



ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

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Abstract-- Artificial Intelligence is concerned with of developing systems that's display aspect of intelligent behaviour. These systems are designed to imitate to human capabilities of thinking and sensing. In simple words we can say that when a machine understands or acts as a human, then the system is said to be Artificial Intelligence. The field of Artificial intelligence is a science and technology based on disciplines. A major thrust of AI is development of computer functions associated with human intelligence such as reasoning, learning and problem solving. Expert System (ES) in closely related to Artificial Intelligence (AI).It is also considered as a branch and advance area of electronics. An expert system is a knowledge based system that employs knowledge about its application domain and uses and reasoning procedure to solve the problems that would otherwise require human competence or expertise. The objective of this paper is to summarize and emphasize AI and ES's contemporary use. And also include AI and ES applications.

INTRODUCTION

Artificial intelligence is a branch of computer science with the study and invention of systems that exhibit aspects of intelligence, a system that can learn and understand the human perspective. "The study of how to make computers do things at which, at moment, people are better" (Rich and knight [1991]).Theory of how the human mind works (Mark Fox). Artificial Intelligence basically deals with symbolic, non-algorithmic problem solving methods. AI methods are the models of how we think, methods to apply our intelligence, simulate parts of human mind.

SOME IMPORTANT AREAS OF AI

- Expert Systems
- Natural language Processing
- Speech understanding
- Robotics and sensory systems
- Computer Vision and Scene Recognition
- Intelligence Computer-Aided Instructions
- Neural computing

Expert Systems attempt to imitate expert reasoning processes and knowledge in solving problems. These are the set of programmes that solve the problems in the special fields that usually needs human expertise. Expert System is the most popular applied AI technology which enhances productivity and augments work forces. Expert System provides direct application of human expertise.

THERE ARE THREE MAJOR ES COMPONENTS:

- Knowledge Base
- Inference Engine
- User Interface

Knowledge Base: It contains the knowledge necessary for understanding, formulating and solving problems. Two basic elements are facts and special heuristics or rules that direct the use of knowledge.

Inference engine: It is the brain of expert system, the control structure and provides methodology for reasoning.

User interface: Language processor for friendly, problem oriented communication.

The major activities in ES are development, consultation and improvement. Expert System is a knowledge based development. Knowledge are of two types -declarative knowledge (factual) and procedural knowledge.

Participants in ES development are domain experts, knowledge engineer and (possibly) information system analysts and programmers. Expert System lead to improved decision making, improved products and customer service, sustainable strategic advantage.

ADVANTAGES OF EXPERT SYSTEM:

- Increased output and productivity.
- Decreased decision making time.
- Capture scarce expertise.
- Easier equipment operation.
- Operation in hazardous environments.
- Can work with incomplete or uncertain information.
- Ability to solve complex problems.
- Knowledge transfer to remote locations.
- Improved decision quality.
- Flexibility.

LIMITATIONS OF EXPERT SYSTEMS:

- Knowledge is not readily available.
- It can be difficult to extract expertise from humans.
- There are frequently multiple correct assessments.
- Time pressures.
- Users have cognitive limits.
- ES works well only within narrow domain of knowledge.
- Most experts do not have independent means to validate results.
- Vocabulary is often limited and difficult to understand.
- Help from knowledge engineers is difficult to obtain and costly.
- Lack of trust from the end users.
- Knowledge transfer subject to a host of perceptual and judgemental biases.

Artificial Intelligence and Expert systems can be used in speech recognition. Speech or voice recognition is a data input method. For example, the computer recognizes and understands one or few word commands. Speech recognition is further explained in this paper.

SURVEY

Artificial Intelligence: Overview

The basic objective of Artificial Intelligence is to represent human thoughts in computers. Astor Teller: “Artificial Intelligence is a science of how to get things done they do in movies”. The basis of Artificial Intelligence started in the area of computation around 1940 to 1950. The main idea of Artificial Intelligence to store maximum amount of data information and processing it in desirable speeds .AI at most of the times works like a human. During these few decades we tried to develop systems in wide area AI and ES based machine. The AI basically gives us a beneficial conclusion about the world. The system that can understand and interpret the natural language and a visual scene.

During the past five decade

During these five decades AI and ES systems comes to this (today’s) development. Samuel developed a program during 1961 to 1964 which learnt to play checkers at a master level. In this phase many events of expert system were developed.

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM DEVELOPMENT

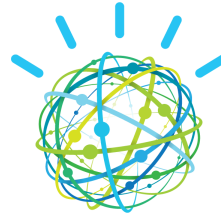
BEFORE 1950

The development and innovation in the area of Artificial intelligence first started in 1940’ s, however officially AI was consider in mid1950’s when international business Machine (IBM) organized a seminar come workshop on Artificial intelligence at Dartmouth College. Between 1920and 30’s such logician helped to develop Artificial Intelligence, which was carried out logically.

POST 1950

During 1950 and post these years most of the research in the field of artificial intelligence and expert system, were developed like programming in chess game, automobile theorem proving and many more. During this decade expert system first came from the research laboratories of a few successful US universities, during the 1960’s and 1970’s. Knowledge was given more importance rather than algorithm and search method.

**SCOPE OF ARTIFICIAL INTELLIGENCE (AI) AND EXPERT SYSTEM (ES)
IN SPEECH RECOGNITION AND NATURAL LANGUAGE PROCESSING**



IBM Watson

OVERVIEW:

It is a question answering computer system which is usually implemented in natural language. It is developed in IBM's DeepQA project based on the research team led by David Ferrucci. It is used in development and betterment of human expertise. Since it has ability to interact with human beings it has large impact in the fields of science, healthcare, education and so on.

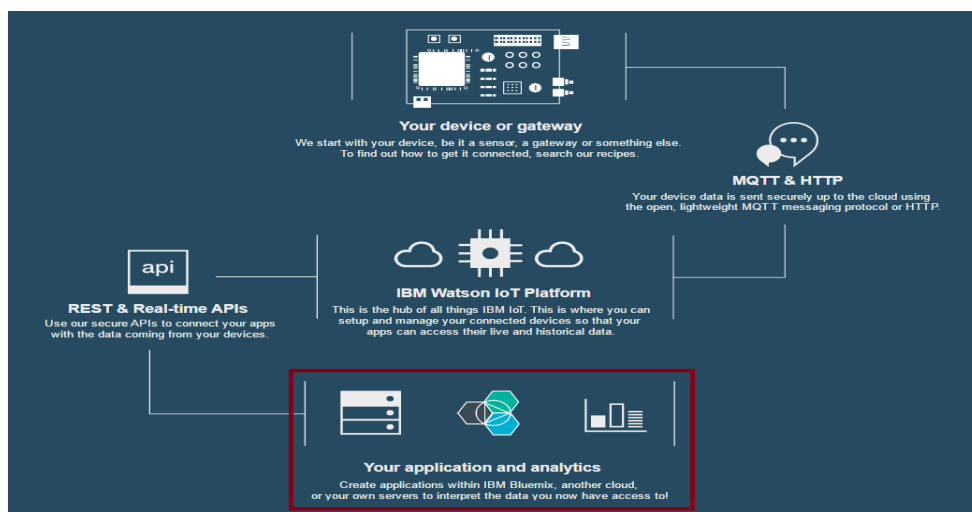


Fig1: Working diagram of IBM Watson

APPLICATION OF WATSON IN VARIOUS FIELDS:

1) IN WEATHER FORECASTING:

Watson contains very large volume of data almost about everything in his world. It is used in weather forecasting. The software used for this purpose is Deep Thunder. It Collects data from various sources like underground personal weather station, weather satellite, smart barometer. Occurrence of natural calamities such as storms, floods can be predicted and alerts for the natural calamities can be issued. This will considerably decrease in both economic and life loss.

2) AGRICULTURE:

IBM Watson can optimally determine the

- i) Use of agriculture and enables precise amount of water usage.
- ii) It can determine the quality of the soil so that the crops can be grown in a better way.
- iii) As it can determine the environmental conditions, the farmers can be well aware of the prevailing environmental conditions.

3) SPACE:

The research about 'The Beyond' is innumerable and with the prevailing abilities and skills of humans, it is difficult to discover the facts and theories of the space. Application of AI and ES makes it easy to study about the universe in even more efficient manner. The Watson can be used as flight assistant operation advisor which can be useful in having a good air control and execute the missions safely. As it has the capacity to interact with the humans it can simply be a co-pilot too. It gives clear cut information about the planet's temperature, distance and also can predict the concerns associated with the exploration which aids in the scope of Astronomy.

4) HEALTHCARE:

IBM Watson Health Club brings together vast amount of medical data into one centralized hub on cloud combing traditional analysis with advanced cognitive capabilities of Watson.

It has the ability to learn and refine its analysis based on what it is learning to turn the data into knowledge. The various applications of AI in the field of medical are Diagnosis Pro, Clinical Decision Support System (CDSS), Mycin so on. The medical field is a platform where committing a small mistake either in prescription or diagnosing the disease or giving treatment may lead to serious consequences, sometimes death too. One of the difficult tasks of medical professionals is not precisely having a right idea about the disease and the medicines prescribed for it. IBM Watson Health Club overcomes these difficulties. It assists the medical professional in diagnosing and treating the patient based on the patient's data. It takes input from the professionals in form of queries describing the symptoms and other related factors. Watson is also used in veterinary care. One such example is lifelearn which uses Sofie App.

5) EDUCATION:

IBM Watson Education is cognitive computers which moulds the teachers to navigate and adapt to the curriculum by providing various resources. It helps teachers to get personified in a way so that they are clear, simple and more knowledgeable to the students.

ADVANTAGES OF IBM WATSON:

- i) Overcomes human limitations.
- ii) Acts as guiding and deciding-support systems.
- iii) Improves the standard of living of the people by providing more structured and advanced concepts of technology, education, medicine, financial aspects so on.
- iv) Provides good customer services.
- v) Recreation and development of prevailing sources.

DISADVANTAGES:

- i) The medium of communication is restricted to only English language.
- ii) Cost is high.
- iii) It is not readily available for all its users.
- iv) Maintenance is difficult.
- v) Cannot replace humans.

AMAZON ALEXA

OVERVIEW

Alexa is an intelligent personal assistant developed by Amazon Lab126. It is a cheap computer which is implemented by Raspberry Pie which is an open technology. The client software installed in Alexa will interact with the Amazon Cloud in order seek information. Some of the Alexa devices are Amazon Echo, Amazon Echo Dot, and Amazon Tap.

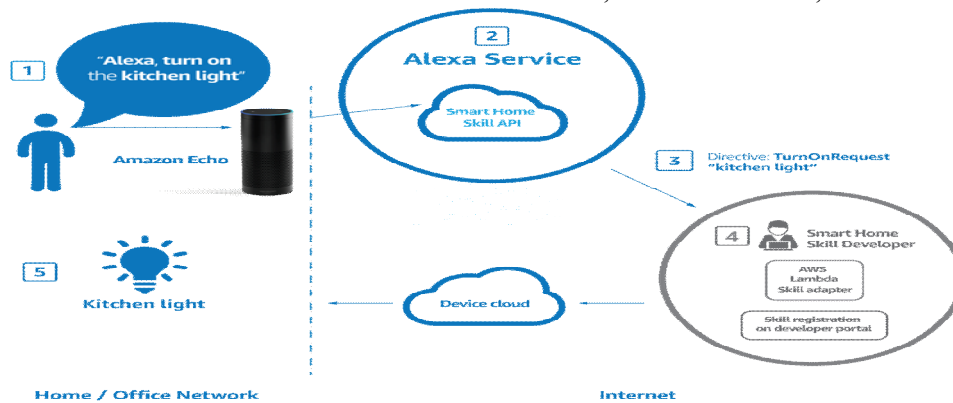


Fig2: Working of Alexa with smart homes API

It consists set of skills (voice commands) through which the user can communicate with Alexa. These devices are connected to the smart devices which are only compatible with it via wifi. It also provides facilities to connect to devices through Bluetooth. Apart from accessing smart devices it provides facilities like scheduling, playing music, booking an uber, shopping, ordering food so on.

APPLICATIONS:

- i) Alexa ease the lifestyle of people by providing skills. By this a person can act according to the pre planned schedule which is set using Alexa.
- ii) The newly added "smart home skill API" allows a person to have smart access of appliances like lights, walkie-talkie, tablets, smart refrigerator, smart speakers, smart watches, smart home system, headphones etc.
- iii) Ordering of food is done by placing orders to the restaurants linked to Alexa such as dominos, pizza hut, and wingstop and also just-eat.

- iv) *Alexa can simply assist a chef in cooking a recipe. We can also get the food cooked by simply passing on a voice command to Alexa irrespective of the place we are. For example, a person while working in his office can direct Alexa as "Alexa heat the water in the microwave for 30sec" provided microwave has to be a smart microwave and has to be connected to his mobile.*

ADVANTAGES:

- i) It supports voice services via skills.
- ii) Eases some of the day to day activities like scheduling.
- iii) Can access smart devices just from the place we are.
- iv) It reads books, gives information about weather and traffic so on.
- v) Has optimal remote control.
- vi) Responds quickly, accurately and clearly.
- vii) It is connectionless.

DISADVANTAGES:

- i) Need to remember the right way to ask for a skill.
- ii) Skills are limited and language is restricted to only English and German.
- iii) Since all the dealings with respect to editing order, adding music to Amazon library and also to recall skills requires accessing to Alexa app, it often is cumbersome and time consuming.
- iv) Requires mostly wifi connection.

Future Horizons of Application of AI and ES:

AI and ES are very powerful and implementing them will uplift almost all the fields to a different level. With the developing technology it can also create a new era in human age, right from smart pens to smart satellites and smart missiles.

Some of the future horizons of AI and ES are:

- 1) If AI and ES are implemented in a more efficient manner, it can help in eradication some diseases, can improve standards of living of the people which in turn develops the country and it can aid in military services too.
- 2) An idea of smart books can change the life of many people. It can be helpful in providing more sophisticated and more efficient education and knowledge not only to a common man. This in turn affects the employment opportunities. With smart books a complex concept can be represented in a more clear, precise and simple manner.
- 3) Implementation of AI and ES can have dramatic evolution in medical field. With the growing chances of diseases and uprising of new diseases the CDSS can give a good judgment and treatment about the disease.
- 4) IBM Watson can be implemented in culinary world which can help in creating new recipes and gives idea to the chef about combination of ingredients which compliments each other. On the other hand IBM Alexa can get a food cooked just by voice commands.
- 5) Using AI and ES can solve many generic disorders.
- 6) Safe guarding environment is our duty and responsibility." "PROTECT THE MOTHER NATURE AND INTURN SHE WILL PROTECT US". Using AI and ES in factories, industries can determine the level of air pollution, water pollutions it is causing and using it in rivers can determine the level of water pollution. It can be used to estimate the optimal amount of water which has to be released through dams.
- 7) These computers can also assist legal professionals like judges, advocates regarding cases.
- 8) AI can replace workers as it can assure security, efficiency and more accuracy. If it is implemented as robots, production of the products can be increased and improvised.
- 9) It can be implemented u in psychology field if the computers can sense emotions of humans by treating various psychological disorders.
- 10) It can assist the customers and give suggestions about the products, offers on it and so on.

RECOMMENDATIONS

- *In devolving countries like India, implementation of AI and ES is necessary as it aids in betterment of the nation. Implementing AI and ES gives a good standard not only socially but also economically. The idea of smart books as discussed earlier can inspire the students and make the students aware of various fields of education in this world. It will also moralize the thoughts of people in a more intellectual manner. If the country is developed then some of the social evils like corruption, illiteracy will be destroyed and it also facilitates opportunities of employment.*
- *Nature is a gift given to us. But human kind has exploited her to the extent. AI and ES can help to track down the exploitation such as illegal export of trees, animal skin, trespassing into forest areas, pollutions, illegal mining and illegal sand mining etc.*
- *Selling of these products should be done in fair manner. The cost of selling should not be highly manipulated for the buyers in other countries. Estimation of the cost of the product should be done fairly and should be calculated more precisely so that it is affordable to everyone.*

- *Using of AI and ES in medical field is very necessary for the current situation of the world. Since it contains large volume of data it can easily identify the disease or disorder of the patient so that necessary medical attention can be given to the patient before any further complications.*
- *The savior of every nation is the military unit. More advanced technique can be implanted in military area such as usage of more advanced weapons, methods to make the soldiers aware of the upcoming dangers. Here weather forecasting can also be used to alert them for the upcoming natural calamities.*
- *“Agriculture is backbone of India”. AI and ES can be used to determine the quality of the soil and to assist the farmers the types of crops that can be grown depending on the quality of the soil and weather conditions. By this the production of the crops will increase which in turn increases the nation’s capital and improves the welfare of the farmers.*

CONCLUSION

The importance of expert system and Artificial Intelligence or service was well known by 1980. A number of successful implementations were completed and these ideas provided cost potent services. AI & ES and its user and uses are expanding as days pass by due to its benediction. However many information and IT institutions are still holding off AI and ES as an electronic tool for important data and information deliverance mechanism. Some of the benefits are possible, through AI and ES in information science area like easy and efficient information and data collection, selection and organization, saving future budget on information product, save time in information and data delivery, to keep information hub and similar foundation functional and active, to meet the aim and objective of information science and service.

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