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# INTELLIGENT SYSTEMS

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*Abstract-* **An intelligent system is a machine with an embedded, internet -connected computer that has the capacity to gather and analyse data and communicate with other system requirements. One of the critical aspects of a truly intelligent system is the ability to learn, that is, to improve its own functionality by interacting with the environment and exploring it. An embedded system may be powerful and capable of complex processing and data analysis but it is usually specialized for all the tasks relevant to the host machine. Intelligent systems exist all around us in point-of-sale (POS) terminals, digital televisions, traffic lights, smart meters, automobiles, digital signals and airplane controls etc. As this ongoing trend continues, a scenario is set up known as the Internet of Things (IoT), in which objects, animals and people can all be provided with unique identifiers and the ability to automatically transfer data over a network without requiring human-to-human or human-to-computer interaction. Twenty-five years ago, intelligence was mainly reasoning, proving theorems, and playing chess. Today we realize how "intelligent" lower animals are and how complex are the problems that our senses routinely solve. We also realize how intractable is the problem of producing software and how much of it would be needed to resolve it using simplest aspects of intelligence. Operational definition of intelligent system says that if a computer behaves in a way indistinguishable from a human person, then it can be called intelligent**

***Keywords*- POS, IoT, Intelligent System, Embedded System, Human-to-Computer interaction**

## I. INTRODUCTION

Intelligent systems are technology advanced machines that perceive and respond to the world Around them. Intelligent systems can take many forms, from automated vacuums such as the roomba to facial recognition programs to Amazon's Personalized shopping suggestion.

Our department focuses on two main areas within intelligent systems: how machines perceive their Environment and how those machines interact with That environment. Our way that such systems can perceive their environment is through vision. The study of how computer can understand and interpret visual information from static images and video sequences.

Emerged in the late 1950s and early 1960s. It has since grown into a powerful technology that is central to the country's industrial, commercial, and Government sectors. the key factors that have contributed to this growth are the exponential growth of processor speed and memory capacity as well as algorithmic advances.

The field of intelligent systems also focuses on how these systems interact with human users in changing and dynamic physical and social environments. Early robots possessed little autonomy in making decisions: they assumed a predictable world and perfumed the same action(s)

Repeatedly under the same conditions. Today robot is considered to be an autonomous systems that can sense the environment and can act as a physical world in order to achieve some goals.

## II. INTELLIGENT MACHINES OR WHAT MACHINES CAN DO

Philosophers have been trying for over two thousand years to understand and resolve two big questions of the universe: how does a human mind work, and can non-humans have minds? However, these questions are still unanswered. Some philosophers have picked up the computational approach originated by computer scientists and accepted the idea that machines can do everything that humans can do. Others have openly opposed this idea, claiming that such highly sophisticated behaviour as love, creative discovery and moral choice will always be beyond the scope of any machine. The nature of philosophy allows for disagreements to remain unresolved. In fact, engineers and scientists have already built machines that we can call 'intelligent'. So what does the word

'intelligence' mean? Let us look at a dictionary definition.

1) Someone's intelligence is their ability to understand and learn things.
2) Intelligence is the ability to think and understand instead of doing things by instinct or automatically.

## III. THE TECHNOLOGY OF EXPERT SYSTEMS OR THE KEY TO SUCCESS

Probably the most important development in the 1970s was the realisation that the problem domain for intelligent machines had to be sufficiently restricted. Previously, AI researchers had believed that clever search algorithms and reasoning techniques could be invented to emulate general, human-like, problem-solving methods. A general-purpose search mechanism could rely on elementary reasoning steps to find complete solutions and could use weak knowledge about domain. However, when weak methods failed, researchers finally realised that the only way to deliver practical results was to solve typical cases in narrow areas of expertise by making large reasoning steps. The DENDRAL program is a typical example of the emerging technology (Buchanan et al., 1969). DENDRAL was developed at Stanford University to analyse chemicals. The project was supported by NASA, because an unmanned spacecraft was to be launched to Mars and a program was required to determine the molecular structure of Martian soil, based on the mass spectral data provided by a mass spectrometer. Edward Feigenbaum (a former student of Herbert Simon), Bruce Buchanan (a computer scientist) and Joshua Lederberg (a Nobel prize winner in genetics) formed a team to solve this challenging problem. The traditional method of solving such problems relies on a generate and-test technique: all possible molecular structures consistent with the mass spectrogram are generated first, and then the mass spectrum is determined or predicted for each structure and tested against the actual spectrum. However, this method failed because millions of possible structures could be generated – the problem rapidly became intractable even for decent-sized molecules

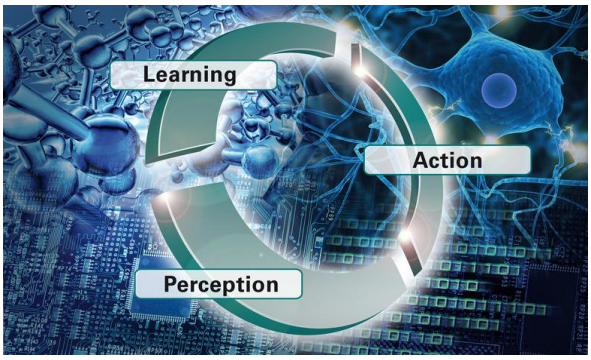

Fig 1

Table 1: A summary of the main events in the history of AI and knowledge engineering

| Period | Key events |
|---|---|
| Evolutionary computation (early 1970s–onwards) | Rechenberg, Evolutionsstrategien – Optimierung Technischer Systeme Nach Prinzipien der Biologischen Information, 1973 Holland, Adaptation in Natural and Artificial Systems, 1975 Koza, Genetic Programming: On the Programming of the Computers by Means of Natural Selection, 1992 |
| Computing with words (late 1980s–onwards) | Zadeh, Fuzzy Sets, 1965 Zadeh, Fuzzy Algorithms, 1969 Mamdani, Application of Fuzzy Logic to Approximate Reasoning Using Linguistic Synthesis, 1977 Sugeno, Fuzzy Theory, 1983 Japanese 'fuzzy' consumer products (dishwashers, washing machines, air conditioners, television sets, copiers) Sendai Subway System (Hitachi, Japan), 1986 Negoita, Expert Systems and Fuzzy Systems, 1985 The First IEEE International Conference on Fuzzy Systems, 1992 Kosko, Neural Networks and Fuzzy Systems, 1992 |

## IV. ADVANTAGES OF RULE-BASED EXPERT SYSTEMS

Rule-based expert systems are generally accepted as the best option for building knowledge-based systems.

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*A. Natural knowledge representation*

An expert usually explains the problem solving procedure with such expressions as this: 'In such-and-such situation, I do so-and-so'. These expressions can be represented quite naturally as IF-THEN production rules.

*B. Uniform structure*

Production rules have the uniform IF-THEN structure. Each rule is an independent piece of knowledge. The very syntax of production rules enables them to be self-documented.

*C. Separation of knowledge from its processing*

The structure of a rule-based expert system provides an effective separation of the knowledge base from the inference engine. This makes it possible to develop different applications using the same expert system shell. It also allows a graceful and easy expansion of the expert system. To make the system smarter, a knowledge engineer simply adds some rules to the knowledge base without intervening in the control structure.

## V. DISADVANTAGES OF RULE-BASED EXPERT SYSTEMS

There are three main shortcomings:

*A. Opaque relations between rules*

Although the individual production rules tend to be relatively simple and self-documented, their logical interactions within the large set of rules may be opaque. Rule-based systems make it difficult to observe how individual rules serve the overall strategy. This problem is related to the lack of hierarchical knowledge representation in the rule-based expert systems.

*B. Ineffective search strategy*

The inference engine applies an exhaustive search through all the production rules during each cycle. Expert systems with a large set of rules (over 100 rules) can be slow, and thus large rule-based systems can be unsuitable for real-time applications.

*C. Inability to learn*

In general, rule-based expert systems do not have an ability to learn from the experience. Unlike a human expert, who knows when to 'break the rules', an expert system cannot automatically modify its knowledge base, or adjust existing rules or add new ones. The knowledge engineer is still responsible for revising and maintaining the system.

## VI. MOST IMPORTANT THINGS TO REMEMBER ABOUT INTELLIGENT SYSTEMS

Knowledge is a theoretical or practical understanding of a subject. Knowledge is the sum of what is currently known.

An expert is a person who has deep knowledge in the form of facts and rules and strong practical experience in a particular domain. An expert can do things other people cannot.

The experts can usually express their knowledge in the form of production rules.

Production rules are represented as IF (antecedent) THEN (consequent) statements. A production rule is the most popular type of knowledge representation. Rules can express relations, recommendations, directives, strategies and heuristics.

A computer program capable of performing at a human-expert level in a narrow problem domain area is called an expert system. The most popular expert systems are rule-based expert systems.

In developing rule-based expert systems, shells are becoming particularly common.

An expert system shell is a skeleton expert system with the knowledge removed. To build a new expert system application, all the user has to do is to add the knowledge in the form of rules and provide relevant data. Expert system shells offer a dramatic reduction in the development time of expert systems.

The expert system development team should include the domain expert, the knowledge engineer, the programmer, the project manager and the end-user. The knowledge engineer designs, builds and tests an expert system. He or she captures the knowledge from the domain expert, establishes reasoning methods and chooses the development software.

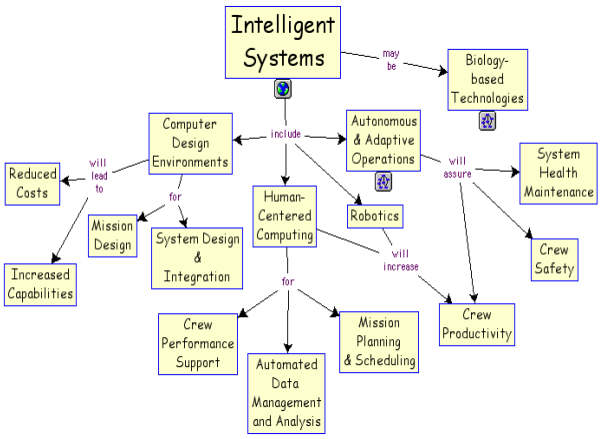


Fig 2

## VII. CONCLUSION

In this paper we are defining the topic intelligent systems. we discussed some important topics based on intelligent systems with some of the advantages and disadvantages of the intelligent systems. This topic is very wide so we can't discuss it fully in some pages so we can discuss just some most important topics related to this which we have discussed.

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Fig 3