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A CONCEPTUAL OVERVIEW OF ROBOTICS AND ITS APPLICATION IN DIFFERENT INDUSTRIES

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The world is witnessing the emergence of Robotic and its application in our daily life. The modern meaning of the word 'robot' has its origins in a 1920 play by Czech writer Karel Čapek.The word robot comes from the Slavic word robota, which is used to refer forced labor. Robotics brings together different engineering areas and skills. Today, robotics is a rapidly growing field, as we continue to research, design, and build new robots that serve various practical purposes, whether domestically, commercially, or militarily. A mechanical device able to perform some preset motions but with no ability to adapt is considered a robot. Many robots do jobs that are hazardous to people such as defusing bombs, exploring shipwrecks, and mines. This research paper is an attempt to understand the concept of robotics and its applications in different industries.

Keywords: Robotics, Robots, Application, Artificial Intelligence etc**.**

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INTRODUCTION

A robot is a programmable mechanical device that can perform tasks and interact with its environment, without the aid of human interaction. Robotics is the branch of technology that deals with the design, construction, operation, structural disposition, manufacture and application of robots. These technologies deal with automated machines that can take the place of humans, in hazardous or manufacturing processes, or simply just resemble humans. It has recently receives extensive attention from robotics community. The focus on the robotics industry has contributed positively in economic growth and the improvement of the strategic needs. Early graphics programming was done by turning pixels on and off; just as early robot programming was done by turning motors on and off. But graphics has developed into a wonderfully rich field that includes specialties such as Web design, game design, and scientific visualization. The applications of computer graphics have outgrown the confines of a single discipline. Better algorithms for perception and manipulation, and high-level frameworks for robot instruction will enable robotics application development by a diverse population of users and innovators.

A robot is a mechanical or virtual intelligent agent that can perform tasks automatically or with guidance, typically by remote control. Robots can be autonomous, semi-autonomous or remotely controlled. Robots are extensively used in many diverse industries ranging from semiconductor manufacturing to electroplating (Dawande et al. 2005). A robot has following characteristics: It is an electric machine which has some ability to interact with physical objects; it is reprogrammable (J.M.Selig, 1992) and it have some ability to perceive and absorb data on physical objects, or to process data, or to respond to various stimuli. A recent example of human replacement involves Taiwanese technology company Foxconn who, in July 2011, announced a three year plan to replace workers with more robots. At present the company uses ten-thousand robots but will increase them to a million robots over a three year period.

Different things which help robot for its efficient working include: sensors and effectors. Sensors are the parts that act like senses and can detect objects or things like heat and light and convert the object information into symbols or in analog or digital form so that computers understand and then robots react according to information provided by the sensory

system Sensors tell the robot position / change of joints odometers, speedometers etc; Effectors converts software commands into physical motion. There are two types of effectors manipulation and locomotion. Feedback Controls: These are provided by cameras, pressure sensors, temperature sensors, limit switches, optical sensors.

According to Issac Asimov (1941), there are three laws of Robotics : Law 1: A robot may not injure a human being or through inaction, allow a human being to come to harm. Law 2: A robot must obey orders given to it by human beings, except where such orders would conflict with a higher order law. Law 3: A robot must protect its own existence as long as such protection does not conflict with a higher order law.

LITERATURE REVIEW

Fong et al. (2003) stated that robot can express and observe feelings, is able to communicate via a high-level dialogue, has the ability to learn social skills, the ability to maintain social relationships, the ability to provide natural cues such as looks and gestures, and has (or simulates) a certain personality and character. Dawande et al. (2005) showed an extensive literature on robotic cell scheduling problems. Crama et al. (2000) surveyed cyclic scheduling problems in robotic flowshops, whereas Galante and Passannanti (2006) studied the use of dual gripper robots in a robotic flowshop,where each part must go through all of the machines in the same sequence.

Advances in robotics are reported weekly at technology news sites such as Robots.net, while the popular magazines *Robot* and *Servo* are energizing the robotics hobbyist community the way *Byte* and *Dr. Dobbs' Journal* once nurtured amateur computing enthusiasts. Advances in sensing, actuator, and power technologies are fueling an explosion in robotics comparable to what microprocessors did for computing three decades ago (David,2010). Bill Gates (2007) drew a parallel between today's robotics industry and the computing industry at the start of the PC revolution. In a flexible manufacturing cell, the processing times can be altered or controlled (albeit at higher cost) by changing machining conditions such as cutting speed and feed rate. A summary of processing time is a linear function of the amount of resource allocated to the processing of the job presented in the recent survey of Shabtay and Steiner (2007).

APPLICATIONS OF ROBOT INDUSTRY

Mobile Robot: Mobile robots have the capability to move around in their environment and are not fixed to one physical location. The simplest case of mobile robots is wheeled robots. Wheeled robots comprise one or more driven wheels and have optional passive or caster wheels and possibly steered wheels. Most designs require two motors for driving and steering a mobile robot (Thomas Branul, 2006)**.**

Industrial Robots: Robots are being used more and more in industry as a substitute for the human work force. It is an automatically controlled, reprogrammable, multipurpose, manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications. The precision and productivity aspect of robots are the major reasons manufacturing has gone through huge technological achievements in such a short time (S. Shafiei-Monfared et al., 2009). Robots are primarily used as material handling instruments. A robotic cell is defined as a manufacturing cell composed of a number of machines and a material handling robot (Serdar Yildiz et al., 2011). Robots cut and shape fabricated parts, assemble machinery and inspect manufactured parts.

Pick and Place Robots: Mass-produced printed circuit boards (PCBs) are almost exclusively manufactured by pick-and-place robots which remove tiny electronic components from strips or trays, and place them on to PCBs with great accuracy. Such robots can place hundreds of thousands of components per hour, far out-performing a human in speed, accuracy, and reliability.

Telerobots : They are used when a human cannot be present on site to perform a job because it is dangerous, far away, or inaccessible. 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: These 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**.**

Traffic signal Robots: A traffic signal robots can be used to manage and control traffic.

Service Robot: 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. Like in post office robots can be used in stamping and related things. It is useful for banks and back office work.

Sports Robots: Sports and recreation is the main area of robotics industry. Examples of those are toys used for kids and soccer fields' robots, where teams used to play real matches using just robots.

Space Robots: Applications outside the Earth's atmosphere are clearly a good fit for robots. It is dangerous for humans to get to space, to be in space and to return from space. It is easy for manipulator to restore parts, to fix the space ship, and to direct the whole space shuttle. Wettergreen D.(2004) has thrown light on Field-deployable mobile, robots System synthesis, Software architecture and engineering; Sensor-based guidance, Adaptive control and learning; Mobility; Exploration and autonomy.

Modular Robot: Modular robot is a new breed of robots that is designed to increase the utilization of the robots by modularizing the robots.

Underwater Robots: Robotic underwater rovers are used explore and gather information about many facets of our marine environment. One example of underwater exploration is to use robots for underwater cable inspection, and for telecommunications. Robot made by Sydney University where the robot is send by itself with a mapping system and all the work is done autonomously.

Security Robots: Some robots are used to investigate hazardous and dangerous environments. In these environments, robots are used for firefighting, for entering into dangerous areas and for removing of injured persons in natural disasters. Another important applications of robots in security is for inspection and search for dangerous materials.

Military 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. Robots are used during war for mine removal and entering into dangerous areas where robots will use guns as their manipulators. Meanwhile, more than 40 nations now have military robotics programs (Levinson , 2010)

Farms robots:– Programmed robots are used by harvesters to cut and collect crops. Robotic milk farms are existing permitting workers to nourish and milk their cattle distantly.

Medical Robots: Robots are able to perform major operations while only making small incisions, patients receive many benefits. Robots are used to perform heart surgery without opening patients chests, provide assistance to people with severe restrictions on movement, can provide exercise platforms to help restore limb function and can monitor the condition of patients. They reduce post-operative discomfort, reduce costs and provide improved access to quality medical care (Howie Choset)

FUTURE OF ROBOTS

Robonaut is a humanoid robot being designed at NASA Johnson Space Center in cooperation with DARPA. It consists of two arms, two hands, a head and a waist. It is currently teleoperated with a small amount of autonomy. They are going to be more robust to send specialized machine per task. Due to their multifunctional ability, they are highly cost saving and their capability is high. They are applicable in space station repair, Mars exploration, Moon station etc.(self replication). Besides, in construction industry, since both effectors (Locomotion with manipulation) are possible, robots may also be used in mine sensor support w/shoring, building construction and architecture. Robots can also be used for search and rescue operations. They can also be used in undersea mining and planetary mining. Although most robots in use today are designed for specific tasks, the goal is to make universal robots, robots flexible enough to do just about anything a human can do. Thus Robotics is a wide field and its revolutionary innovation makes our life simple.

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