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ROBOTICS

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ABSTRACT :-

Robotics is an interdisciplinary branch of computer science and engineering. Robotics involves design, construction, operation, and use of robots. The goal of robotics is to design machines that can help and assist humans. Robotics integrates fields of mechanical engineering, electrical engineering, information engineering, mechatronics, electronics, bioengineering, computer engineering, control engineering, software engineering, mathematics, etc.

Robotics develops machines that can substitute for humans and replicate human actions. Robots can be used in many situations for many purposes, but today many are used in dangerous environments (including inspection of radioactive materials, bomb detection and deactivation), manufacturing processes, or where humans cannot survive (e.g. in space, underwater, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take any form, but some are made to resemble humans in appearance. This is claimed to

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help in the acceptance of robots in certain replicative behaviors which are usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics. Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily.

INTRODUCTION:-

Robotics engineering is a field of engineering which centre's on building machines that replicate human actions. A robotics engineer creates these applications or autonomous machines (aka robots) for industries such as mining, manufacturing, automotive, services and more. Often, the goal is to program machines to do repetitive, hazardous or unhealthy jobs.A robotics engineer designs prototypes, builds and tests machines, and maintains the software that controls them. They also conduct research to find the most cost-efficient and safest process to manufacture their robotic systems.

Robotics engineer job duties include:

- Conducting research in various robotics fields (e.g. nanotechnology)
- Designing processes and prototypes to build machines
- Testing robotic systems

Robotics six degrees of freedom .

Six degrees of freedom (6DOF) refers to the specific number of axes that a rigid body is able to freely move in three-dimensional space. It defines the number of independent parameters that define the configuration of a mechanical system. Specifically, the body can move in three dimensions, on the X, Y and Z axes, as well as change orientation between those axes though rotation usually called pitch, yaw and roll.

Six degrees of freedom is a specific parameter count for the number of degrees of freedom an object has in three-dimensional space, such as the real world. It means that there are six parameters or ways that the body can move.

Six degrees of freedom consists of the following movement parameters:

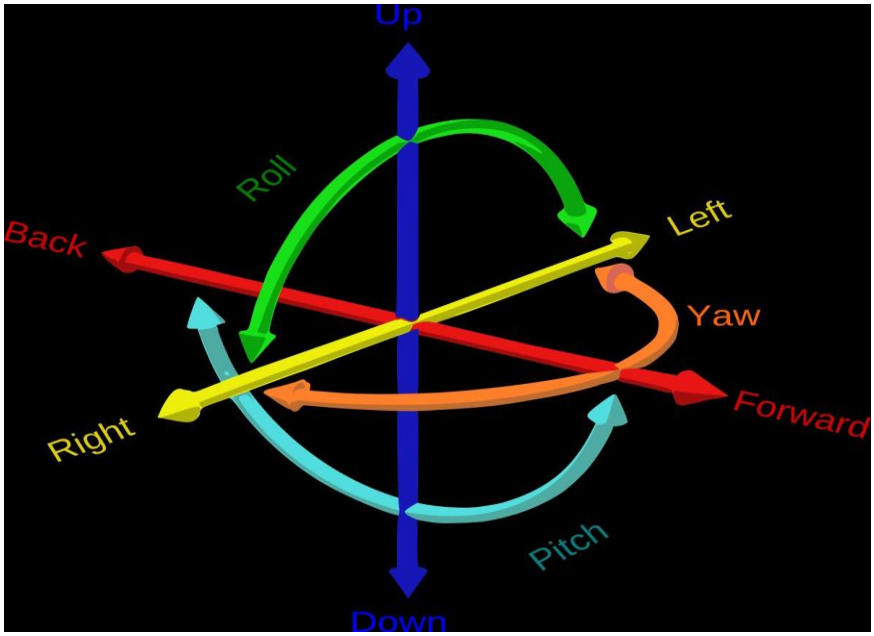
- Translation – Moving along the different axes X, Y and Z

1) Moving up and down along the Y axis is called heaving.
2) Moving forwards and backwards along the X axis is called surging.
3) Moving left and right along the Z axis is called swaying.

- Rotation – Turning in order to face a different axis

1) Moving between X and Y is called pitch.
2) Moving between X and Z is called yaw.

3) Moving between Z and Y is called roll.



ADVANTAGES.

- Cost Effectiveness. There will be no lunch breaks, holidays, sick leave or shift time allocated for robotic automation.
- Improved Quality Assurance.
- Increased Productivity.
- Work In Hazardous Environments.

DISADVANTAGES.

- Potential Job Losses. ...
- Initial Investment Costs.

Benefits of Implementing Robots

There are many benefits to implementing industrial robots, some of the main ones include: Lower costs - Automating a production line with industrial robots will result in lower costs. Automating will reduce material waste, cut down on errors, save on utilities such as electric, and reduce labor expenses resulting in significant savings for expanded profit potential.

Increased productivity - Articulated robots operate at faster speeds for longer periods of time and without breaks or delays. This allows for greater throughput and will increase productivity.

- Better Quality - Industrial robots operate with great precision and accuracy. Removing or limiting human interaction with productions will reduce errors, resulting in the manufacturing of higher quality products.
- Safer Productions - Many tasks associated with manufacturing can be hazardous or dangerous to workers. Industrial robots are better equipped to perform such tasks thus creating a safer work environment for your employees.
- Consistent Operations - Implementing robots will create consistency across your production line. Robots are able to replicate each cycle, resulting in consistent productivity rates, quality, materials used, and cycle times.

CHARACTERISTICS:-

The following five essential qualities characterize robots as we have come to know them today.

1. Intelligence

Human intelligence is derived from the elaborate and interconnected network of neurons within the human brain. These neurons form electrical connections with one another, but it remains unclear how exactly they collectively cultivate brain activity like thoughts and reasoning. Nevertheless, innovations in the realms of computation and data mining enable the development of artificially intelligent systems that reflect human intellectual capability.

A robot known as Kismet (developed at the Massachusetts Institute of Technology) decentralizes its computing by separating it into different processing tiers. Higher levels of computing deal with complicated and technically advanced processes, while the lower resources are allocated to the tedious and repetitive activity. Kismet works very similarly to the human nervous system, which consists of both voluntary and involuntary functionality.

Artificial intelligence can be a controversial technology, including how its terminology is applied as well as the subjective nature of AI and whether or not it could ever constitute a form of consciousness. Today, much of the modern debate on human-like AI revolves around their lack of true emotions or personality. Possibly, one of the most unique traits that characterize humanity and its evolution over animals is empathy – a powerful driver influencing many of our decisions and actions.

Machines still lack a true “emotional intelligence,” and it’s probably better if they never have their own emotions– unless we want to see our Alexa refusing to work because she’s angry or sad. However, the ability of modern AI to recognize human emotion may be beneficial. Even now, AI seems to show the first signs of an early empathy–in the form of an enhanced ability to recognize human facial expressions, vocal intonation, and body language, and tune their reactions accordingly.

A glimmer of very rudimental empathy has been positively identified in a recent experiment led by the engineers at Columbia Engineering’s Creative Machines Lab. Although it's a bit of a stretch to define this very

primitive ability to visually predict another robot's behavior as true "empathy", this one still is a very first step towards this direction. In a nutshell, a first robot had to choose his path depending on whether he was able or not to see a certain green box in his camera. The other "empathic" robot couldn't see that, yet, after 2 hours of observation, it was eventually able to predict his partner's preferred path 98% of times even without possessing any knowledge about the green box.

2. Sense Perception

The technology that empowers robot senses has fostered our ability to communicate electronically for many years. Electronic communication mechanisms, such as microphones and cameras, help transmit sensory data to computers within simulated nervous systems. Sense is useful, if not fundamental to robots' interaction with live, natural environments.

The human sensory system is broken down into vision, hearing, touch, smell and taste – all of which have been or are being implemented into robotic technology somehow. Vision and hearing are simulated by transmitting media to databases that compare the information to existing definitions and specifications. When a sound is heard by a robot, for example, the sound is transmitted to a database (or "lexicon") where it is compared among similar sound waves.

Self-driving vehicles are a great example of how robotic senses work. The car is stacked with sensors such as LIDAR, RADAR, video cameras, GPS, and wheel encoders that allow it to collect data from its surroundings in real time. Advanced perception algorithms will then elaborate this raw data to allow the AI to compare it against a set of pre-defined items. This way the vehicle will be able to identify and, thus, "sense" other cars, road signs, highways, pedestrians, etc. (Read also: **Are These Autonomous Vehicles Ready for Our World?**)

Much still needs to be done before engineers will truly be able to make human-robot interactions more genuine. A particularly coveted frontier of machine perceptivity for which modern robotics is focusing all its endeavors is the ability to recognize human emotions from facial expressions. Although not yet fully employed in robotics, early emotion recognition systems are currently tested by several tech companies, including Google, Amazon and Microsoft.

These not-particularly-intelligent AI-powered systems are being used for a variety of purposes, such as empowering surveillance cameras with the ability to identify suspicious people or gauge how customers respond to advertisements. Whether these techs will be used for teaching machines how to better understand humans, or just demolish our right to privacy even more, only time will tell.

3. Dexterity

Dexterity refers to the functionality of limbs, appendages and extremities, as well as the general range of motor skill and physical capability of a body. In robotics, dexterity is maximized where there is a balance between sophisticated hardware and high-level programming that incorporates environmental sensing capability. Many different organizations are achieving significant milestones in robotic dexterity and physical interactivity.

The United States Department of Defense is host to the Defense Advanced Research Projects Agency (DARPA), which sponsors a great deal of innovation in the development of prosthetic limbs. This technology lends a great deal of insight into the future of robot dexterity, but not all robots imitate the human physical form (those that do are often referred to as "androids," whose Greek etymological origin basically translates as "likeness to man").

Organizations like Boston Dynamics explore a variety of both bipedal and quadrupedal configurations (with its famous BigDog robot falling in the latter category) while expanding on the idea of extrinsic dexterity in grasping mechanisms.

Anthropomorphic robotic hands that can perform delicate tasks such as opening jars or writing can be used in many circumstances where it is too dangerous for a human to use their own limbs, such as in extreme environments or when handling harmful substances and materials. Reinforcement learning (a relatively new form of machine learning), has driven forward robot dexterity. The algorithms help the machine understand which techniques are more effective in manipulating a certain object or achieving a specific task, similarly to what happens with muscle memory in animals. The results are outstandingly dexterous robots that are nearly able to emulate the level of precision of true human hands.

4. Power

Robots require an energy source, and there are many factors that go into deciding which form of power provides the most freedom and capability for a robotic body. There are many different ways to generate, transmit and store power. Generators, batteries and fuel cells give power that is locally stored but also temporary, while tethering to a power source naturally limits the device's freedom and range of functions.

One very notable exception would be the simple machine-based bipedal walking system that relies only on gravity to propel its walk cycle (developed at Japan's Nagoya Institute of Technology). While this may not qualify as a stand-alone (no pun intended) robot, it could lead to innovations on how robot power could potentially be optimized, or possibly even generated.

A fantastically ingenuous example of how advanced robotics power can be arranged by for soft and flexible intelligent robots is using soft smart materials such as dielectric elastomers which can be used as transducers to design intelligent wearable robotics.

A wearable actuator-generator such as robotic clothing could, for example, accumulate energy from the body movements while the robot walks down a flight of stairs, only to return this stored energy to provide added power when they must climb up again those same stairs. The strain-responsive properties of these soft materials are employed to create advanced assisting robots that are nearly self-sufficient in terms of power consumption.

5. Independence

Intelligence, sense, dexterity and power all converge to enable independence, which in turn could theoretically lead to a nearly personified individualization of robotic bodies. From its origin within a work of speculative

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fiction, the word “robot” has almost universally referred to artificially intelligent machinery with a certain degree of humanity to its design and concept (however distant).

This automatically imbues robots with a sense of personhood. It also raises many potential questions as to whether or not a machine can ever really “awaken” and become conscious (sentient), and by extension treated as an individual subject, or "person.

CONCLUSION:-

Robotics is a vast network which is growing rapidly in all sectors. NOW a days cue to Robitics automation in industries employment crisis is happening. As being a part of this world we all wish implementation of technologies that should not to be effected o the employment crisis because every man work is replacing by robots its difficult in coming Eras of generation.