PHILOSOPHICAL AND PSYCHOLOGICAL PROBLEMS OF ARTIFICIAL INTELLIGENCE

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The paper presents discussion of interrelation between human intelligence and computer functioning. Differences are demonstrated between heuristic search of artificial intelligence and human intelligence actirity. "Machinocentrism" as a trend of comaring human and machine functions is strongly criticised. Three programs of artificial intelligence development are analysed. It is demonstrated that the goal of approximation to human intelligence is being set under conditions of either disregarding or restricted use of psychological data about human intelligence. A real recreation of human intelligence in the work of computer is being associated with simulation of needs, emotional regulation of search, goal-formation, selective reflection of the situation. It is stated that representation of man and his intelligence as "just a machine" makes up the basis of the specific formofnatural-scientificmaterialism which is being developed in bounds of artificial intelligence as a scientific trend. Psychological problems arizing in connection with origin ans use of artificial intelligence are also formulated.

Analysis of theoretical principalee of artificial intelligence as a scientific trend obtains critical importance. Comparison of human intellect and machine functioning, exposure of their similarities and differences is one of the most significant approaches to this trend analysis. Yet this analysis would be impossible without addressing philosophy and psychology - the sciences that have been traditionally studying human intellect.

Machine realisation of such games as chess and checkers is often mentioned as a cogent indicator of machine Intellect existence, Psychology obtains data, that one and the same problem may be solved by man and computer using different principles and that similarity of formal results estranged (written or typed) from the solving system can not serve as a basis for "diagnosing[19] that computer has human intelligence (1)•

Between the heuristic search analysed in the theory of artificial intelligence on the one hand and human intellect activity on the other there are Important differences which should not be ignored.

The first difference is connected with the fact that the so called heuristic searchisdescribedinartificialintelligence works in relation to the problems having precisely defined initial situation and precisely defined goal, while it is characteristic of man to form goals and to distinguish initial and subsequent search situations. Broadly admitted is the opinion that artificial intelligence investigations have not yet developed a universal method for sophisticated formulation of problems.

The second difference is connected with the nature of "operators" transforming one situation into another". In human intellectual activity this "transformation" may have qualitatively different psychological structure being realized by a goalful action, by an impulsive action or by a consolidated skill. It is also significant to differ two types of "operators" practical behavioural acts (drawing near and moving off, manipulations etc.) and gnostic or investigation acts (examination, observation of relations in the situation, implementation of its properties before realization of practical acts) "Operators" of the second type are usually ignored in artificial intelligence

works.

The third difference concerne "states". When describing "states" man uses not only such forms as lines of symbols, vectors, two-dimensional arrays, trees and lists, but also images, meanings and senses, the most important peculiarity of which is their object relatedness. Apart from the space of "problem states" a human being also has a space of states of himself as of a subject solving the problem and it is not irrelevant to the problem-solving activity.

The forth difference consists in the fact the so called "heuristic search methods" of human intelligence and of artificial one are different by nature. Human "intensification of search" depends not only on "specific information about the problem" but also on the motives of problem-solving activity, on the psychological state of the solver, on his attitude and so on. Generally speaking it depends on the subject. Thus there are also subjective factors that "assist in finding the solution". It is characteristic of man to regulate his search not only by syntactic and semantic rules, but rather by sense factors. It is not only the execution of evaluation functions that takes place in human intellectual activity - in the course of problem-solving there also accure their formation. These "evaluation functions" say also be different by nature (emotional and verbal evaluations, generalized and eituative ones).

Even this enumeration shows that psychology analyses a wider range of the problem than the so called theory of heuristic search does. Furthermore it is necessary to point out that "restricted count" is rather freely interpreted here as "heuristic" in the meaning of "favouring discovery", for "discovery" is interpreted as a solution of any problem by a mode shorter than complete count. Among the thins that do "favour discovery" in human intellectual activity the most important ones are not mentioned as a rule. Thus for instance the state of maximum mobilization of psychic activity named "inspiration" is ignored.

Enumerated differences are important in evaluating significance of artificial intelligence works and show that perfection of heuristic search in artificial intelligence may be unrelated to any significant approximation to human intelligence structure.

"Artificial intelligence" is a rapidly developing trend. Therefore forecast of its development and validity evaluation of these forecasts gains more and more importance. Psychology also contributes to solution of these problems.

Approximation of machine problem-solving methods to human ones is often pronounced as a strategic goal in the field of artificial intelligence.

In an attempt to achieve this goal many authors resort to comparison of human intelligence and computer potentials. Yet this comparison frequently suffers from downright one-sidedness. One of the most typical cases here is evaluation of man from, so to say, "machine view-point" ("machinocentrism"). It means that first of all only those characteristics of man are pointed out that are obtained by a machine. The further analysis considers here only the degrees to which these characteristics are represented in human beings. Thus "rapidness" "working memory" "arithmetical problems[1] solution" and "speed and accuracy of information input and storage" are being discussed. According to this approach the group of human characteristics which is not represented in machines remains out of the analysis! the group includes needs, motives, goal-formation, emotional regulation of activity.

Strongly restricted enumeration of

differences results in a rather dering conclusion that neither of the mentioned differences is in principle insuperable (2) in approximating machine potentials to human intelligence; after this the conclusion is made that there are quite fair chances to build a machine cleverer than a man and at last it is stated, that in case we are able to construct a machine cleverer than ourselves, it will be able in its turn to project a still cleverer one. We should bare in mind anyhow that the most important differences have just not been encluded in the list of the "in principle insuperable" ones.

Pull accounting of human intellectual activity peculiarities is also needed for a more precise evaluation of "machined characteristics. Thus it is necessary for example to restrict the habitually mentioned machine advantage of "rapldness" *tor* it is valid only for "routine" work.When dealing with creative work, that ie the one including the processes of goal and intention formation, we may say that no matter how long this work is carried out by man, it is carried out "quicker" then by machine, for it is not able to carry out this work at all.

Even in case scientists underline advantages of man over machine, human intelligence is often approached by them unilaterally. Thus among obvious human advantages the "volume of parallel information handling" is often mentioned, yet being abstracted from such important characteristic of the activity as its realization by not only parallel but also qualitatively heterogeneous processes. Interaction of concious and unconcious components in the structure of human intellectual activity may serve here as an example. Furthermore this position is sometimes reduced to only quantitative characteristics, that is to indication that brain possesses a considerably greater quantity of solving elements related by a huge number of interconnections.

Sometimes papers mention such peculiarities of human activity as "selection of essential data", "retrieval of essential information", yet do so without any refernces to the fact that human information "essentiality" is determined by relation of the infonnation to the individual's needs which may change in the course of one concrete problem - solving. There is also an opinion expressed according to which the obvious fact that an organism has needs is although not denied but considered as something outer in relation to behaviour organization. As for psychology, "mental energy" (Spearman) is sometimes pronounced to be a "general factor" of mental endowments and "mental activity", "need in activity" is considered as its main component (3). These components and factors are interpreted here not as something outer in relation to the activity, but as a most essential constituent of human intellectual activity. As it has been shown by experimental investigations, the need is connected not only with final goal statement, but also with problem-solving, with organization of the search per se.

Three programs of artificial intelligence developments may be pointed out as pithy. The first one states that the increase of memory volume and of interrelations between its elements would lead to the development of machine creative potentials. This opinion is open to criticism for cases are known when the increase of human memory volume and of interrelations between its elements did not at all lead to the increase of hie creativity (4). Therefore this condition may not be approched as the most important one.

The second program declares the highest importance of finding out knowledge and concept systems used by a hu-

man in solving a certain class of problems with their further introduction into machine (transference of "semantic information"). In this context knowledge is understood as an ability to answer questions. If a system answers a question, it obtains knowledge. This is the so called empirical definition of knowledge. The method of finding out knowledge needed by man in solving a certain class of problems, which is usually used by artificial intelligence specialists,consists in self-observation in the process of learning by themselves.

To evaluate this program it is necessary to take into account the fact that for very long psychology differs formal and comprehended (meaningful) knowledge.

In the bound of artificial intelligence knowledge gets formalistic interpretation and thus bears only superficial resemblance to genuine human knowledge.

The method used by artificial intelligence specialists in finding out human knowledge (observation of learning by themselves processes) used in the course of problem-solving is strongly limitted. The thing is that in any human action there take place concious and unconcious components including generalizations.

The third program of artificial intelligence development accentuates the simulation of human "heuristics" yet in doing so it ignores the above mentioned differences between machine and human heuristic methods.

Therefore we may point out a very essential peculiarity of artificial intelligence as a scientific trend: its strategic goal - approximation to human intelligence - is Bet by either neglecting or restricted use of psychological data about human intelligence.

On the basis of psychological analysis applied to comparison of human and artificial intelligence we may state that the three described programs of artificial intelligence development suggest modification (alteration) of the characteristics which in human intelligence should be qualified as "outer quality" ("increase of memory volume, of interconnections between its elements; increase of formal knowledge volume; increase of formal methods of search reduction"). If strategic goal of artificial intelligence as a scientific trend - recreation of human intellectual activity methods - does not become senseless in this absolutely real situation, then we should speak about new, that is the fourth program of artificial intelligence development. The point of it is to attempt to simulate needs, emotional regulation of search, goalformation, selective reflection of the situation.

The frequently declared thesis that at present there is no theoretical limit of intelligence degree that can be ever achieved by a machine should be essentially amended: if the fourth program of artificial intelligence development is in question the point at present issue should be not presence or absence of limit B i . . tue implementation of the progrrun, but the very possibility to start its realization, i.e. embodiment of inner essential characteristics of human Intel* ligence in the work of a computer.

"Emancipation" of works of artificial intelligence from psychology of intelligence revealed in the course of our comparative analysis does not restrict progress in the field of hard- and software developments, yet it sets a rather significant limit in possible interpretations of gained practical results in their relation to human intelligence.

The question of human and artificial intelligence interrelation is discussed by many authors in the context of philosophical problems. There are direct at-

tempts to relate identification of human and artificial intelligence to materialism. In this light the analysis of what materialism namely is advocated by enthusiasts in the field of artificial intelligence gains principal importance.

It is well known that there exist different forms of materialism (as well as of idealism). The pre-Marx materialism is usually characterized by the attribute "mechanistic" "metaphysical" and "vulgar": words with meanings only partly intersected. To characterize some forms of materialism the concept of "natural-scientific materialism" is used. The term "mechanistic" has two meanings - specific and a more general ones. The first is related to the form of materialism connected with classic mechanics, the latter - to any method of "reducing" complex phenomenon to its more simple constituents. Representation of man and his intellect as "just a machine" serves the basis for the particular form of natural-scientific materialism which is being developed in bounds of artificial intelligence as a scientific trend. This materialism is mechanistic in the above mentioned broader meaning of the word, yet on the other hand it is a new form of mechanism for not the laws of mechanics, but the laws of "information handling" are taken here as central. In other words it is the particular form of mechanism that is being changed but not its main principle.

One of the central theses of dialectical materialism is the qualitative peculiarity of different movement forms of the matter; antireductionalism is characteristic of it. The alternative "cither machine or soul should be resolutely rejected for it contradicts the essence of dialectics. Neither "machine" nor "soul" but psychic as a qualitatively peculiar phenomenon originated at a oertain stage of matter development and bearing new characteristics in relation to the matter which has not yet passed this stage of development. Concrete psychological investigations demonstrating qualitative peculiarity of human intellect in comparison with the functioning of existing and practicably projected computers prove and enrich dialectical materialism.

The term "artificial intelligence" applied to computer functioning is no more than a metaphor analogous to word combinations "artificial hand" and "artificial eye" applied to mechanical manipulators and T.V. cameras realizing the function of tracing. The difference between natural and artificial hand, as well as between natural and artificial eye is selfeviuwnfc and does not raise Keen discussions, yet the* difference between artificial and human intelligence is not obvious for many scientists and sometimes is deliberately minimized. Therefore we should take into account the danger of "literalism in understanding the metaphor".

Instead of mechanical borrowing of concepts and methods from artificial intelligence psychology should concentrate on a more intense development of its own problems arising in connection with origination and use of artificial intelligence. These problems Include analysis of artificial intelligence use influence on human intellect, analysis of psychological after-effects of computerization (5). Talks about intellect augmenterB are not usually supplied with real analysis of psychological after-effects of these "augmenters[1]" use in human activity-

Approaching artificial intelligence as a tool of human activity it is necessary to bear in mind that it gives "augmentation" only in potential and that the opposite potential - that is of "weakening" - does not automatically fall away;

what is more, it comes into reality under poor organization of computers[1] use. Furthermore the tool itself may be different (type of the machine, type of the program, type of the communication vdth the machine) which lead to qualitatively different variants of "augmentation".We should also take into account that human intellect may/be rather different and hence wisdom and stupidity, intellect of a scientist and intellect of an astrologer would be augmented. Artificial intelligence "augments" not all components of human intellect, but only the "machine-like" ones, making first of all their "allies" out of them. Therefore we should speak not about just an intellect augmentatin but rather about its structure transformation (6). Intellect augmentation should be approached in a broader context of mental development. The computer frequently appears to be not just a tool of some abstract intellect, but a tool of real personalities striving for self-assertion using means of high prestige range. Activity motives of personality may be both socially valid and egoistic.

Effectiveness increase of artificial intelligence use by means of considering peculiarities of human creative activity makes up a separate scientific problem. Wot only cybertetics but also psychology makes up the theoretical basis of mental labour automatization. Effective use of psychological science in solution of actual problems of technological progress is to be associated not with its "technologization" and "engine erizat ion" but on the contrary with its "psychologization". The problem of "coordination" of man and machine characteristics is often met in technological literature. We would like to stress the scantiness of the way the problem is put and also the illegality of identifying this problem with the problem of optimization of human activity conditions."Optimization" of activity conditions is often achieved by "discoordination" of man and machine characteristics - for example by setting conditions of free work rythm or of free access to the machine. Extention of human creative potentials is one of psychological indicators of artificial intelligence use effectiveness. The thesis of human thinking peculiarity in comparison with computer information handling is the methodological principle of the automatic systems' projecting theory (7).

And, finally, perspective is the problem of artificial intelligence use in the investigation of the human one (computerization of psychological experiment D).

We think that between the science of psychology and artificial intelligence as a scientific trend should be set new relatione. Artificial intelligence should to a greater degree take into account data of psychological science in evaluation of its practical achievements, in the works of computer development perspective programs, in increasing effectiveness of computer use. An actual problem of psychology is critical assimilation on the ground of dialectical materialism of the processes connected with the development new natural-scientific materialism form represented by artificial intelligence theorists and thus the further development of concept apparatus allowing to Reflect the specificity of pfeQrckic activity regularities*

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