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Significance of Artificial Intelligence in Science and Technology

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Abstract
Intelligence is composed of harmonious and proportional connection of different human abilities among which are mind, cleverness, rationality, intuition, ambition, interest, culture, belief, scientific information treatment and alike gifts given by Allah. Every individual has intelligence level at different scales and levels; there is no one who is immune of these abilities. The intellectual intelligence might be at the static level without any research and development for the betterment of human beings in the society. Although natural human intelligence has been in existence since the creation of man and woman (Adam and Eve), but it took centuries to reach todays intellectual level after a series of philosophical thinking and logical propositions. Unfortunately, today, in many disciplines and societies human intelligence reflection to science and technology has been overlooked and consequently such societies are lacking behind well developed countries. This paper provides brief review and suggestions for artificial intelligence significance through the historical perspective and methodological (models and machines) aspects. It is advised that for innovative inventions or at least partial modification of existing scientific and technologically available methodologies human intelligence must shed light rather than classical, repetitive and imitative approaches.

Keywords: Artificial, intelligence, logic, machine, model, philosophy, robot.

Bilim ve Teknolojide Yapay Zekanın Önemi

Öz
Zeka; Allah'ın verdiği zihin, akıl, sezgi, hırs, ilgi, kültür, inanç, bilimsel bilgi davranışları olmak üzere farklı insan yeteneklerinin ahenkli ve orantılı bağlantısından oluşur. Her birey farklı ölçek ve seviyelerde zeka seviyesine sahiptir; Bu yeteneklerden etkilenmeyen kimse yoktur. Entelektüel zeka, toplumdaki insanları iyileştirmek için hiçbir araştırma ve geliştirme yapılmaksızın statik seviyede olabilir. Doğal insan zekası, erkek ve kadının (Adem ve Havva) yaratılmasından bu yana var olmasına rağmen, bir dizi felsefi düşünce ve mantıksal önermeden geçerek günümüzün entelektüel seviyesine ulaşması yüzyıllar boyu sürdü. Ne yazık ki günümüzde pek çok disiplin ve toplumda insan zekasının bilim ve teknolojiye yansıması göz ardı edilmekte ve dolayısıyla bu toplumlar iyi gelişmiş ülkelerin gerisinde kalmaktadır. Bu makale, tarihsel perspektif ve metodolojik (modeller ve makineler) yönleriyle yapay zeka önemi için kısa bir değerlendirme ve öneriler sunmaktadır. Yenilikçi buluşlar veya mevcut bilimsel ve teknolojik olarak mevcut metodolojilerin en azından kısmen değiştirilmesi için insan zekasının klasik, kendini tekrar eden yaklaşımlar yerine bu konulara ışık tutması gerektiği önerilmiştir.

Anahtar Kelimeler: Yapay, zeka, mantık, makine, model, felsefe, robot.

1. Introduction

Artificial intelligence can be thought of Allah (Creator) given human natural soft abilities transition to some gadgets, software, robots and machines.

Human beings have been wondering about artificial intelligence, even though it may be unconsciously, right from the antiquity times. The initial thoughts and their mechanical instrumentations were either in the form of ideas that have not been materialized or as simple weapons, gadgets and instruments or drawings, which have not been put into application stages. The fundamentals of artificial intelligence were born in the philosophical thinking during Old Greek period (Archimedes, B.C. ~ 159), verbal descriptive writings during early Roman period (Heron, A.C. ~ 50) and actual and today like robotic mechanical drawings and explanations during Medieval Islamic civilization period (Abo-l Iz Al-Jazari, ~ 1200). In general, artificial intelligence born thoughts have their bases in

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the reduction and conversion of rather complex problems to human graspable levels with its consequent simple linguistic, symbolistic, mathematical, algorithmic and logistic solutions. Artificial intelligence works does not necessitate formal education only, but it may depend on personal of group experiences, which may be expressed in linguistic terms that can later be converted to mechanical movements through various purpose machines. Today artificial intelligence searches for human brain and mind functionality, machine learning and improvement machines and robots so as their main objectives are service to men.

Modern artificial intelligence works had started right after the Second World War and had their origin with the emergence of computer technology and engineering sprout out during 1950s. Digital computers provided a domain for simulation of natural events in different disciplines (social, economy, engineering, etc.), and hence, these initial works triggered the human thought towards the artificial intelligence direction. A brief history of these recent developments is presented by Russel and Norvig (1995).

Artificial intelligence theoretical and practical studies and applications are increasing since the appearance of digital computers and these studies deal with uncertain, vague, incomplete and missing data cases through approximate reasoning models. Computers help to visualize and apply artificial intelligence configurations provided that human intelligence can be translated to computer software through a set of assumptions and simplifications. Linguistic knowledge and information can be represented by modeling, reasoning and decision making procedures in addition to numerical data treatments. The main source of artificial intelligence is the human brain functionalities leading to clever gadgets, instruments and machines for social and economic life improvement purposes. Human intelligent is the main source of artificial intelligence not only in clever gadgets, instruments and machines only but also in any basic or applicable science and technology studies. Scientific and technological developments cannot be achieved without transformation of human intelligence to artificial intelligence, which may appear in the forms of formulations, equations, algorithms, software, models and machines. This paper provides a brief explanation by touching on these forms from artificial intelligence point of view.

2. Human and Intelligence

Any activity in this world cannot be thought without the human thinking, work, application and process. These activities may be mental, social, educational, research and development, economic, environmental, military, health, etc. Each individual has to engage him (her) self with some of these activities and perhaps with several of them to achieve a personal goal in the society or as a service to men for betterment and improvement of life standards. Although human have gifts as five sensitive organs that help to take inside outside knowledge and information, but their processing in some subjective or objective manner provides better or improved outputs. Figure 1 is a simple model for a human being existence in the environment that is physical and also to some extend spiritual.

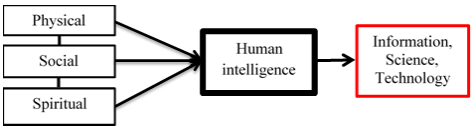

Figure 1 Human activity model

The final goal is to generate useful information, scientific knowledge and technological gadgets that help human to have easier life without difficulties. As shown in the initial part of this figure among the three components, namely, physical, social and spiritual aspects of human life the most effected part lies within the physical realities of life. For instance, washing machines, dish washers, natural gas and many alike are for the relief of physical overburdens and partially also for the social activities. Today, intelligence is taken for granted to express the physical improvements of the life neglecting other aspects of life like social, cultural and spiritual dimensions. Anyone who will be the most satisfied with the artificial intelligence will also have satisfaction with other supportive aspects of the life. It has been shown in Figure 1 that physical, social and spiritual components of human existence are related with each other and one cannot be exterminated from others. In case of a balance among these three components the artificial intelligence can emerge with peace and generative manner of enlightenment.

Apart from the above mentioned facts the other most two important software within that are parts of human intelligence are philosophy and logic. One can gather tremendous amount of knowledge, information and know-how practical abilities, which may remain in his (her) daily life as non-generative agents without any innovative developments. This is especially true if the philosophical and logical aspirations are missing from human thoughts. Without especially science philosophy and logic the knowledge and information accumulation is like concrete without reinforcement. However, on these and future days each society seeks and urges for individual that are empowered with innovative idea and brilliant generations at least as improvements and developments of existing facilities, whatever they may be. Artificial intelligence cannot be without science philosophical and logical thinking ingredients. Furthermore, artificial intelligence needs “suspicion” from the behavior of gadget that is around us.

3. Models and Intelligence

Models are description, imitation, and replacement of human thoughts into a sequence of logical statements and first to geometrical shapes and then translation to

mathematics and finally the solutions with their verification according to real life observations and, if possible, measurements. Each model digests human intelligence to a certain extend under the light of idealizations, hypothesis, theorems, assumptions and other sort of simplifications to reflect the real-world problems (social, environmental, economy, health, energy, education, etc.) on the graspable level such that the human intelligence can approach the reality. During the long history of modeling various probabilistic, statistical, analytical, chaotic and artificial intelligence alternatives took place. All type of models is based on human intelligence, which are expressible in terms of rational sentences that are convertible to mathematical signs and consequently mathematical analytical, empirical and differential equations. The rational and logical expressions are very helpful to communicate with computers through well-established models. The historic evolution of models has also started in applications after the digital computer entrance into scientific and technological research domain. The first intelligent models were in the form of "black box" type, where the input and output numerical data are available in the form of measurement records. This caused researchers to look for "data bases" to initiate the model estimations. The first classical black box model has three components as input, output and transfer unit as in Figure 2.

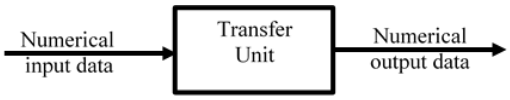

Figure 2 Black box model components

After having obtained input and output data bases the researchers think about the transfer system to replicate the output pattern from the input data. The transfer unit needs artificial intelligence thoughts for desired match between two sets of data. Unfortunately, at this stage many researchers dive into existing methodologies without his (her) own intelligence contribution for the formation of transfer unit. In general, the transfer unit is in the form of probability, statistics, stochastic processes, analytical formulations, empirical equations, Fourier series, artificial neural networks, genetic algorithms, analytical hierarchical methods and many other similar approaches. Such a way does not activate the human intelligence but provides ready answers under a certain error limits.

On the other hand, active human intellect after knowing the philosophical and logical bases of each classical methodologies may try to bring another innovative modeling technique or at least suggest some modifications, which implies the contribution of his (her) intellectual ability. Such an implementation of human intelligence provides artificial intellect in the model construction.

Another artificial intelligence methodology after around 1970s is the fuzzy logic modeling (Zadeh, 1965, 1968), which depends completely on the individual or group intelligence, because it requires the scientific philosophical basis with rational inferences leading to a set of constructive rule base" instead of "data base". Herein, approximate reasoning plays the most active role for artificial intelligence implications under the light of human intelligence. The general parts of fuzzy modeling take the form as shown in Figure 3.

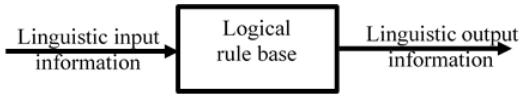

Figure 3. Fuzzy model components

The bases of the model in Figure 3 are completely linguistic, which requires verbal rational logical prepositions with antecedent and consequent parts within a set of the following statements.

Rules: IF…. (antecedent, linguistic input) …… THEN ……. (Consequent, linguistic output)

Any natural, social, economic and engineering problem can be expressed linguistically for its science philosophical fundamentals and then a set of logic rules like the proposition can be set for its linguistical description. In any artificial intelligence or even analytical approaches in any aspect of scientific research rather than "1data base" "logical rule base" is important. The logical rules can best be set down by human intelligence, but unfortunately rather ready formulations, equations, software and algorithms are considered in numerous studies without any bother. Artificial neural networks (Şen, 2002) are among the most used modeling technique, because one does not need to ponder and pump human intelligence after all the architecture is known and by means of trial and error methodology the best suitable one can be identified.

For better, improved and innovative research activities it is advised that the researcher should criticize each method with suspicion and bring it to his (her) intelligence level.

4. Machine and intelligence

Human intelligence can be transferred to machines as robots and such intelligence systems are in existence throughout the science history. Although there have been some thoughts on artificial intelligence through machines and machine like robotic visualization during Old Greek and Early Hellenistic civilizations, but the first crisp and vivid examples have been suggested by Muslim thinkers through pictures and in geometric shapes. The first of automatic robotic is presented in the following figure where water power is used to raise the left and right hands of a robotic man on an elephant. He has expressed his ideas, opinions and views not in a subjective manner as many ancient Greek philosophers have done, but on objective grounds with drawings that can be convinced by everybody even today. Perhaps, his engineering side is more significant than his

philosophical and scientific sides. For instance, Figure 4 is the first historical example provided by Al-Jazari, who lived during the 12th century in the southeastern part of present Turkey.

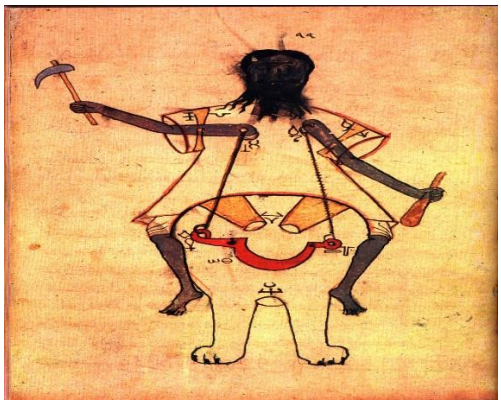

Figure 4 The first robotic gadget based on human intelligence

Machine learning provides effective data mining procedures whereby one can deduce significantly applicable techniques.

5. Conclusions

This paper presented a brief description of artificial intelligence significance in the human life at present with emphasis that these techniques are bound to gain more significance in the future. Even though everyone has natural intelligence, but in recent decades, s/he wants to load the intelligence activities to models through which the computers can deal with artificial intelligence, but more appropriately through the machines that are directed by computer software. Any software whether simple of complex can be disintegrated down to logical rule set, because without logical propositions about the problem concerned, one cannot write computer programs. It is stated in the paper that the first objective, physical and mechanical artificial drawings and explanations emerged from the Islamic civilization although there were some early versions only in the form of general writings without mind and intellectual triggering. Artificial intelligence originates from natural human intellect first in the form of models and finally machines including robots.

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