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Artificial Intelligence and Robotics

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Abstract:- **Artificial intelligence is a theory. The base object is the agent who is the "actor". It is realized in software. Robots are manufactured as hardware. The connection between those two is that the control of the robot is a software agent that reads data from the sensors decides what to do next and then directs the effectors to act in the physical world. The aim of this paper is to provide basic, information of global scope on two emerging technologies: artificial intelligence (AI) and robotics. According to the Department of Trade and Industry (DTI), it is important to consider these emerging technologies now because their emergence on the market is anticipated to 'affect almost every aspect of our lives' during the coming decades(DTI,2002).Thus, a first major feature of these two disciplines is product diversity. In addition, it is possible to characterize them as disruptive, enabling and interdisciplinary.**

Keywords- AI concept, robotics, software.

I. INTRODUCTION

Many researchers now feel that the goal of mimicking the human ability to solve problems and achieve goals in the real world the so-called 'strong AI' is neither likely nor desirable because a long series of conceptual breakthroughs is required.[1]. AI systems are generally embedded within larger systems applications can be found in video games speech recognition, and in the 'data mining' business sector. The field of robotics is closely linked to that of AI, although definitional issues abound. 'Giving AI motor capability' seems a reasonable definition, but most people would not regard a cruise missile as a robot even though the

navigation and control techniques draw heavily on robotics research. AI and robotics are likely to continue to creep into our lives without us really noticing. Unfortunately, many of the applications appear to be taking place amongst agencies, particularly the military that do not readily respond to public concern, however well articulated or thought through.[2]

II. BASICS OF AI

Today successful AI applications range from custom-built expert systems to mass produced software and consumer electronics. Robotics may be thought of as

'the science of extending human motor capabilities with machines' (Trevelyan,1999).However, a closer look at this definition creates a more complicated picture. For example, a cruise missile, although not intuitively referred to as a robot, nevertheless incorporates many of the navigation and control techniques explored in the context of mobile-robotics research. This report, however, considers robotics research as the attempt to instill intelligent software with some degree of motor capability. Since many of the major areas of AI research play an essential role in work on robots, robotics will be considered here as a

sub-section of AI.[3] Many of those in industry do not use the term 'artificial intelligence' even when their company's products rely on some AI techniques. Artificial intelligence is a theory. The base object is the agent who is the "actor". It is realized in software. Robots are manufactured as hardware. The connection between those two is that the control of the robot is a software agent that reads data from the sensors, decides what to do next and then directs the effectors to act in the physical world. AI is one of the newest disciplines. It was formally initiated in 1956, when the name was coined. Robotics is based on two enabling technologies: Telemanipulators and the ability of numerical control of machines. Telemanipulators are remotely controlledmachines which usually consist of an arm and a gripper. The movements of arm and gripper follow the instructions the human gives through his control device. First telemanipulators have been used to deal with radio-active material. Numeric control allows controlling machines very precisely in relation to a given coordinate system. It was first used in 1952 at the MIT and lead to the first programming language for machines (called APT: Automatic Programmed Tools).The combination of

both of these techniques lead to the first programmable telemanipulator. The first industrial robot using this principle was installed in 1961. These are the robots one knows from industrial facilities like car construction plants. The development of mobile robots was driven by the desire

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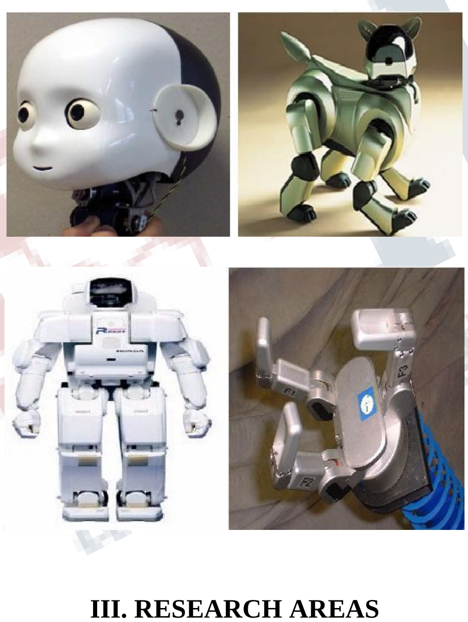
toautomate transportation in production processes and autonomous transport systems. The former lead to driver-less transport systems used on factory floors to move objects to different points in the production process in the late seventies.[4] New forms of mobile robots have been constructed lately like insectoid robots with many legs modeled after examples nature gave us or autonomous robots for underwater usage. Since a few years wheel-driven robots are commercially marketed and used for services like "Get and Bring" (for example in hospitals). Humanoid robots are being developed since 1975 when Wabot-I was presented in Japan. The current Wabot-III already has some minor cognitive capabilities. Another humanoid robot is "Cog", developed in the MIT-AI-Lab since 1994. Honda's humanoid robot became well known in the public when presented 1back in 1999. Although it is remote controlled by humans it can walk autonomously (on the floor and stairs).In science fiction robots are

already human's best friend but in reality we will only see robots for specific jobs as universal programmable machine slave in the near future.



III. RESEARCH AREAS

AI, based upon the capabilities of digital computers to manipulate symbols, is probably not sufficient to achieve anything resembling true intelligence. This is because symbolic AI systems, as they are known, are designed and programmed rather than trained or evolved. AI software designers are beginning to team up with cognitive psychologists and use cognitive science concepts. Another example centers upon the

work of the 'connectionists' who draw attention to computer architecture, arguing that the arrangement of most symbolic AI programmers is fundamentally incapable of exhibiting the essential characteristics of intelligence to any useful degree. As an alternative, connectionists aim to develop AI through artificial neural networks (ANNs). [5] The emergence of ANNs reflects an underlying paradigm change within the AI research community and, as a result, such systems have undeniably received much attention of late. However, regardless of their success in creating interest, the fact remains that ANNs have not nearly been able to replace symbolic AI. AI researchers have a variety of learning methods at their disposal. However, as alluded to above, ANNs represent one of the most promising of these. There are many advantages of ANNs and advances in this field will increase their popularity. Their main value over symbolic AI systems lies in the fact that they are trained rather than programmed: they learn to evolve to their environment, beyond the care and attention of their creator (Hsuing, 2002). Other major advantages of ANNs lie in their ability to classify and recognize patterns and to handle abnormal input data, a characteristic very important for systems that handle a wide range of data.

As a result, they are best used when the results of a model are more important than understanding how the model works. To this end, these systems are often used in stock market analysis, fingerprint identification, character recognition, speech recognition, and scientific analysis of data.

V. AI IN ROBOTICS

A distinction has already been drawn above between robots working in informational environments and robots with physical abilities. One advantage of the former is that there is little need for investment in additional expensive or unreliable robotic hard ware as existing computer systems and networks provide adequate sensor and effectors environments. On the other hand, the kinds of robotics systems elaborated on here, physical robots, require mechanization of various physical sensory and motor abilities (Doyle and Dean, 1996).[5] The challenges involved in providing such a latter environment are considerable, especially when complete automation is sought, as in Honda's humanoid ASIMO project. Thus, rather than

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focus on the ambitious and distant goal of relative autonomy, this report picks up on Trevelyan (1999) who points out that complete automation is often unfeasible, impossible, or simply unwanted. Indeed, much of today's robotics research focuses instead on far humbler goals, such as simplicity, force control, calibration and accuracy. Thus, we can see that, to some extent, the field of robotics has followed similar lines as that of AI, attempting to rebound from the overly optimistic predictions of the 1950s and 1960s, and coming up against more contemporary problems not dissimilar to the AI effect

.Indeed, while few of the innovations that emerge from the work of robotics researchers ever appear in the form of robots, or even parts of robots, their results are widely applied in industrial machines not defined as so (Trevelyan, 1999). In spite of these significant challenges, there are some good examples of AI-controlled robotic systems. For instance, Tri Path Imaging has built Focal Point, a diagnosis expert system that examines Pap smears for signs of cervical cancer. Focal Point screens five million slides each year, or about 10% of all slides taken in the US and, like human lab technicians in training, teaches itself by practicing on slides that pathologists have

Already diagnosed. Thus, one big advantage of such a system is that, if implemented properly, Focal Point allows you to replicate your very best people (Khan, 2002).[6] A second example and, again, perhaps the most ambitious of all, concerns DARPA, who are in the process of developing an Unmanned Combat Air Vehicle (UCAV). According to Boeing (2002), the UCAV system is designed to 'prove the technical feasibility of multiple UCAVs autonomously performing extremely dangerous and high priority combat missions.' In a typical mission scenario, 'multiple UCAVs will be equipped with preprogrammed objectives and preliminary targeting information from ground-based mission planners. Operations can then be carried out autonomously, but can also be revised en route by UCAV controllers should new objectives dictate.' If the program is a success, the US DoD expects to begin fielding UCAV weapon systems in the 2008 time-frame.

CONCLUSION

This paper began by stressing the need to provide background information on AI. In doing so, it was hoped that the prospects of these emerging technologies to affect quality of life in the coming decades could be realistically assessed. One consequence of providing such an overview is that there can be no decisive conclusions as such; the industries characterized here are too dynamic and uncertain to generate any real sense of resolution. However, it is possible to highlight a number of important differences and similarities between robotics and AI which go some way to shedding more light on their character. Perhaps the greatest contrast between the two industries concerns public interest. Indeed, as this paper has demonstrated, robotics is widely regarded as a 'new' and exciting branch of science and technology. AI, on the other hand, is viewed by many as a highlyspecialized and unproven discipline. One reason for this concerns the gross over-optimism that characterized the industry in the 1960s and 1980s. Another reason reflects the AI community's seemingly insurmountable difficulty in publicizing its own achievements without whipping up general anxiety over machine superiority. The upshot of all this has been the field's struggle to attract funding in the past and it is likely that this trend will continue for some time into the foreseeable future. Revealing similarities also exist between robotics and AI.

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