

Artificial Intelligence and Robotics

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Abstract— The Artificial Intelligence and Robotics although addressing in similar problems. The two fields interact profitably in the area of building intelligent agents; this interaction has resulted in important developments in the area of vision and phased action. Recent advancements of technologies, including computation, robotics, machine learning communication, and miniaturization technologies, brings us closer to futuristic visions of compassionate intelligent devices. The missing element is a basic understanding of how to relate human functions (physiological, physical, and cognitive) to the design of intelligent devices and systems that aid and interact with people. Robotics is the branch of technology that deals with the design, construction, operation and application of robots and computer systems for their control sensory feedback, and information processing.

Keywords: Intelligent Agent, Manipulators, Robotics, Effector.

I. INTRODUCTION

The ultimate goal of designing and building intelligent agent that perceive reason about, and act upon, our everyday world is shared by artificial intelligence (AI) and robotics. We shall discuss further advances that are essential for eventual success this area.

Vision may be done much more efficiently and success as possible on the basis of sensory inputs, avoiding the fully when the system knows what it is looking for computational and semantic difficulties of large databases the essence of a computer vision subfield called model based vision. The agent has such a system, allowing it to remember more about the con-a continuing interaction with the world; it can utilize prior text of its action while retaining much of its computational knowledge to predict what it will see. Manipulation research has addressed such problems as planning the motion of arms through space and computing appropriate angles from which a manipulator should grasp an object.

As regards locomotion, control systems are developed for widely divergent styles of movement, including robots on wheels or with one or more legs, as well robots that swim and

fly. Robotics is a branch of AI, which is composed of Electrical Engineering and Computer Science for designing, construction, and application of robots.

Roboticians are nowhere near achieving this level of artificial Intelligence but they have made a lot of progress with more limited AI.

Today's AI machines can replicate some specific- Today's AI machines can replicate some specific elements of intellectual ability.

There is endless variety in the size, shape and jobs of robots. Some robots are used day after day in factories, while others are highly experimental and use artificial intelligence to behave more and more like living creatures, able to act independently in changing environments.

II. DEFINITION

A. Artificial Intelligent

Artificial Intelligence is a branch of Science, which deals with helping machines find solutions to complex problems in a more human-like fashion. This generally involves harrowing characteristics from human intelligence, and applying them as algorithms in a computer friendly way. AI is generally associated with Computer Science, but it has many important links with other fields such as Math, Psychology, Cognition, Biology and Philosophy, among many others. The Potential applications of Artificial Intelligence are endless. They stretch from the military for autonomous control and target identification, to the entertainment industry for computer games and robotic pets.

B. Robotics

A robot is a machine that gathers information about its environment (senses) and uses that information (thinks) to follow instructions and to do work (acts). A robot is an electromechanical or bio-mechanical device or group of devices that can perform repetitive or preprogrammed tasks. A robot May act under the direct control of a human, such as the arm on a space shuttle, or under the control of a programmed computer. Robots are being designed to perform precision surgery, explore space, the ocean, and other dangerous areas.

III. INTELLIGENT AGENT

An **intelligent agent (IA)** is an autonomous entity which observes through sensors and acts upon an environment using actuators (i.e. it is an agent) and directs its activity towards achieving goals.

Intelligent agents may also learn or use Knowledge to achieve their goals. They may be very simple or very complex.

Intelligent agents are often described schematically as an abstract functional system similar to a computer program.

A **rational agent** is one that does the right thing. Obviously this is better than doing the wrong thing, but what does it mean? As a first approximation, we will say that the right action is the one that will cause the agent to be most successful.

An **agent** is anything that can be viewed as **perceiving** its environment through **sensors** and **acting** upon that environment through **effectors**. A human agent has eyes, ears and other organs for sensors, and hands, legs, mouth, and other body parts for effectors.

A **robotic agent** substitutes cameras and infrared range finders for the sensors and various motors for the effectors. A software agent has encoded bit strings as its precepts and actions.

Intelligence. This is an important block that is used in many Mechatronics and Robotics projects. Intelligence often can be considered as an independent block.

The intelligence blocks process information that is picked up by sensors or received from other external sources. The intelligence block can be as simple as a basic neural compare for example, senses ambient light and determines the robot distance from the light source or a wall. It can also handle much more complex configurations, involving high-level decisions.

Two forms of artificial intelligence are suitable for applications in robotics and mechatronics

Software intelligence is provided by a computer, microprocessor or microcontroller in which any intelligent software runs. Hardware links provide the data the processor needs to make decisions and communicate with the control block. The decisions are programmed in a basic structure and in some cases can be changed according to the incoming data. In such a case, the program can "learn" with experience, which is co-considered to be a basic Software intelligence can be located inside the own robot or mechatronic machine when microprocessor and microcontrollers are used. The Basic Stamp chip provides a simple way to some degree of intelligence

Hardware intelligence. Another way to add intelligence to machine is by using circuits that can learn. The basic idea is to imitate the way living beings process the information they receive via senses, i.e. using the nervous system.

IV. PLANNING AND ACTING

The model of planning namely, choosing a sequence of actions that achieves a goal, has been extended and generalized, and has been studied extensively by the AI community. Although the model is of some theoretical interest, it has not only been shown to be computationally intractable, but is considered by many to be psychologically implausible as well.

Humans and other living creatures spend the majority of their time performing routine tasks without devoting time to thinking about how to do them. Occasionally we have to stop and plan the most efficient sequence in which to perform a set of errands, or a plan a route map, but that sort of activity is very much out of the ordinary. Some AI and cognitive science researchers study planning for exactly this reason it is a uniquely human activity that requires sophisticated intelligence. Many of those whose goals to concentrate instead on building mechanisms for routine behavior rather than planning.

There are two practical reasons that make it difficult to use planning as the model of action for an agent in a dynamic world during the time it takes the agent to plan what to do, the current State of the world may change in such a way as to invalidate its plan; if the agent is not carefully constructed, it may ignore its sensory inputs while it is planning, and, without being aware of it, become endangered.

One way to avoid these difficulties through reactive planning in which the agent embarks on performed plans but continuously monitors the world to assure itself that the plan it is executing is indeed appropriate to the circumstances. The plans in such a system still make reference to the state of the world through a central symbolic data base.

Another approach is to design the agent to act as much as possible on the basis of sensory inputs, avoiding the computational and semantic difficulties of large databases of facts. In the simplest of these systems, the agent executes a continuous mapping from the values of its sensors to those of its effectors.

Although this method affords maximum reactivity, it is susceptible to the many criticisms of stimulus response system. State can be added gradually to text of its actions while retaining much of its computational efficiency.

Conditional Planning: We begin by looking at the nature of Conditional plans and how an agent executes them. This will help to clarify the relationship between sensing actions in the plan and their effects on the agent's knowledge base. We then explain how to construct conditional plans.

Execution monitoring: is related to conditional planning in the following way. An agent that builds plan and then

executes it while watching for errors is, in a sense, taking into account the possible conditions that constitute errors. Unlike a conditional planner, however, the execution monitoring agent is actually **deferring** the job of dealing with those conditions until they actually arise. The two approaches of course can be combined by planning for some contingencies and leaving others to be dealt with later if they occur.

V. HOW ROBOT MAKE DECISION?

A robot acts through the use of its actuators, also called effectors. Robotic actuators are very different from biological ones, both are used for:

a) **Locomotion:** Locomotion is the mechanism that makes a robot capable of moving in its environment. This type of locomotion consumes more power while demonstrating walk, jump, trot, hop climbs up or down, etc.

b) **Manipulation:** (handling objects): Robots are aimed at manipulating the objects by perceiving, picking, modifying the physical properties of object, destroying it, or to have an effect thereby freeing manpower from doing repetitive functions without getting bored, distracted, or exhausted.

Manipulators are various robot arms, they can move in one or more directions. The number of dimensions are called the Robot's degree of freedom (DOF).

Effectors: an effector is any device that affects the environment, under the control of robot. To have an impact on the physical world, an effector must be equipped with an Actuator that converts software commands into physical motion. The actuators themselves are typically electric motors or hydraulic or pneumatic cylinders. It can spin the turntable, It can rise and lower the stylus arm, and it can move the arm laterally to the first track.

Effectors are used in two main ways: to change the position of the robot within its environment ie. locomotion, And to move other objects in the environment (manipulation). A third use, to change the shape or other physical properties of objects, is more in the realm of mechanical engineering than robotics.

Robotics divided into three areas:

a) **Mobile robotics:** A mobile robot is an automatic machine that is capable of locomotion. A spying robot is an example of mobile robot capable of movement in a given environment. Mobile robots have the capability to move around in their environment and are not fixed to one physical location.

b) **Manipulator robotics:** An industrial robot is comprised of a robot manipulator, power supply, and controllers. Robotic manipulators can be divided into two sections, each with a different function:

Arm and Body: The arm and body of a robot are used to Move and position parts or tools within a work envelope. They Are formed three joints connected by large links.

Wrist: The wrist is used to orient the parts or tools at the work Location it consists of two or three compact joints.

Robot manipulators are created from a sequence of link joint

Combinations. The links are the rigid members connecting the joints, or axes. The axes are the movable components of the robotic manipulator that cause relative motion between adjoining links. The mechanical joints used to construct the robotic arm manipulator consist of five principle types. Two of the joints are linear, in which the relative motion between adjacent links is non –rotational, and three rotary types in which the relative motion involves rotation between links.

c) **Communication robotics:** This type of robotics outlines the strategy adopted for establishing both wireless communication between the mobile robot and the remote Base Station, and serial communication between the remote Base Station and the GUI Application. The Base Station requires serial communication with the GUI Application and also needs to be hardwired with radio packet controller, FRPC2 for wireless control. Our aims to be command and control the Robot wirelessly by the GUI Application.

Can Robot Make Ethical Decision?

Robots and computers are often designed to act Autonomously, that is without human intervention. Is it possible for an Autonomous machine to make moral judgements that are line with human judgement?

This question has given rise to the issue of machine ethics and morality. As a practical matter, can a robot or computer be programmed to act in an ethical manner? Can a machine be

Designed to act morally?

Issac Asimov's famous fundamental Rules of Robotics are Intended to impose ethical conduct on machines issues about Ethical behavior are found in films like the 1982 movie Blade Runner. When the replicant Roy Batty is given the choice to Let his enemy, the human detective Rick Deckered, die, Batty Instead chooses to save him.

Automatic Arm:

This Simple mechatronic project consists of a robot an arm or mechanism the pick-up objects from one place and put them in a basket or another location suggested by figure. The basic configuration in blocks is shown in the following functions:

A. **Control:** Obtaining information from a keypad or a joystics.

B. Actuator: Moving the arm and the gripper. An alternative for The gripper in a simplified project is use of an electromagnet, If the objects to be moved can be attracted by it.

C. Sensor: Optionally, we can send information to the operator such as whether the basket is empty or full, whether there are obstacles, and if the object falls before it is placed in the basket

D. Effects: Light or sound effects can be added; a light can Flush or a counter can be ratcheted up the object falls into the Basket.

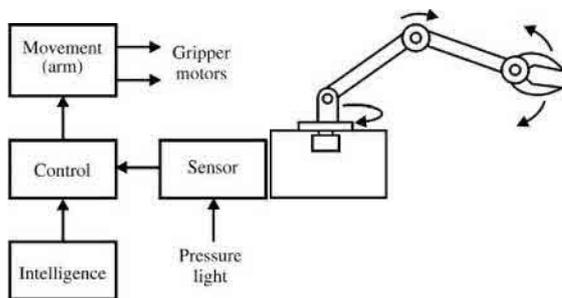


Fig1. Automatic Arm and Block Diagram

VI. APPLICATIONS OF AI AND ROBOTICS

Artificial Intelligence has been used in a wide range of fields including medical diagnosis, stock trading, robot control, law, scientific discovery and toys. However, due to the AI effect, many applications are not perceived as AI: "A lot of cutting edge AI has filtered into general applications, often without being called AI.

Many thousands of AI applications are deeply embedded in the infrastructure of every industry.

1) Computer science:

AI researchers have created many tools to solve the most difficult problems in computer science. Many of their inventions have been adopted by mainstream computer science and are no longer considered a part of AI.

All of the following were originally developed in AI laboratories: time sharing, interactive interpreters, graphical-User interfaces and the computer mouse, the linked list data structure ,symbolic programming and object-oriented programming.

2) Finance:

Financial Institutions have long used artificial neural network systems to detect charges or claims outside of the norm, flagging these for human investigation.

Bank use artificial intelligence systems to organize operations, invest in stocks and manage properties. In August 2001, robots beat humans in a simulated financial trading competition.

3) Hospitals and medicine:

Artificial neural network are used in clinical decision support system for medical diagnosis, such as in Concept Processing Technology in EMR software.

Other tasks in medicine that can potentially be performed by artificial intelligence include:

a.) Computer-aided interpretation of medical images. Such systems help scan digital images e.g. from computer tomography, for typical appearances and to highlight conspicuous sections, such as possible diseases. A typical application is the detection tumour.

b) Heart sound analysis.

c) Watson project is another use of AI in this field, a Q/A program that suggest for doctor's of cancer patients

d) Companion robots for the care of the elderly.

4) Music:

The evolution of music has always been affected by technology. With AI, scientists are trying to make the computer emulate the activities of the skillful musician.

Composition, performance, music theory, sound processing are some of the major areas on which research in Music and Artificial Intelligence are focusing.

5) Aviation:

The Air Operations Division (AOD) uses AI for the rule based expert systems. The AOD has use for artificial intelligence. for surrogate operators for combat and training simulators, for tactical decision making. And post processing of the simulator data into symbolic summaries.

6) Toys and Games.

AI also used in to help to introduced people, especially children, to a life of dealing with various types of Artificial Intelligence.

AI has also be applied to video games, for example video

game bots which are designed to stand in as opponents where humans aren't available or desired.

Robotics Application:

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

- 1) Industries: Robots are used for handling material, cutting, welding, color, coating, drilling, polishing, etc.
- 2) Military: Autonomous robots can reach inaccessible and hazardous zones during war. A robot named *Daksh*, developed by Defense Research and Development Organization, is in function to destroy life-threatening objects safely.
- 3) 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.
- 4) Exploration: The robot rock climbers used for space exploration, underwater drones used for ocean exploration. Are to name a few.
- 5) Entertainment: Disney's engineers have created hundreds of robots for movie making.
- 6) Robots are increasingly used in manufacturing (since the 1960s). In the auto industry they can amount for more than half of the "labor".
- 7) Robots can serve as waiters and cooks also at home. Boris is a robot that can load a dishwasher.
- 8) Robot combat for sport – hobby or sport event where two or more robots fight in an arena to disable each other. This has developed from a hobby in the 1990s to several TV series worldwide.

VII. THE FUTURE OF ROBOTICS

DAVID M. ANDERSON'

Most commentators on the future of robotics will dwell on leading edge technology advances such as vision, tactile, sensing, and artificial intelligence; and, certainly, many technological advances will take place in these areas. However, an equally significant impact on the factory floor will be made by simple, low-cost, low to medium-technology robots.

The popularity of these low-cost robots should increase even faster than overall robot growth as thousands of smaller and more diverse companies introduce robots into their factories.

Today, robot use in the United States is concentrated in larger companies. Industrial marketing theory concludes that early adopters of new technology tend to be the largest firms because they are better able to afford the required investment and absorb the risks. Also, they have the technical support necessary to introduce, operate, and maintain sophisticated technology.

There is a saying in the robot field that "if you think you need one robot, you shouldn't have any." In other words, the expense of gearing up for robotics (especially sophisticated ones) isn't justified by just a single robot.

Thus, smaller companies with less technical support have a natural aversion to the financial investment and risk involved in unfamiliar technology. Less complex robots represent less investment and risk with more familiar technology. This type of machinery will be more closely matched to existing capabilities for installation, operation, and maintenance.

Although there are more demands on parts presentation with medium- or low-technology robots, these tasks have been done by manufacturing engineers for years, and the resulting machinery is usually reliable and easy to maintain.

Another factor affecting the use of low- to medium-technology robots is the trend toward the integrated, automated factory. Most U.S. robot applications are in "islands of automation" in which certain manual tasks have been automated by robots with manual labor or hard automation in between. When the factory of the future is designed for a high level of automation, there will probably be many simple transfer and pick-and-place robots for every sophisticated servo-controlled robot. This is the automated pattern used by the highly successful Japanese factories.

Low-technology robots can be integrated into computer-controlled manufacturing by controlling the speed, reject/sort routines, and start/stop points. The low- to medium-technology robot can control its repetitive sequences with its own simple actuations and low-cost control systems.

Assembly should represent more opportunity for low-cost robots. Much attention is given to the servo-robot with large enough computer power to perform a long sequence of assembling complex parts. However, a similar investment might be able to procure a pick-and-place robot for each simple function. And since they all operate simultaneously, the output would be several times that of the single advanced robot for roughly the same cost.

Although there will be much highly visible progress advancing the leading edge of robotics technology, the future will see the introduction of very many low- to medium-technology robots in smaller, less sophisticated companies and large, fully automated plants.

There is great opportunity here for smaller firms to enjoy the benefits of flexible automation. This can be accomplished most easily (especially on the first application) with the many low-cost, simple robots available now and in improved future versions. Similarly, there is an opportunity for robot manufacturers to meet this demand and expand it with refinements, simplification, and cost reductions that will reduce the investment and risk while making robots easier to install, operate, and maintain.

Thus, the low- to medium-technology robot will play an important role in the future of robotics.

VIII. CONCLUSION

Aspects of intelligent behavior, such as solving problems, making inferences, learning, and understanding language, have already been coded as computer programs, AI programs outperform human experts. The necessity of providing solutions that work efficiently in the real world has propelled AI research along significant new paths of investigation in perception and planning. For the endeavor to succeed, further advances will be needed from AI in the areas of belief revision and learning. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans.

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