

# AN OVERVIEW ON ROBOTICS AND CONTROL SYSTEMS

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**Abstract-** A robot is a virtual or mechanical agent. In practice, it is often an electro-mechanical system, which looks and speeds as if it were one of its own. The intent and its own agency. The term robot refers to both physical robots and virtual software agents, but often virtual software agents are called bots. There has been no consensus that machines are qualified as robots, but there is a consensus among experts and the public that some or all of the following can be done such as: walking, operating a device or a component of the environment, the environment Understanding and manipulating it and imparting intelligent behavior that mimics human and animal behavior. The stories of artificial assistants and companions and and the effort to create them have a long history, but fully autonomous machines were the only programmed first robot to run in the digital system since the 20th century, Unimate, In 1971, hot pieces of metal were picked up from the stamp making machine and made to make their stack.

Today, commercial and industrial robots are widely used inexpensively and with greater accuracy and greater reliability than humans. They are also employed for tasks which are very dangerous in human terms. , Messy and boring tasks. Robots are being widely used for manufacturing, assembly and bundling, transportation, earth and space exploration, surgery, weapons manufacturing, laboratory research and consumer and industrial production. Domestic robots are generally common around homes for cleaning and maintenance work. Concerns about the economic impact of robotic weapons and automation are generally common. Remains, a concern that is not resolved by the villainous, intelligent, acrobatic robots described in popular entertainment. Real robots are still benign, retarded, and gross compared to their imaginary counterparts.

**Keywords:** Control systems, Robotics, Mechatronics, GA, Neural network.

## 1. INTRODUCTION

Robotics refers to the science and techniques of the design, construction and application of robot. Working in this field requires practical knowledge in many fields other than electronics, mechanics and software. Although the appearance and capabilities of Robot are quite diverse, they all have many similarities [1]. For example, mechanical movable structures and self-control all take place. The shape of the robotic structure is a human asperger and can be called a pure-motion garland. This garland is its bones, promoters its meat muscles and joints, which give it one or more independent dimensions. The control system constantly monitors the output or state variables of the plant and changes the output of the plant in such a way that the output remains the same or changes as desired .For continuous controlled control, a feedback controller is automatically used to control a operation [2]. The control system compares the position of the process variable with the desired set point , and applies the difference as a control signal to bring the process variable output of the plant to a particular task 3-4], first he has to tell about that task. Only then is he able to do that work. Robots are given the necessary instructions to do a particular task by "computer programming". Only after this programming, the robot becomes intelligent enough to decide when, what and how to do it [5]. In today word all the control are done by virtually using the internet. Internet of the thing is one of the main role in today emerging tread and techniques [6]. But the security of the data is also important in the internet [7-9]. In the robotics the internet and control system both are very needful.

## 2. IMPORTANCE OF CONTROL SYSTEM

- The control system is the main tool for the development of engineering.
- The Industrial Revolution was actually possible only due to automated control systems.
- The problem of the construction of the aircraft (flying machine) was solved only when in 1903 the Wright brothers solved the problem of stability and control related to it.
- Robots are also proving to be so useful due to the control system.

## 3. CONTROL SYSTEM FUNDAMENTALS

### 3.1 Open Loop

An open loop control system functions solely on the basis of input and output has no effect on the control action. The system whose processes and operation depends on time is known as open loop control system and it is free from feedback [10].

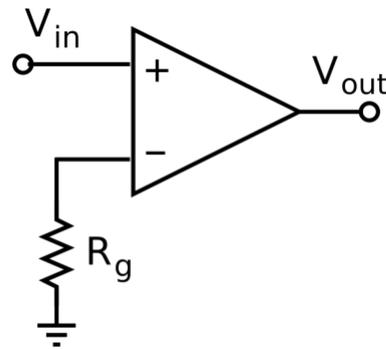


Fig. 3.1 Open Loop

### 3.2 Close Loop

Closed-loop control systems means output is dependent on their input of the system. The system has one or more feedback loops between its output and input. Closed loop system designs are like as they automatically gives the output by comparing both of them with its actual input. The closed-loop system produces an error signal which is the difference between input and output. [11].

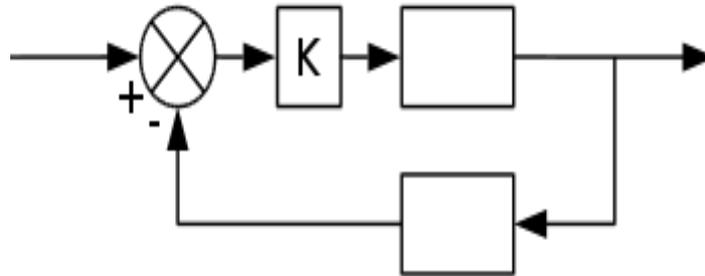


Fig. 3.2 Close Loop

### 3.3 Linear Systems

Linear systems are loops which follows the law of super imposable. This law state that when two different functions are applied at same time , the reaction gives is that the consequence of two individual function reaction. This makes it easy to calculate the response to sundry input of the linear systems by considering one input at a given time and adding their outputs.

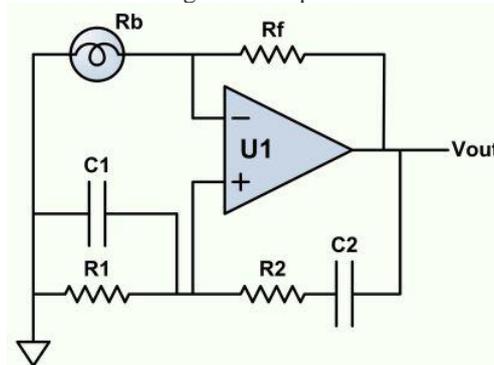


Fig. 3.3 Hybride System

## 4. ARTIFICIAL INTELLIGENCE

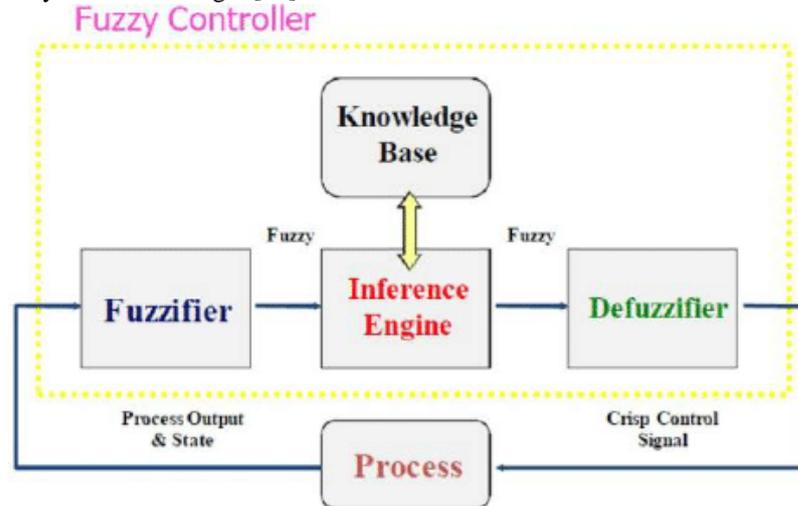
Wisdom is the main quality of humans. Whatever achievements our civilization has achieved, they are the result of human intelligence. Then whether it is to master the use of fire, produce grain, invent the wheel or invent the motor engine [12]. The only thing that plays a role behind all this is human intelligence. This is the only thing that separates us from other animals.

With the help of intelligence, man uses different animals and different machines for his own interest. All the machines made so far, they do the work already scheduled. Be it factories, motor vehicles or computers. But now humans have succeeded in making machines intelligent with the help of their intelligence [13]. Although this technology is still in the initial stages, but its revolutionary results have started coming out.

### 4.1 Fuzzy Logic

Fuzzy logic is multi-valued logic in which the truth values of the variables is anything between 0 and 1. Its use is consistent with the concept of 'partial truth' because often we find in life that an argument is neither

completely 'true' nor completely 'untrue'. In contrast, in boolean logic, the values of variables are either 0 or 1. Digital circuits operate only on Boolean logic [14].



**Fig. 4.1 Block Diagram of Fuzzy Logic**

The term 'fuzzy logic' was first used by Lotfi Zadeh in 1965 with a rendering of fuzzy set theory. But the study of ambiguous logic was going on since the 1920s, which was called infinite-value logic.

#### 4.2 Genetic Algorithm

Genetic algorithm (GA) is technique of search that is used to obtain approximate solutions to optimization problems and search problems. This algorithm is one of many developmental algorithms. Developmental algorithms are based on the pursuit of techniques of evolutionism and related concepts (inheritance, mutation, choice, and crossover, etc.) [15].

This algorithm is also good for 'private' situations.

- It also works on mixed problems in which both discrete and continuous variables are present.
- It does not use derivatives, but uses an objective function.
- It is also useful for multi-objective optimization.
- This method is also robust in terms of local minimum / maximum

#### 4.3 Neural Networks

Artificial neural network, also commonly called "neural network", is a mathematical model. This model follows the structure and methodology of biological neural networks. In most cases, the artificial neural network constantly changes its form by analyzing various information. Neural networks are a tool of non-linear statistical data modeling. Complex data analysis can be done using this model. An array network connecting basic elements related to neurons. In an effort to clarify the human brain nervous system and realize it with the power of technology, we can learn like a human by changing the weight vector of each element. Since the structure of neural networks in the brain is very complex, its operation has not yet been elucidated and further development is expected [16].

### 5. HUMAN ROBOT COLLABORATION

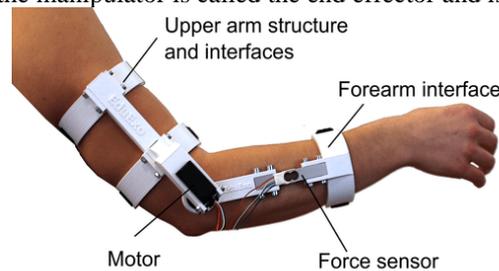
Gesture recognition is a subject in language technology with the target of recognizing or understanding human nerves signal through mathematics algorithms. It can arise from any physical motion of the body but usually arise from the face or hand. Currently the main focus in the field is includes emotion recognition from face and hand gesture recognition [17].

Kinect looks at a range of human characteristics to provide the best command recognition based on natural human inputs. It provides gesture recognition, voice recognition and in some cases both skeletal and facial tracking in addition to the depth and color of the background scene. Kinect reproduces this data in a printable three-dimensional (3D) model. The latest Kinect development includes an adaptive user interface that can detect user height.



**Fig. 4.2 Kinect Sensor**

A robotic arm is a type of mechanical arm, usually coded, with similar operations of the human body. The hand may be part of a more complex robot. Such manipulator links are connected by joints that allow either rotational motion or translational displacement. The links to the manipulator is considered to form a kinematic chain. The limit of the kinematic chain of the manipulator is called the end effector and is similar to the human hand.



**Fig. 4.3 Adaptive Arm System**

## CONCLUSION

This paper presents the fundamentals of control systems in robotics and some other artificial intelligence parts. Each type of control system has its purpose advantage and disadvantage or pros and cons which have been talk about in this paper. In order to run the mechanical structure of robot, attention is given to three separate departments - direct knowledge, processing and action. With the help of the signals, the robot acquires information about its surroundings and the position of its own pairs. Using the strategies of control policy, the promoters are now rotated in the right direction. Techniques such as path planning, model recognition, obstacle conversion are used to rotate the organs of robots. Even more complex and adaptive control can be called artificial intelligence. In the robotic course, students study about the following areas. . 1-Artificial Intelligence or Artificial Intelligence 2-Computer Integrated Manufacturing 3-Computational Geometry 4-Robot Motion Planning 5-Digital Electronics & Micra-Processor 6-Robot Manipulator.

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