ROBOTICS AND AUTOMATION

KANCHAN[1], HIMANI[2]

[1]Assistant Professor in Department of physics at SH. L.N. Hindu College, Rohtak

[2]Assistant Professor in Department of physics at A.I.J.H.M. College, Rohtak

ABSTRACT

A robot may be considered as a machine with built – in intelligence, called artificial intelligence . In 21st century, robotics play an important role in society for its influence in every aspect of life . A robot replaces the role of human beings to perform a particular task including medicine and healthcare ,building service, logistics and transportation . They are establishing themselves in manufacturing automation systems to produce a range of goods with great precision . Several disciplines of Science and Technology are involved in building a suitable robot with specific application ; thus making the field of robotics a highly interdisciplinary area of specialization .

In this paper we are going to present an idea of robotics history and the laws governing making of robots and its application in various fields that we come across. Developments in this area are accelerating at an incredible rate . But these new discoveries raise the efficiency and effectiveness of business operations and by using these tools we can improve the automated processes and neutronic technologies where the future is going to take us.

Keywords*: Automation , Robot*

I. INTRODUCTION

Robotics is a science of designing or building an application of robots. The aim of robotics is to design an efficient robot. A robot is a machine that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. Designing, building, programming and a robot is a combination of physics , mechanical engineering , mathematics and computing .

Robots can also be defined as the physical agents that perform tasks by manipulating the physical world. They are equipped with sensors and have three key elements : Programmability, implying computational or symbol – manipulative capabilities that a designer can combine. It can operate a variety of programmes and transport material in various ways. (1)

II. HISTORY

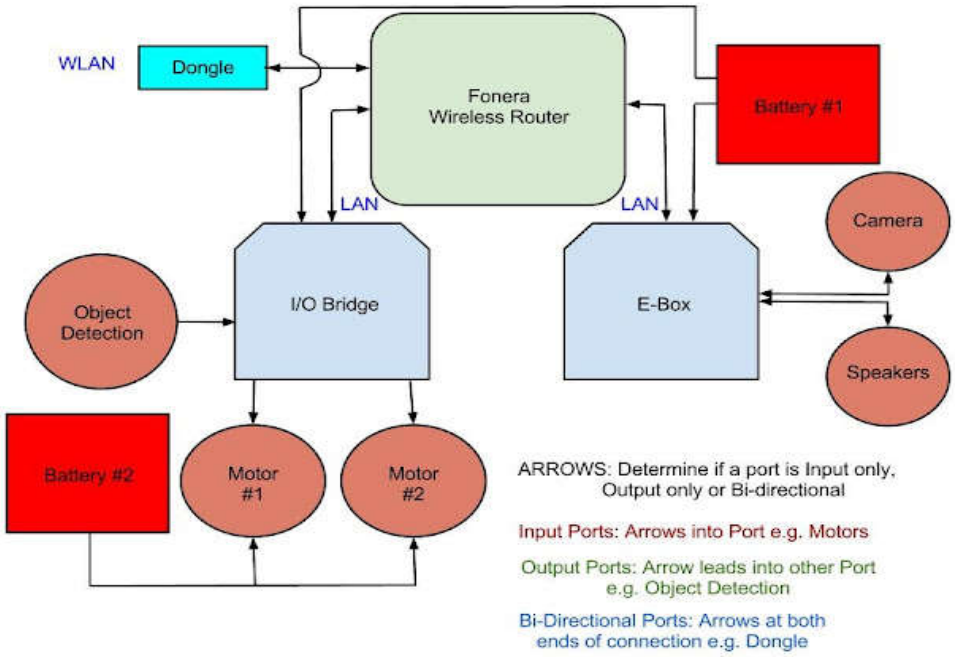
Widely known as the father of the modern robotics industry, **Engelberger** worked closely with inventor **George Devol**, licensing patents and developing the first industrial robot in the United States under the brand name “Unimate.”

- In 1954 **George Devol** invented the first digitally operated and a programmable robot called the Unimate. In 1956, **Devol** and his partner Joseph Engelberger formed the world's first robot company. In 1961, the first industrial robot, Unimate, went online in a General Motors automobile factory in New Jersey. Today I found out the first known robot was created around 400-**350 BC** by the mathematician Archytas and was an artificial bird. Archytas, who is known as the “father of mechanical engineering,” constructed his bird out of wood and used steam to power the movements of the robot.
    - The term automation, inspired by the earlier word automatic (coming from automaton), was not widely used before 1947, when Ford established an automation department. It was during this time that industry was rapidly adopting feedback controllers, which were introduced in the 1930.(2)

III. LAWS OF ROBOTICS

- The Three Laws of Robotics (often known as Asimov's Laws) are a set of rules devised by the science fiction author Isaac Asimov. The rules were introduced in his 1942 short story "Runaround" , although they had been foreshadowed in a few earlier stories. The Three Laws, quoted as
- A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.
- These form an organizing principle and unifying theme for Asimov's robotic-based fiction, appearing in his *Robot* series, the stories linked to it, and his *Lucky Starr* series of young-adult fiction. The Laws are incorporated into almost all of the positronic robots appearing in his fiction, and cannot be bypassed, being intended as a safety feature. Many of Asimov's robot-focused stories involve robots behaving in unusual and counter-intuitive ways as an unintended consequence of how the robot applies the Three Laws to the situation in which it finds itself. Other authors working in Asimov's fictional universe have adopted them and references, often parodic, appear throughout science fiction as well as in other genres.(3)

IV. WORKING OF A ROBOT



V. TYPES OF ROBOTS

There are six main types of industrial robots: cartesian , SCARA, cylindrical, delta, polar and vertically articulated. However, there are several additional types of robot configurations. Each of these types offers a different joint configuration. These are described as:

Articulated - This robot design features rotary joints and can range from simple two joint structures to 10 or more joints. The arm is connected to the base with a twisting joint. The links in the arm are connected by rotary joints. Each joint is called an axis and provides an additional degree of freedom, or range of motion. Industrial robots commonly have four or six axes.

Cartesian - These are also called rectilinear or gantry robots. Cartesian robots have three linear joints that use the Cartesian coordinate system (X, Y, and Z). They also may have an attached wrist to allow for rotational movement. The three prismatic joints deliver a linear motion along the axis.

Cylindrical - The robot has at least one rotary joint at the base and at least one prismatic joint to connect the links. The rotary joint uses a rotational motion along the joint axis, while the prismatic joint moves in a linear motion. Cylindrical robots operate within a cylindrical-shaped work envelope.

Polar - Also called spherical robots, in this configuration the arm is connected to the base with a twisting joint and a combination of two rotary joints and one linear joint. The axes form a polar coordinate system and create a spherical-shaped work envelope.

SCARA - Commonly used in assembly applications, this selectively compliant arm for robotic assembly is primarily cylindrical in design. It features two parallel joints that provide compliance in one selected plane.

Delta - These spider-like robots are built from jointed parallelograms connected to a common base. The parallelograms move a single EOAT in a dome-shaped work area. Heavily used in the food, pharmaceutical, and electronic industries, this robot configuration is capable of delicate, precise movement.

Typical industrial robots are articulated and feature six axes of motion (6 degrees of freedom). This design allows maximum flexibility. Six-axis robots are ideal for:

- Arc Welding
- Spot Welding
- Material Handling
- Machine Tending
- Other Applications (4)

VI. Conclusion

Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can, e.g. robot can built, assemble a car. Yet robots cannot perform every job; today robots roles include assisting research and industry. Finally, as the technology improves, there will be new ways to use robots which ill bring new hopes and new potentials.

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