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Basics of Robotics and their Technology

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Abstract

This paper is all about the basics and general ideas about robotics and its technology. The present world needs robots for helping mankind in different fields of work. Man created robots in his form to do his work and to reduce his labor. But robots took few steps above man and reached many hearts with its activities and abilities. In this paper we'll see about its hostile characteristics and compare robots with man to see who will withstand for the next generation.

Keywords: Laws, characteristics, type, advantages and disadvantages, applications, comparison between human and robot

Introduction

What is the first thing that comes to mind when you think of a robot? For many people it is a machine that imitates a human—like the androids in Star Wars, Terminator and Star Trek. In one word it is “The Next Generation”. Technically speaking the definition of robot is that it is a system that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. The study of robots leads to “ROBOTICS”.

Then, what is robotics? It is a branch of engineering that involves the conception, design, manufacture and operation of robots. Why do we need robotics? People need robots for dangerous, repetitive and high-precision work. Robots perform tasks in hostile environments that are impossible for humans, while also carrying out repetitious tasks with speed and accuracy. Without robots, our modern industrialized world would not be possible. The world needs robots for a countless number of reasons, including hazardous jobs and automated manufacturing. Robots work without breaks or the need to rest, allowing manufactures to streamline processes and improve output.

Laws of Robotics:

Science-fiction author Isaac Asimov's Three Laws of Robotics, as they are called, have survived to the present:

1. Robots must never harm human beings.
2. Robots must follow instructions from humans without violating rule 1.
3. Robots must protect themselves without violating the other rules.

Characteristic of Robots Sensing

First of all your robot would have to be able to sense its surroundings. Giving your robot sensors: light sensors (eyes), touch and pressure sensors (hands), chemical sensors (nose), hearing and sonar sensors (ears), and taste sensors (tongue) will give your robot awareness of its environment.

Movement

A robot needs to be able to move around its environment. To count as a robot either the whole robot moves, like the Sojourner or just parts of the robot moves, like the Canada Arm.

Energy

A robot needs to be able to power itself. The way your robot gets its energy will depend on what your robot needs to do.

Intelligence

A robot needs some kind of "smarts." This is where programming enters. A programmer is the person who gives the robot its 'INTELLIGENCE'. The robot will have to have some way to receive the program so that it knows what it is to do. All these characteristics are just an outline of how the robot has to be designed. Basic designing contains simple processing and multiple scientific and of course some engineering disciplines.

Types of Robotics:

- land based robots wheeled robots tracked robots
- legged robots
- water based robots air based robots
- miscellaneous and hybrid combinations arms and grippers

Classification of Robotics

Robots are classified as Assistive Robotics and Autonomous Robotics

Assistive Robotics deals with robots which are used as tools rather than task based self-system robots whereas Autonomous Robotics deals with self-developed robots rather than being controlled by system.

Socially Interactive Robots

What if robots can do what humans can do? Like feelings and emotions. Socially interactive robots are specially built in competition with humans. They exhibit human in their shape. They show characteristics of a human being like

- Express and/or perceive emotions;
- Communicate with high-level dialogue;
- Learn/recognize models of other agents;
- Establish/maintain social relationships;
- use natural cues (gaze, gesture, etc.);
- Exhibit distinctive personality and character;
- May learn/develop social competencies.

So, What You Should Know?

Mechanics - A few knowledge about how forces are transferred, centre of gravity, Newton's law, inertia.

Electronics - Electronic components, analog digital logics, micro controllers.

Programming - Control structures, data types, algorithms, hardware controls.

Artificial Intelligence - Dealing with obstacles, handling new situations.

The Basic Components Manipulator

Just like the human arm, the robot consists of what is called a manipulator having several joints and links.

Endeffector

The base of the manipulator is fixed to base support and at its other free end, the Endeffector is attached. The Endeffector is expected to perform tasks normally performed by the palm and finger arrangements of the human arm.

The Locomotive Device

In the case of Human Beings the power for the movement of the arm, the palm and fingers is provided by muscles.

For the robot the power for the movement (locomotion) is provided by the motors. The motors used for providing locomotion in robots are of three types depending on the source of energy: Electric, Hydraulic or Pneumatic.

The Controller

The digital computer (both the hardware and the software) acts as a controller to the robot. The controller functions in a manner analogous to the human brain. With the help of this controller, the robot is able to carry out the assigned tasks. The controller directs and controls the movement of the Manipulator and the Endeffector. In other words, the controller controls the robot.

The Sensors

Without the data supplied by the sense organs, the brain would be incapable of intelligence. In other words the controller (the computer) of the robot cannot do any meaningful task, if the robot is not with a component analogous to the sense organs of the human body. Thus, the fifth and the most important component of the robot is the set of sensors. Sensors are nothing but measuring instruments which measures quantities such as position, velocity, force, torque, proximity, temperature, etc.

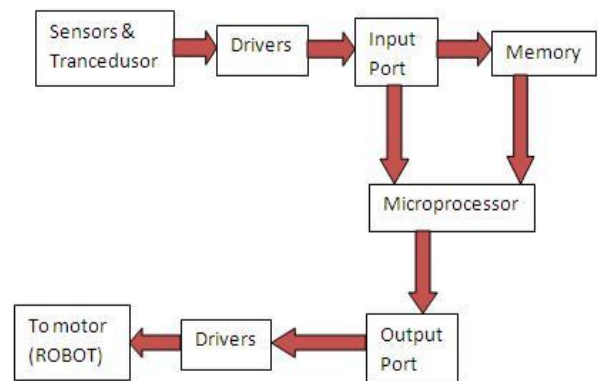


Fig. 1

Building a Robot:

- Simply, how can we build a robot?
- Assembling the Robot Wiring the Robot
- Wiring the Power
- Installing the Arduino Software Programming the Robot

Advantages:

Productivity: Robots produce more accurate and high quality work. More precise than human workers.

Safety: Robots save workers from performing dangerous tasks.

Savings: Robots save time by being able to produce a greater magnitude of products.

Disadvantages:

- The robots need a supply of power.
- The robots cost much money in the maintenance and repair.
- The robots can store large amounts of data but the storage, access, and retrieval is not as effective.

Comparison between Human and Robots: Human Superior to Robot:

Humans are organic beings, while robots are not. Humans are far more complex and superior to robots in

almost all aspects. Humans are highly social beings compared to robots.

Robot Superior to Human:

Mass Reproduction Mind/Data Sharing
Advanced Intelligence Physically Tough
Reduced Energy Needs

Applications:

Some of the applications include:

Industrial robots.

Domestic or household robots. Medical robots.

Service robots. Military robots. Space robots.

Hobby and competition robots.

Conclusion:

All though we might think that robots can do marvelous works without the help of a man, it was invented and created by man himself with his knowledge and ability. It can replace a man's work but not the man. Technology gave rise to the most advanced form of worker in its maker's shape. We can make the best use of these robots in forth coming years or maybe this generation too, but in the wisest way to avoid the damages and violation of the laws stated above.

"If robots are to clean our homes, they'll have to do it better than a person."- James Dyson. If robots are to clean then definitely human beings should be there to litter the place!. So definitely both humans and robots are needed for the next generation to go through thick and thin.

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