Artificial Intelligence in Knowledge-based Technologies

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Abstract - **This paper figureout the essence and significance of artificial intelligence and its advantages and disadvantages along with its applications. It also reviews the current development of the technology in the real world. It also discusses the applications of artificial intelligence in the field of gaming, weather forecasting, expert systems, industries and aviation. A transform of the prototype of Artificial Intelligence is proposed in this paper. The modification is based on the hypothesis that there is algorithm which are basic of construction but can be proved mathematically. The modification provides consolidation of many concepts in the field of Artificial Intelligence. The paper concludes by evaluating the forth coming potential of Artificial Intelligence.**

Keywords - **Artificial Intelligence, Model Modification, Inductive Inference, Justification Problem, Technology for Knowledge Systems Processing, Model Modification, Gaming Industries.**

Fig 1. Overview of Artificial Intelligence

1. INTRODUCTION

Artificial Intelligence is defined as intelligence revealed by an artificial unit to solve compound problems. Artificial Intelligence is an integration of computer science. Intelligence is the ability to imagine creating understanding, recognizing patterns, making choices and study from experiences. Artificial intelligence have to do with making computers act like humans like fashion and in less time than a human takes. So it is called as Artificial Intelligence. Artificial intelligence is divided into two parts according to philosophy of AI.

a) Strong AI   b) Weak AI

StrongAI
The theory behind Strong AI is that the machines could be made to think. In other words it could represent human minds. Thus Strong AI demands that in near future everyone will be enclosed by such kinds of machine which can entirely works like human being. The machine could also have human level intelligence.
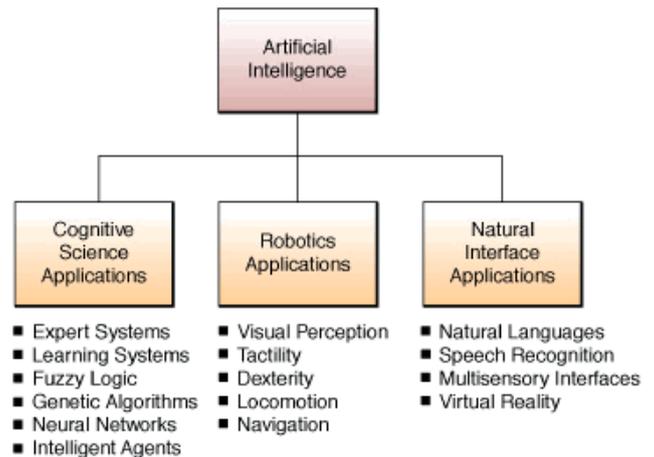
Weak AI
The principle of Weak AI is simply that the machines can be made to perform if they are intelligent. Weak AI states that thinking like features can be easily added to computer and it make them more useful tools.

Presently, the usual trend in the development of mankind is a balanced increase in the volumec of information. People have learned to cope with the information and have a lot of tools as well as technology to work with it. Thus, the particular significance is not only data acquisition, storage and transfer but the usage as well. Perhaps, the first question is knowledge gaining from the ever growing body of data. Certainly, the data that is useless do not exist. But if all the information, being stored in various information systems, is accumulated, then the resources may merely be exhausted soon.

The most difficult problem in artificial intelligence is knowledge extraction from data. However, there are the essential prerequisites for its solution.

What are the prerequisites under concern? First of all the ones that relate to the idea of artificial intelligence, corresponding computer technologies and its applicability for resolving problems. Decision-making support systems, executive information systems and systems for storing and

obtaining data are left aside. But actually the above-computed systems are parts of a wide range of AI systems. We can say that they are specific cases of AI systems.
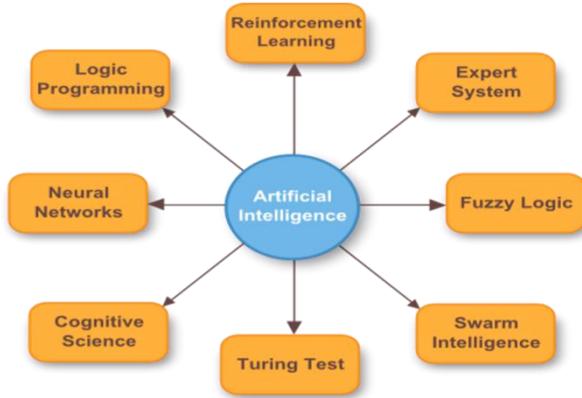

Fig 2. Areas of Artificial Intelligence

*TuringTest***:** The Turing test is a test of a machine's ability to exhibit intelligent performance. The test was proposed by Alan Turing in 1950 paper Computing Machinery and Intelligence. The question behind this test was "Can machines think? ". The test proceeds as follows a human judge involves in a natural language conversation with a human and a machine, each of which attempts to appear human.
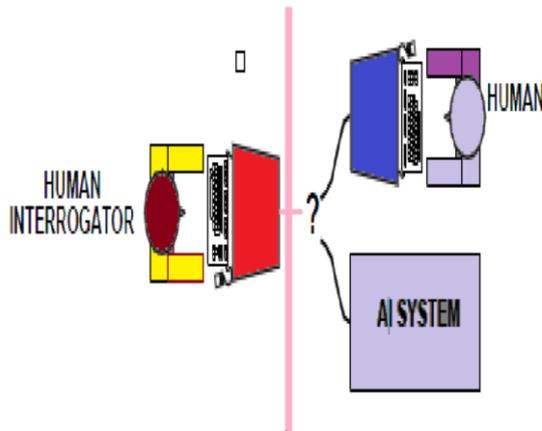

Fig 3. Turing test for checking machine intelligence

RootsofAI
Artificial Intelligence has particular roots in a number of disciplines, mainly
- Philosophy
- Logic/Mathematics
- Computation
- Psychology/Cognitive Science

2.DESCRIPTION OF THE EXISTING PARADIGM

There are three levels of their construction: *theoretical, technological and applied*.

Theoretical level. The starting point in entire theoretical constructions is the definition of knowledge. By now the following definitions may be considered as the best known and logically complete:
- definitions based on informal aspects of the view, knowledge is a interpreted data [1];
- definitions based on different ways of signifying the source information. The most widely used sources are frames, semantic networks and axiomatic. The main postulate are expressed in the following manner: knowledge is all that can be achieved on the basis of the above-mentioned representations with the help of related mechanisms of inference.

Technological level. The concept of this level are not quite stable. So we will provide some explanations first. The technological level embraces a set of methods and software that are proposed for the support of realization, design and functioning of systems based on knowledge. These methods and software require that the objects being processed fulfil certain conditions and the logic of their processing be standardized. The basic notions of this level are [2,3]:
- knowledge base;
- interpretation of objects;
- interface;
- knowledge extraction.

The notions almost completely establish the meaning and content of the technology for operating with knowledge. It can be widenedby taking into account the specialization of means. The means can be universal, specialized ones. The following views can be singled out:
- language for knowledge description;
- representation scheme;
- suitable operations on knowledge;
- Explanation;

Applied level. This level is reinforced in the least extent. However, the following notions can be stated:
- problem;
- qualitative and quantitative evaluates characterizing solvability of a particular problem and its solution.

Now let's determine the principle of the existing AI paradigm. We will define a way of constructing a system on the basis of the notions. Any theory has its purpose if at least one problem can be solved. Hence theoretical, technological or any other systematization is a direct significances of an applied one. A system should portray interaction and inter-conditionality of notions.

Statement 1. The prime notion is a *problem* that is framed on the informal level. For each cases (relates to AI) it is

possible to indicate the related*knowledge representation model*.

Statement 2. A definite set of manipulation algorithms is connected with respective knowledge representation model. The array of a particular algorithm is specified by a number of limitations. The key restriction is that an algorithm should not be concentrated to a simple exhaustion under all allowable conditions forced on the problem.

Statement 3. The choice made at the above stages stipulates a possibility of choice on the technological level. Realization and specific content of notions of this level depend on the choice of programming environment.

Statement 4. It is essential to carry out an approximate of superiority of problem solution. If the estimate is inadequate, then a correction is possible.

It is clear that notions themselves do not depend on applied problems. But their aptitude to form systems is completely formed by a possibility to solve all problems that

can be connected to the field of AI.

3. BRIEF DESCRIPTION OF A POSSIBLE MODIFICATION

Let's consider the kernel of the proposed modification. For this, we will consider knowledge manipulation algorithms in detail. There is a nearby interdependence between the notion of an algorithm and the notion of knowledge. But algorithms have a property that depends not only on parts of the notion of knowledge, but on qualitative and quantitative characteristics of the problem as well. This property is called justification.

The system comprises of axioms A and inference rules R. For such a system, it is shown that the system is in a unique fashion characterized by the following properties:

- completeness;
- consistency ;
- closure;

The result of the above-mentioned properties is the presence of a universal algorithm that ensures entering of any object above language L in a truth class. This algorithm is called resolution. It operate with universal knowledge representation. In this case, without loss of information it is supposed that a universal representation+ can be attained from any existing one.

It is easy to see that there is a possibility to avoid at least two drawbacks mentioned above. The point is that justification is always associated with properties of algorithm R_1, i.e. completeness, consistency and closure. These properties in turn are a fixed basis for further realization.

Now we may perform the modified model. Let's do it with the help of statements.

Statement 1'. The main notion is the problem that is framed on informal level. To each problem a way of change to a universal knowledge representation model is chosen.

Statement 2'. The choice of an algorithm is absent in this statement.

Statement 3'. The interrelation of notions of technological level is specified with the aid of a system that is called knowledge-based management system (KBMS). The system comprises means permitting to carry out design, functioning and realization of knowledge.

Statement 4'. It is vital to carry out an estimation of quality of problem solution. If the valuation is inappropriate, then a correction is possible. In this case correction of knowledge creates logic.

Then start with *justification scheme of algorithm*. For this propose a number of classes of problems. Let's represent X an arbitrary set of objects. Then:

- Z_1 are problems in which data about X is given in the following way. A specific finite subset X_0 is known well as rules R with the help the whole set X is constructed from X_0

- Z_2 are problems in which knowledge about X is like in Z_1, but rules R is not known. To define deducibility use is prepared of the similar algorithm R_0;
- Z_3 are problems in which information about X is given through a specific finite subset X_0. But to define deducibility use is made of algorithm R_1 which varies from R_0.

The view of knowledge can be determined on the basis of the evident points:

- Knowledge can be defined on 2 levels, i.e. formal and informal. The relation between the levels exists and is understood with the help of coding (from the informal level to the formal one) and interpretation (from the formal level to the informal one). As a result it is possible to determine a sequence (in terms of categories) for obtaining and processing knowledge;
- Knowledge, as an object, is an element of notion of information. On the informal level objects that are explained by these notions overlap. On the formal level information drops into objects that are described by the notions of the knowledge and data. These are dissimilar notions and they explained diverse objects. As a result of clarification both set of objects are signified as knowledge on informal level;
- The variance between data and knowledge on the formal level can be explained in terms of correlations. In this sense data are well-defined as objects that are totally described by connections of one of the following forms: lack of connections, connections of regularity, connection of multiplicity. In terms of permissible processes, all these types of connections are explained by the relational algebra. Data are set closed under operations of the relational

algebra. Knowledge, in its turn, is described as an objects that are defined by connections of inheritance and deducibility. The language, which it is likely to unite these 2 sets of object, is the language of algebraic systems [9].

It is informal to understand that in the case the notion of knowledge statement must fulfil the following conditions:

- to keep support for the algorithm R_1 and also operations used to define the connections of the succession;
- to permit without deformations to pass from illustrations prevailing on formal levels to the desired one;

In [6,7] one can discover explanation of the representation that fulfil all those computed conditions. On the entire, when we drop out details, the representation is equal to the one handled in object-oriented programming. So the representation is knownas an object representation.

One constituent of universal representation is the set of elements considered by the generalities of structures and their mode of constructions in the following sense:

$$object: \Pi_1 \times \Pi_2 \ldots \times \Pi_n \rightarrow D_1 \times D_2 \ldots \times D_n$$

where as Π_i are the signs, D_i is the set of values of a sign ($i=1,2\ldots, n$). An additional component is the certain characteristic of connection between objects. On the formal level relation is thesubset of Cartesian powers of sets $\{object\}^m$. Thus, some objects can be recognised with the pair $<object, relation>$, or with the Cartesian product $\{<object, relation>\}^m$. Thus the formal sense also has a representation in terms of $\{<object, connection>\}^m$. As a part, all permissible connections that take part in the definition of knowledge, can be explained in terms of the following representations:

$$F:\{<object, connection>\}^m \rightarrow \{<object, connection>\}^k$$

where $m, k \in N$.

Now let's define in briefly the construction of the equivalent notions for those technological level. The key notion at this point is a *knowledge base* that must fulfil those following conditions:

- to get properties of former technologies like bases and data structures;
- to make sure the support for the entire spectrum of connections;
- to provide division of knowledge or data from means of manipulations;
- to make sure that a design process that just in case of knowledge can be built on consistency.

By enhancing interpretation uphold for knowledge, interface and other characteristics of developed systems to the system holding the enumerated properties, obtain a *knowledge-based management system* (KBMS).

4. CURRENT PROGRESS

Artificial Intelligence is formed with the unique aim of imitating or outperforming the minds of human. So it is important to question the truth whether it has really been able to do it so.

It cannot be disregarded that fact of AI is be there employed all around us mainly in fields of medicines, robotics, law and stock trading. It is been employed in the homes and large establishments. Such as military bases and in the NASA space station. NASA has launched out artificially intelligent robots to the planets so to learnadditionally about their habitat and also the atmosphere, with the purpose of researching if there is any chance of humans be alive on these planets. Expert systems make sure to be used by Mercedes Benz and also additional auto manufacturers in the sketch of vehicle components, and subway systems in Washington, D.C. use skilled system software controllers to make happen the subway trains to discontinue within three inches of the right spot on platforms. Those trains possess motormen primarily to comfort passengers. AI has been filtered into common applications in these fields and has become so usual that it is not stated to as Artificial Intelligence. Blind followers of AI must point to the time when AI Deep Blue II conquered chess master Garry Kasparov to turn out that Artificial Intelligence can in truth be " sharper than humans. However there is no suspect that the AI Deep Blue II won that match, it is still possibly one of the dumbest software lively. The operators was programming the AI in each round depending on the opposition's most recent move. Similarly, Deep Blue II had studied all of Kasparovs former matches whereas the previous wasnot granted the similar benefits. One could securely reveal that however the Deep Blue II AI conquered Kasparov, it was at no time a moderate fight to start with.

Most recent technologies like Xbox 360s Kinect and iPhone « s Siri aid algorithms created on Artificial Intelligence, although it is a familiar truth that those technologies are an elongated method from being accurate. So we could securely determine that yetArtificial Intelligence had created a set of advancements in the precedent few decades, it is not at any level wherever in any one can assertively affirm that it is promptly willing to fully exchange the human mind. That have being said that, largescale research is promptly being operated into the area of appropriate recreation of the human brain. Cortex is a mission by Artificial Development Inc. and Swiss government's IBM sponsored Blue Brain Project, are the main ventures, whose aim is to pretend the human brain.

5. APPLICATIONS

Artificial Intelligence in the mode of neural networks and expert systems includes applications in approximately whole human activities. The group of high precision and low computation time creates Artificial Intelligence a sharp edging technology. Robot ES₄ s are even now gaining over workshop level jobs in large scale industries, so side lining humans into a much more supervisory role. Stock brokerage firms are nowadays utilizing Artificial Intelligence to analyse data, create analysis and also buy (accept) or sell (offer) stocks without interference of human beings. Few of the applications of Artificial Intelligence are described below-

A. Gaming *Industry-*

It is the most commonly well-known applications of AI in the gaming industry is its aid in chess. However these machines are not intelligent as humans, they make use of brute force algorithms and scan 100's of positions in each and every second so to decide the succeeding move. As specified earlier, AI is being utilised in Microsoft Xbox 360s Kinect for body motion detection. Although it is yet in its beginningand also need more development for it to be used in day-to-day applications.

B. Heavyindustries-

Artificial Intelligence robots have turn out to be very popular in heavy industries and also employed in jobs that are else take into account as dangerous for humans. These robots besides rises the effectiveness, as they do not require any disruption during working so overwhelmingthe intrinsic drawback of grogginess in humans.
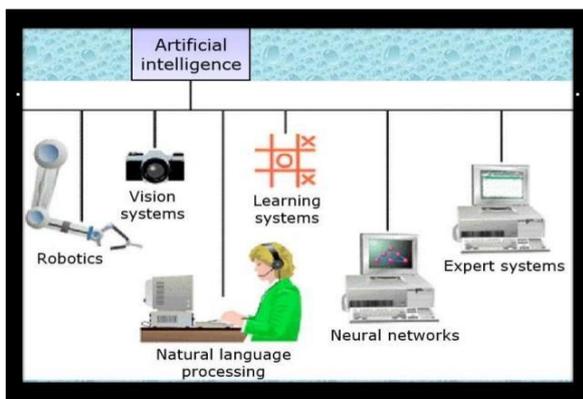

Fig 4 AI Applications

C. WeatherForecasting-

Neural networks are currently being use up for forecasting weather conditions. Past data is granted to the neural network, which besides analyses the data for patterns and prophesies the upcoming weather conditions.

D. ExpertSystems-

Expert Systems are machines that are guided to carry out entire expertise in certain sections of interests. They are established to resolve the difficulties in hollow areas. These techniques utilize statistical analysis and also data mining to crack those difficulties by determining the elucidations over a analytical stream of yes or no questions. An expert system is created up of mainly three parts-

➢ Knowledge base- It collects the entire information, rules, data and relationships that are required by expert system to take the entire expertise in its region of interest.

➢ Inference engine- It pursuesthe information from the knowledge base on actually being introduced with a query, and evaluate it and replieswith a solution in the means of a human expert would

➢ Rule- It theconditional statement that connects the providedterms to the last solutions

E.*Data Mining or Knowledge Extraction*: Data mining is a rapid-developing areas. Data mining is a segment of a method known as KDD knowledge discovery in databases. This process comprises mainly of phases that are presented before taking out data mining such as data selection, data cleaning, pre-processing of data, and also data transformation

Fig 5 Pattern Matching AI Applications

6. CONCLUSIONS

Let's consider the principle of the planned modification of AI paradigm. On the entire, everything is diminished to the use of defensible inductive algorithms. Surely, this limits the choice to some range, nevertheless as an outcome we obtain much additional. Firstly, we must have a discrete definition of the notion of knowledge. Secondly, the outcome is assured. Third, we have division of knowledge from the way of its manipulation. The last two factors

fallouts in a prospect to have a technology for creating systems established on knowledge.

The justification of algorithms reveals not only theoretical meanings. In practice, the circumstances that the outcome is guaranteed directs to the following. Let's pretend that we have accomplished to achieve an a priori estimate characterizing the relative body of the existing knowledge. For example, can be the ability of information or entropy. Let's signify such estimate by α. It is obvious that any of the quality estimate α' characterizing outcomes of the algorithmic processing of latest knowledge couldn't be greater than that of α. The justification of algorithm guarantees that $\alpha'=\alpha$. Surely, this would not takes off pathological heuristic nature [10] of practical problems that is the significances of incompleteness of the priori knowledge.

The proposed paradigm somewhat alter the soul of problem solution as well. Admiring R. Hamming we can say that the target of problem solution is not numerals but understanding. Such understanding must direct to the creation of a model validated according to all the canons of mathematical rigour. The proposed paradigm is a model permitting to enhance towards understanding.

And thus finally. It is evident that the proposed modification is not only one. Other modifications are also possible. But to realise what these modifications can be it is essential to have at least one. We optimise that the proposed modification of AI paradigm will aid this purpose as well.

The practicalconsequences of the proposed modification is verified by applications, e.g.: "ORTHO-EXPERT" computer system[7,8], which is proposed for the diagnosis and treatment of diseases in the arena of orthopedics; "Adviser" system that is directed at accompanying decision-making in Internet (http://www.heeftmijnkindautisme.nl/lkh/).

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