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ROBOTICS - REVIEW

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ABSTRACT

Robots have always had a fascination in our mind. The concept of creating machines that can operate autonomously dates back to classical times, through history, robots has been often seen to mimic human behaviour, and often manage tasks in a similar fashion. Robotics is the branch of technology that deals with the design construction, operation, and application of Robots. A Robot is generally considered a machine that is programmed to perform task. There are two types of major Robots i.e. Industrial Robot and Service Robots we can apply the robotics in many field like Automotive industry, Engineering, Military, Medical laboratories, Medicene, Neuclar Energy, Agriculture and customer services. Robotics in health care are biorobotics, rehabilitation robotics robotics surgery and socially assistive robots. Biorobotics are bionic limb prosthesis, Hearing aids and possibility of inserting brain chips. Now a day various activities in nursing like assisting in patient recovery, monitoring patients vital signs, telerounding, doctor patient interaction, changing linens, carrying food to patients and feeding patients etc., so robots are going to play a very significant role in our daily life. Like computers in 20th century robots are going to be a common house hold items in future.

KEY WORDS: Robotics, Robot, Biorobotics, Robotic Tele Surgery.

INTRDUCTION

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans

in appearance, behavior, and/or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics.

The word *robotics* was derived from the word *robot*, which was introduced to the public by Czech writer Karel Čapek in his play R.U.R. (Rossum's Universal Robots) which was published in 1920.

The word *robot* comes from the Slavic word *robota*, which means labor. The play begins in a factory that makes artificial people called *robots*, creatures who can be mistaken for humans – similar to the modern ideas of androids.

History

Over the few years robotics activities in India has moved well beyond the traditional areas of industrial applications, atomic energy, etc. and has entered newer domains of education, rehabilitation, entertainment, and even got placed into homes in a certain sense. Indian robotics researchers have similarly grown from a handful to over a hundred engaged in research labs, education, industry, atomic energy, etc. To further augment robotics activities and to provide aid in promoting close cooperation among its members, the Robotics Society of India was formed on 10 July 2011 in the evening at Indian Institution of Technology Delhi following the workshop on Haptics & Virtual Reality.The society wishes to act as an academic center of robotics in India in order to contribute to the field of robotics in cooperation with academic societies of related fields both in India and abroad.

Fully autonomus robots only appeared in the second half of the 20th century. The first digitally operated and programmable robot, the Unimate, was installed in 1961 to lift hot pieces of metal from a die casting machine and stack them. Commercial and Industrial robots are widespread today and used to perform jobs more cheaply, or more accurately and reliably, than humans. They are also employed in jobs which are too dirty, dangerous, or dull to be suitable for humans. Robots are widely used in manufacturing, assembly, packing and packaging, transport, earth and space exploration, surgery, weaponry, laboratory research, safety, and the mass production of consumer and industrial goods.

MEANING

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots as well as computer systems for their control, sensory feedback, and information processing.

A robot is generally considered a machine that is programmed to perform task.

TYPES OF ROBOTS

MOBILE ROBOTS

Mobile robots have the capability to move around in their environment and are not fixed to one physical location. An example of a mobile robot that is in common use today is the *automated guided vehicle* or *automatic guided vehicle* (AGV). An AGV is a mobile robot that follows markers or wires in the floor, or uses vision or lasers. AGVs are discussed later in this article.

Mobile robots are also found in industry, military and security environments. They also appear as consumer products, for entertainment or to perform certain tasks like vacuum cleaning. Mobile robots are the focus of a great deal of current research and almost every major university has one or more labs that focus on mobile robot research.

INDUSTRIAL ROBOTS

“An automatically controlled, reprogrammable, multipurpose manipulators which may be either fixed in place or mobile for use in industrial automation applications."The kinds of robots which form the most commonly used industrial robots are robots with fixed arms ands manipulators chiefly doing work related to production and distribution of goods.

Industrial robots usually consist of a jointed arm (multi-linked manipulator) and an end effector that is attached to a fixed surface. One of the most common type of end effector is a gripper assembly.

SERVICE ROBOTS

Most commonly industrial robots are fixed robotic arms and manipulators used primarily for production and distribution of goods. The term "service robot" is less well-defined. The International Federation of Robotics has proposed a tentative definition, "A service robot is a robot which operates semi- or fully autonomously to perform services useful to the well-being of humans and equipment, excluding manufacturing operations.

ROBOTICS IN HEALTH CARE

Now, there is a new “face” on the horizon. A product of the technological developments in healthcare that are rapidly advancing.In a few hospitals, service robots are performing some direct patient care tasks.

CATEGIRIES IN HEALTH CARE

- ☺ Biorobotics
- ☺ Rehabilitation robotics

- ☺ robotics surgery
- ☺ Socially assistive robots

BIOROBOTICS

It can be defined as the science and engineering of applying robotics to problems regarding biology and medicine (Dario, 2003).

It may lead to number of practical applications for substitution of organ or/and function of humans.

Example

- Bionic limb prosthesis
- Hearing aids and aids targeted towards neuro motor recovery
- Possibility of inserting brain chips
- Microchips to detect sounds and substitute the auditory nerve

REHABILITATION ROBOTICS

- ○ Intelligent wheel chairs
- ○ Self navigating wheel chairs with sensors enabling to avoid obstacles
- ○ Daily life home assistance

MOVAID (Mobility And Activity Assistance System For The Disabled) - a mobile based which fits into different activity workstations.

ROBOTICS SURGERY

A surgical robot has been defined as a powered computer controlled device that can be programmed to aid in the positioning and manipulation of surgical instruments. (B.Davis 2000).

Classification of surgical robots

- Passive robots
- Semi active and synergistic robot
- Active robots

Passive robots

Passive robots function to hold a fixture at a desired location through the surgeon intrudes an instrument.

Eg- Puma 560 guide drills and needles for intra cranial biopsies

Semi active and synergistic robot

The devices that combine the capability of some autonomous function with other functions carried out by surgeons.

Eg- LARS (laproscopic assistant robotic system) and endoscopic assisted robotic system.

Active robots

The devices function with significant independence from the surgeon. The robots carry greatest safety concerns and has developed for specific purposes.

Robotic Tele surgery

is a promising application with minimally invasive surgery through using millimeter-scale robotic manipulators under control of the surgeon.

SOCIALLY ASSISTIVE ROBOTS

Paro is a **therapeutic robot** intended to produce a calming effect and elicit emotional responses in hospitalised patients, similar to Animal-Assisted Therapy.

The robot has **tactile sensors** and responds to petting by moving its tail and opening and closing its eyes. It also responds to sounds and can learn a name. It can show emotions such as surprise, happiness and anger. It produces sounds similar to a **real baby seal** and (unlike a real baby seal) is active during the day and goes to sleep at night.


APLICATION OF ROBOTICS IN NURSING

The concept of using robots in the providing patient care would possibly increase efficiency and the robot assisting with mundane tasks such as making beds, carying linen, assisting in feeding, caarrying food, bed baths and carrying charts, would allow nurses more time to provide the highest quality care possible to their patients. Robotics can play a role in assisting nurses to complete their daily tasks in order to provide better healthcare.



MONITORING PATIENTS VITAL SIGNS

TELEROUNDS

Allowing doctors to make rounds remotely

MODULAR ROBOTS

Modular robots are a new breed of robots that are designed to increase the utilization of the robots by modularizing the robots. The functionality and effectiveness of a modular robot is easier to increase compared to conventional robots. These robots are composed of a single type of identical, several different identical module types, or similarly shaped modules, which vary in size. Their architectural structure allows hyper-redundancy for modular robots, as they can be designed with more than 8 degrees of freedom (DOF).

Modular robotic technology is currently being applied in hybrid transportation, industrial automation, duct cleaning and handling. Many research centres and universities have also studied this technology, and have developed prototypes.

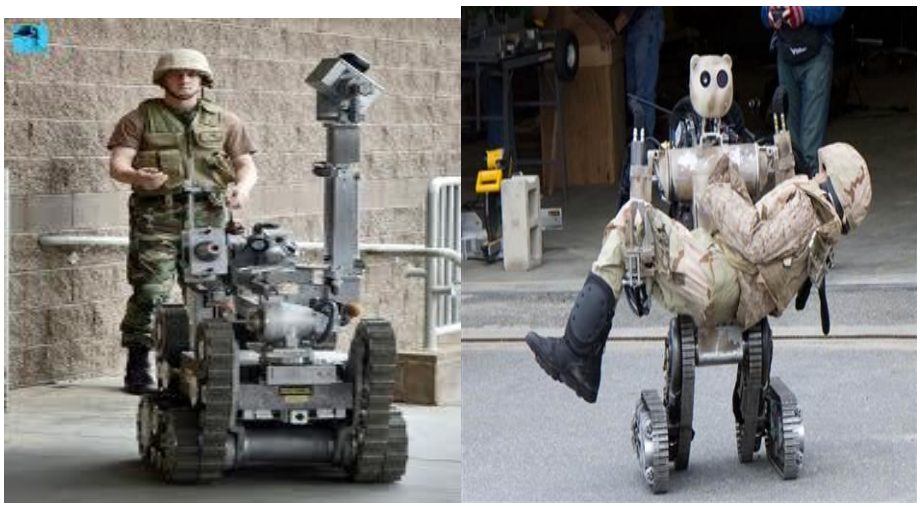
COLLABORATIVE ROBOTS

A *collaborative robot* or *Cobot* is a robot that can safely and effectively interact with human workers in performance of simple industrial tasks. However, end-effectors and other

environmental conditions could create a hazard, and a risk assessment should be done with any industrial motion control application. The collaborative robots most widely used in industries today are manufactured by Universal Robots in Denmark.

MILLITARY ROBOTS

Some experts and academics have questioned the use of robots for military combat, especially when such robots are given some degree of autonomous functions. There are also concerns about technology which might allow some armed robots to be controlled mainly by other robots. The US Navy has funded a report which indicates that, as military robots become more complex, there should be greater attention to implications of their ability to make autonomous decisions. One researcher states that autonomous robots might be more humane, as they could make decisions more effectively. However, other experts question this.



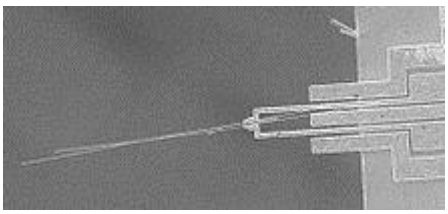
TELE ROBOTS

Teleoperated robots, or telerobots are devices remotely operated from a distance by a human operator rather than following a predetermined sequence of movements. They are used when a human cannot be present on site to perform a job because it is dangerous, far away, or inaccessible. The robot may be in another room or another country, or may be on a very different scale to the operator. For instance, a laparoscopic surgery robot allows the surgeon to work inside a human patient on a relatively small scale compared to open surgery, significantly shortening recovery time. They can also be used to avoid exposing workers to the hazardous and tight spaces such as in duct cleaning. When disabling a bomb, the operator sends a small robot to disable it.

MINING ROBOTS

Mining robots are designed to help counteract a number of challenges currently facing the mining industry, including skills shortages, improving productivity from declining ore grades, and achieving environmental targets. Due to the hazardous nature of mining, in particular underground mining, the prevalence of autonomous, semi-autonomous, and tele-operated robots has greatly increased in recent times. A number of vehicle manufacturers provide autonomous trains, trucks and loaders that will load material, transport it on the mine site to its destination, and unload without requiring human intervention.

NANOROBOTS



A microfabricated electrostatic gripper holding some silicon nanowires.

Nanorobotics is the emerging technology field of creating machines or robots whose components are at or close to the microscopic scale of a nanometer (10^{-9} meters). Also known as "nanobots" or "nanites", they would be constructed from molecular machines. So far, researchers have mostly produced only parts of these complex systems, such as bearings, sensors, and synthetic molecular motors, but functioning robots have also been made such as the entrants to the Nanobot Robocup contest. Researchers also hope to be able to create entire robots as small as viruses or bacteria, which could perform tasks on a tiny scale. Possible applications include micro surgery (on the level of individual cells), utility fog, manufacturing, weaponry and cleaning. Some people have suggested that if there were nanobots which could reproduce, the earth would turn into "grey goo", while others argue that this hypothetical outcome is nonsense.

CONCLUSION

Robots have replaced humans in the assistance of performing those repetitive and dangerous tasks which humans prefer not to do, or are unable to do due to size limitations, or even those such as in outer space or at the bottom of the sea where humans could not survive the extreme environments.

There are concerns about the increasing use of robots and their role in society. Robots are blamed for rising unemployment as they replace workers in some functions. The use of robots in military combat raises ethical concerns. The possibility of robot autonomy and potential repercussions has been addressed in fiction and may be a realistic concern in the future. Robots are going to play a very significant role in our daily life. Like computers in 20th century robots are going to be a common house hold items in future.

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