AI-16

## Components of a Robot

Robots are constructed with the following −

* Power Supply − The robots are powered by batteries, solar power, hydraulic, or pneumatic power sources.
* Actuators − They convert energy into movement.
* Electric motors (AC/DC) − They are required for rotational movement.
* Pneumatic Air Muscles − They contract almost 40% when air is sucked in them.
* Muscle Wires − They contract by 5% when electric current is passed through them.
* Piezo Motors and Ultrasonic Motors − Best for industrial robots.
* Sensors − They provide knowledge of real time information on the task environment. Robots are equipped with vision sensors to be to compute the depth in the environment. A tactile sensor imitates the mechanical properties of touch receptors of human fingertips.

## Computer Vision

This is a technology of AI with which the robots can see. The computer vision plays vital role in the domains of safety, security, health, access, and entertainment.

Computer vision automatically extracts, analyzes, and comprehends useful information from a single image or an array of images. This process involves development of algorithms to accomplish automatic visual comprehension.

### Hardware of Computer Vision System

This involves −

* Power supply
* Image acquisition device such as camera
* A processor
* A software
* A display device for monitoring the system
* Accessories such as camera stands, cables, and connectors

## Tasks of Computer Vision

* OCR − In the domain of computers, Optical Character Reader, a software to convert scanned documents into editable text, which accompanies a scanner.
* Face Detection − Many state-of-the-art cameras come with this feature, which enables to read the face and take the picture of that perfect expression. It is used to let a user access the software on correct match.
* Object Recognition − They are installed in supermarkets, cameras, high-end cars such as BMW, GM, and Volvo.
* Estimating Position − It is estimating position of an object with respect to camera as in position of tumor in human’s body.

## Application Domains of Computer Vision

* Agriculture
* Autonomous vehicles
* Biometrics
* Character recognition
* Forensics, security, and surveillance
* Industrial quality inspection
* Face recognition
* Gesture analysis
* Geoscience
* Medical imagery
* Pollution monitoring
* Process control
* Remote sensing
* Robotics
* Transport

## Applications of Robotics

The robotics has been instrumental in the various domains such as −

* Industries − Robots are used for handling material, cutting, welding, color coating, drilling, polishing, etc.
* Military − Autonomous robots can reach inaccessible and hazardous zones during war. A robot named *Daksh*, developed by Defense Research and Development Organization (DRDO), is in function to destroy life-threatening objects safely.
* Medicine − The robots are capable of carrying out hundreds of clinical tests simultaneously, rehabilitating permanently disabled people, and performing complex surgeries such as brain tumors.
* Exploration − The robot rock climbers used for space exploration, underwater drones used for ocean exploration are to name a few.
* Entertainment − Disney’s engineers have created hundreds of robots for movie making.