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Robotics

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Abstract: Robotics is a science which includes different fields like electronics, computer science, artificial intelligence, nanotechnology and bio engineering. Here we develop robots which do all the functions starting from simple tasks to dangerous ones like bomb disposal, dealing with toxic material. They work fine even on flat surface, rough surface, mud etc. They have wheels together with one leg, two legs up to six legged robots based on the requirement and the surface on which it will work. Robots are of different types like stationary, autonomous, virtual, remote, beam robots etc. all will be discussed here in brief. Different components are also discussed here.

Keywords: nanotechnology, artificial intelligence, bio engineering, stationary, autonomous.

Introduction

Robotics is a study of Robots. Robotics is a science in which you manufacture and design operation of robots. It includes electronics, computer science, artificial intelligence, nanotechnology and bioengineering.
Three laws of Robotics by Asimov:

1. Robots must never harm human beings.
2. Robots must follow instructions given by human beings without violating rules.
3. Robots must protect themselves without violating the other rules.

Robotics is an engineering in which we create robots, and devices which can move and react to sensory input. It is considered as a part of artificial intelligence. Now a day's robots are used in factories and also used to defuse bombs or cleaning toxic waste. Robots are basically made to do difficult or dull job. But with all those advantages robots are still not used in everyday life. Robots have three main parts: a controller, mechanical parts and sensors. These all works together, to perform a function. Robots are basically made to make people's lives better.

Types of Robots

1) **Cartesian Robot**: - robot has Cartesian coordinator; it is used in applications for handling machine tools and arc welding.
2) **Cylindrical robot**: - used for assembly operations, spot welding and handling at die-casting machines.
3) **Scara Robot**: - used for pick and place work and handling machine tools. This robot has parallel rotary joints.
4) **Articulated robot**: - It is used for fettling machines, gas welding, spray painting, arc welding. Its arm has at least three rotary joints.
5) **Parallel Robot**: - It is used in cockpit flight simulators. It has concurrent prismatic joints.
6) **Mobile Robots**: - they are used to search areas. E.g. mars explorer designed to explore mars. It is best where people cannot go. It is divided into two categories

i) **Rolling robots**: - these robots have wheels to roam around. These robots are used only in flat areas; it is very difficult to use them in rocky terrains.

ii) **Walking robots**: - These robots are basically designed for rocky terrains, so these robots have 4 to 6 legs, these are designed after insects.

7) **Stationary robots**: - used to perform repetitive tasks. They can work day and night without getting fatigued or with same perfection with which he did his first task.

8) **Autonomous Robots**: - They are self contained they have their mind of their own. They perform actions based upon the surroundings. They adapt and learn from surroundings.
9) **Remote Control Robots**: - It is not very intelligent robot, memory and brain capacity is very limited. It is not a very good option for complicated tasks human beings are better for such tasks. A person controls a robot by remote.
10) **Virtual Robots**: - they don't exist in real life. These are software's build to simulate a real robot or to perform repetitive task. Chatterbot is a virtual robot. These robots simulate conversations with users of internet.
11) **Beam Robots**: - it is short for biology, electronics, aesthetics and mechanics. These are simple robots and suitable for starters.

Components of Robotics

There are various components of Robots which are as follows:

1) **Power source: -** Batteries are the main source of power. Many different types of batteries are available for robots which vary from lead acid batteries which are safe and have long lives to silver cadmium batteries which are smaller in size and very expensive. Weight is an important factor in batteries which defines the actual weight of the robot.
2) **Actuation**: - In this part stored energy is converted into movement. Electric motors are actuators which control industrial robots in factories.
3) **Electric motors**: - Robots uses DC motors in portable robots or AC motors in industrial robots. Here the motion is rotational.
4) **Linear actuators: -** These have quick direction changes and they are powered by compressed air.
5) **Series elastic actuators**: - it is a part of motor actuator, to improve control; it is used in humanoid robots.
6) **Air muscles**: - these contract when air is forced inside them. They are used with few applications.
7) **Muscle wire**: - it contracts slightly when electricity runs through it. These are used with small robot applications.
8) **Electro active polymers**: - they contract by electricity used in facial muscles and arms of humanoid robots. It allows robots to swim, float etc.
9) **Piezo motors**: - these are also called ultrasonic motors. These have nanometer resolution, speed, and available force for their size.
10) **Elastic nanotubes**: - these are artificial muscle technology in early stage experimental development.
11) **Sensing**: - this sensing will allow receiving information from the environment. It calculates the response from the environment.
12) **Hopping**: - a special algorithm was developed to generalize two or four legs. A bipedal robot can perform summersault. A quadruped robot could run and pace.
13) **Dynamic balancing (controlled falling)**: - it monitors the robot motion and it maintains stability.
14) **Touch**: - Scientists use sensors which behave like human fingers. Smart hand works like real hand, which allows a person to write and type on keyboard, and perform all basic functions with prosthesis, and even human feels the same sensation as if he doing that tasks with his real fingers.

15) **Vision**: - It is the technique with which a computer can see. Robots use artificial intelligence to apply vision in robots to extract information from images. Computers are generally pre-programmed to perform any tasks. They use neural networks, so that they learn while they interact or perform actions.
16) **Manipulation**: - Robots are used for pick up, modify, destroy objects. Hands used in robots are called end effectors. Arm is called manipulators. Each manipulator has some tasks to perform.
17) **Mechanical grippers**: - they are used for picking and putting up the objects, they have hands very much like humans, they come in various types.
18) **Vacuum grippers**: -these are simple devices which can hold loads are very smooth to make sure there is suction. There is special robot which acts as vacuum grippers.
19) **General purpose effectors**: - they use fully humanoid hands. These are manipulators with 20 degrees of freedom and few hundred sensors.
20) **Rolling robots**: - it has four wheels and continuous tracks. More complex tracks are also designed for different applications. They have greater efficiency so that they can navigate in confined places.
21) **Two-wheeled balancing robots**: - it detects how the robot is falling and then drives the wheels in the same direction.
22) **One-wheeled balancing robots**: - it is an extension of one wheel robot, so that it can perform tasks like human do with two legs. They have the potential to function and perform better than other robots.
23) **Spherical orb robots**: - it is also called ball bot. These are completely inside spherical ball.
24) **Six-wheeled robots**: - it is used for that purpose where good grip is required such as on rocky dirt or glass.
25) **Tracked robots: -** it provides more traction than six wheeled robot. They are best for outdoor and military robot. They are difficult to use inside such on carpet and smooth floors.
26) **Walking applied to robots**: - to apply walking procedure for robot is quite dynamic problem. It is not as robust as human. It can move on more than two legs so it is easy to walk. Its movement is also calculated on uneven surface which provides better mobility and energy efficient than other locomotion movements.
27) **ZMP Technique**: used to keep the total inertia forces which are opposed by floor reaction forces. So that it leaves no moment. It still requires a smooth surface to walk.

Other methods of locomotion

Flying: - they can perform like normal planes including normal takeoff, normal flight and even landing. Other flying robots are called unmanned aerial vehicles. They are smaller in size and lighter without a human pilot on the board and fly into dangerous areas for surveillance.

Snaking: - it mimics how snake moves. Some robots can even navigate both on land and in water.

Skating: - various skating robots have been developed, it has legs, wheels.

Climbing: - different robots have ability to climb vertical surfaces. It has the ability to climb up and down buildings walls; smooth glass, rough and sticky walls, and identifies obstacles and has flexible and realistic movements.

Swimming (Piscine):- it follows the fish swimming pattern. The Aqua penguin, copies the streamlined shape and propulsion of penguins.

Sailing: - it is used to make measurements at the oceans. Sailboat uses wind, and energy of batteries is used for computer, for the communication and for the actuators.

Conclusion

Robotics is basically study of Robots. Now a day's robots are used in almost every field, ranging from scientific projects to normal product delivery. They are also used for security purposes using UAV i.e. unmanned aerial vehicle where it is dangerous for humans to keep track of activities. Robots have range of components which as a whole works like a professional to perform any task. However robots is used in various complex areas as far as simple house hold works are concerned it is not used because of its price firstly, and also such a technique cannot be used for performing such simple tasks because if can do much more than that.

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