can learn to identify new objects, adapt to variations in lighting conditions, and optimize its movements for specific tasks.

Intelligent Control Systems

Reinforcement Learning: The Echo Cobot can be trained using reinforcement learning techniques to develop optimal strategies for tasks that involve uncertainty or complex decision-making. The robot can learn from its interactions with the environment, adjusting its actions to maximize rewards and minimize penalties.

Adaptive Control: The Echo Cobot's control system can be adaptive, allowing it to adjust its behavior in response to changes in its environment or tasks. This enables the robot to handle unexpected situations and maintain its performance under varying conditions.

Human-Robot Collaboration

Natural Language Processing**:** The Echo Cobot can be equipped with natural language processing capabilities to understand and respond to human commands or questions. This facilitates more intuitive and efficient human-robot interaction.

Gesture Recognition**:** The Echo Cobot can use computer vision to recognize human gestures, allowing operators to control the robot's movements in a more natural and intuitive way.

Safety Enhancements

Multi-sensor Fusion**:** Combining data from multiple sensors, such as cameras, force sensors, and proximity sensors, can provide a more comprehensive understanding of the robot's surroundings and enhance its safety capabilities.

In conclusion, the Echo Cobot represents a convergence of advanced technologies that enable it to perform a wide range of tasks in a safe, efficient, and collaborative manner. By incorporating features like advanced vision systems, intelligent control systems, and enhanced human-robot interaction, the Echo Cobot is poised to play a significant role in shaping the future of manufacturing and automation.

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❖ Robotics in Disaster Management

[Sarthak Pagare (4th year) E&TC]

Introduction

In recent years, robotics has emerged as a transformative force in disaster management, offering innovative solutions to complex challenges. As natural and man-made disasters become increasingly frequent and severe, the integration of robotic technologies into disaster response strategies promises to enhance effectiveness, speed, and safety. This article explores the architecture and functions of disaster management robots, their applications, and the future potential of this technology.

Architecture and Functions

Sensors: Equipped with cameras, thermal imaging, and gas detectors, sensors allow robots to gather critical data from hazardous environments.

Mobility Systems: Wheels, tracks, or legs enable robots to navigate through rubble, uneven terrain, or confined spaces.

Manipulators: Robotic arms or grippers are used for tasks such as debris removal or first aid assistance.

Communication Systems: Wireless communication enables real-time data transmission between robots and human operators, facilitating remote control and monitoring.

Power Supply: Batteries or other energy sources ensure that robots can operate autonomously or semi-autonomously for extended periods.

Disaster management robots function by performing a range of tasks crucial for effective emergency response. They can search for survivors, assess structural damage, deliver supplies, and even perform initial medical assessments. Their ability to operate in dangerous or inaccessible areas makes them invaluable for first responders.

Applications

Robotics technology is applied in various aspects of disaster management, including:

Search and Rescue: Robots equipped with sensors and cameras can navigate through debris to locate survivors in collapsed buildings or natural disaster sites. For example, drones and ground robots have been successfully used in earthquakes and landslides to perform search operations.

Damage Assessment: After a disaster, robots can be deployed to assess structural damage and environmental hazards, providing data that helps prioritize response efforts and resource allocation.

Hazardous Material Handling: In cases of chemical spills or radiological emergencies, robots can safely handle and contain hazardous materials, reducing the risk to human responders.

Logistics and Supply Delivery: Robots can transport essential supplies such as food, water, and medical kits to affected areas, especially when traditional means of transport are disrupted.

Environmental Monitoring: Robots can monitor environmental conditions, such as air quality and radiation levels, providing critical information to ensure the safety of both responders and affected populations

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