

The Exploration of Intelligence from the Perspective of Psychology

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Abstract—The definition of “intelligence” is an unavoidable basic theoretical problem in all intelligent research. However, the importance of this issue has been overwhelmed by many achievements in specific disciplines such as artificial intelligence, which has led to a lot of “intelligence”. This phenomenon has become a stumbling block for the advancement of intelligence-related research. Judging from the research results of psychology and philosophy that first studied intelligence, it is a consensus to effectively distinguish various forms of “intelligence”. “Intelligence” essentially refers to the autonomous characteristics of a material with a specific intrinsic structure that appears in a particular environment.

Keywords—intelligence; origin; essence; psychology

I. INTRODUCTION

Intelligence is the comprehensive ability of human beings to observe, remember, analyze, judge and purposefully act on objective things and effectively solve century problems in practice. It is a unique feature of human beings and different from general organisms. The unique intelligence of mankind is the product of the long-term development of the objective world and also the product of social labor.

At the beginning of the birth of the earth, there is no existence of life, there is no intelligence at all, and all the responsiveness of matter is the material basis of human intelligence. The form of biological reaction (stimulation, feeling and psychology) is the premise of generation of human intelligence. The generation of human intelligence has gone through three decisive phases: the first phase is from the reaction characteristics of inanimate matter to the stimulating sensitivity of lower organisms. The reaction characteristic means that the substance changes correspondingly when it is subjected to other substances. For example, rocks are weathered by the action of air, sunlight, and water. About 3.1 billion years ago, inferior creatures were produced in inanimate matter, and this form of reflection is stimulating. The so-called stimulating sensitivity refers to the stimulating ability of the organism to change and act on the external environment. For example, the branches and leaves of plants will reach out to the sun, and the roots will be tied to places with water and fertilizer. The stimulating sensitivity of the organism is a high-level reflection form of the reaction characteristics, and it has autonomy, selectivity and profit-avoidance. Therefore, this stimulating sensitivity is not a simple mechanical, non-

selective physical or chemical reaction, showing the germination of a certain autonomic reaction. The second stage is from the reflection form of the lower organism's stimuli to the feelings and psychology of the higher animals. As the organism continues to evolve, the sensory organs and nervous system evolved. Because of the material basis of the nervous system, animals have a sense, a form of reflection. In the reflection of stimuli, information, matter, and stimuli must appear at the same time. In sensation, information and things can be indirect relationships, showing a tendency to separate from the prototype of stimuli. Advanced animals have a brain that evolved from the nervous system, and thus have a form of reflection. Higher animals can unify the sensory organs and sensory abilities and form a reflection on the objective environment. This is animal psychology. The third stage is from the animal's feelings and psychology to the generation of human intelligence. Intelligence is not only a product of nature, but also a product of society. From ape to humans, this process is accomplished by constantly changing the social work of the objective world. In the process of social labor, it is necessary to go deep into the inside of things to understand its laws and essences, and the generation of language enables the brain to summarize various sensory materials and improve the ability of abstract thinking. Under the impetus of labor and language, the ape brain becomes the human brain. The human brain is larger than the animal brain, the structure is more complicated, and there are “language centers” and “prefrontal lobe” that the animals do not have, that is a unique form of advanced reflection - human intelligence.

II. THE ESSENCE OF INTELLIGENCE

Dialectical materialism believes that the physiological essence of intelligence is the psychological activity based on the physiological activities of the human brain and nervous system, and intelligence is the reflection of human beings in the objective world in social life. This is the social essence of intelligence.

The first discussion is about the physiological nature of intelligence. A highly complex material system - the human brain lays the physiological foundation for human intelligence. Intelligence relies on a highly organized, highly complex central nervous system and peripheral nervous system centered on the brain, relies on the physiological activities of the entire physiological tissue. The human sense

receives objective information of objective external things, transmitted to the human brain through the nervous system, and the brain stores, analyzes and creates information. This is the transformation from the form of information to the consciousness and thought of human beings. Without this physiological activity of human beings, it is impossible to produce human intelligence. The second is to explore the social nature of intelligence. Human intelligence must be based on social practice. First, the human brain does not automatically generate intelligence. It is only a physiological organization that human beings can produce an active reflection of the objective world. The intelligence generated by the human brain is premised on the input of various information in social practice. Second, human intelligence is a process of penetrating the appearance of objective things in social practice and understanding the inherent nature and laws of things. Third, human intelligence has a strict logical structure and learning mechanism. Fourth, through the understanding of the nature and laws of things, human intelligence can predict the development trend of objective things, and then guide social practice. The study of the essence of human intelligence by dialectical materialism provides a scientific philosophical vision for the development of artificial intelligence.

III. THE EXPLORATION OF "INTELLIGENCE" IN PSYCHOLOGY

In intelligent research, psychology is undoubtedly an important subject. Especially since the birth of cognitive psychology, psychology's research on human intelligence constitutes a very important part of the field of intelligent research. In the past many years, although many people have proposed many definitions and explanations of "intelligence", various arguments have tried to understand "intelligence" through various possible ways and methods. However, the dominant definition of "intelligence" has always been ruled by the traditional view of psychology, that is, intelligence refers to the ability of a subject to perform certain behaviors of a person. Psychologists generally believe that "intelligence" should be defined as the ability to adopt, use, and properly select the environment to achieve a certain development. On this basis, a variety of definitions of "intelligence" have emerged. In the history of psychology, the first representative view is to define the standard of intelligence from the external manifestation of intelligence, and its viewpoint has a strong functionalism. For example, Galton in the United Kingdom seeks to understand "intelligence" in terms of the abilities or skills demonstrated by the mental. He believes that when the intelligent subject distinguishes some significant differences in weight and length, the individual can separate the weight and length in an orderly manner. And can feel that they occur in distinct time and space areas, as well as the different time and space characteristics of weight and length. This ability expressed by the mind is intelligence. A little different from this is that Binet and T. Simon of France believe that intelligence is a term or concept that describes the complex judgment ability. Binet believes that there are three important cognitive abilities that are necessary for "intelligence." The first is the tendentiousness. The agent has tendentiousness to know

about what must be done and how to do it. The second is the ability to adapt, and the agent can choose and continue to complete a task in different environments. The third is the ability to control. The agent has the ability to self-adjust its own judgments and make self-corrections. This kind of intelligent standard emphasizes the external and explicit features of the intelligent concept in content, and better reflects the characteristics of "intelligence" from the intuitive level. Based on this, Binet also designed an intelligent test that can successfully predict children's performance at school. Therefore, the definition of intelligence has a significant impact. The British psychologist Spearman can be said to be a pioneer in the study of intelligence at the same time. He proposes to understand the potential "intelligence" from the three manifestations of information processing. The first is the ability to capture and understand feelings and experiences. The second is the inference and analysis ability of relationships. The third is the inference and analysis ability of relevance. Spearman uses four units (A, B, C, D) to analyze and illustrate the problem and any intelligent processing can be understood based on these four units. He believes that the first process is to code these units, the second process is to point to the relationship between A and B, and the third process is to apply this relationship from C to D, completing an entire process is to complete an intelligent behavior. The famous American psychologist Sternberg used information processing and mathematical models to deconstruct cognitive tasks. After seeing each of the basic elements, components, and basic strategies for completing cognitive tasks, Sternberg believes that if individuals can understand the complex causes and problem-solving tasks in the information processing process, then it is "intelligent". The intelligent standards created by traditional psychologists dominated the early 20th century. In general, these definitions of "intelligence" emphasize the differences in individual functional performance, and thus distinguish between non-intelligence and different levels of intelligence. However, people are far from satisfied with this "functionalist" intelligent description, because traditional psychologists rarely refer to intelligent factors in the identification of intelligent standards, which prompted people to start looking for new approaches to understand intelligence. In the subsequent research, people began to pay attention to the internal factors of intelligence, and tried to define intelligence. This gave birth to the definition of the second type of intelligent standards in the history of psychology. The second type of representative viewpoint attempts to define "intelligence" by explaining the internal structure of intelligence, and its viewpoint fully inherits the western analysis tradition. The description of these intelligent standards uses the analysis method of factors. American psychologist Thurstone believes that cognitive intelligence requires a comprehensive consideration of seven factors. Carroll proposed a three-level intelligent processing model divided into three levels. This hypothesis is generally considered to be a direct result of the development of psychology. In fact, he fully borrowed the internal information processing mechanism of computer networks to illustrate the "intelligence" architecture. He pointed out that the factor *g* with certain ability is at the top, followed by the

more limited cognitive skills at the next level. Each level provides the basic services from the bottom up to the upper level, so that the top layer shows some kind of complex intelligence. In the 1970s, with the formal rise of cognitive science, the method of illustrating intelligent standards from intelligent structures was further developed. Psychologists' definition of "intelligence" not only greatly inspired the study of cognitive science, but psychologists and cognitive scientists also began to analyze the composition of intelligence in a unique way of cognitive science. The core is to apply the intelligence processing ability in cognitive science directly in the experiments of cognitive psychology and other disciplines to define intelligence, and then further use the intelligence test scores of various traditional psychologies to determine the subject's level of intelligence. In this type of work, Hunt's research is particularly representative. Hunter and his colleagues found correlations between various parameters that affect efficiency in information processing tasks such as letter recognition, and scores on psychophysical tests of verbal ability. In this experiment, participants must say any physical feature or name of the same letter, whether or not the letters appear in pairs like AA, Aa, or Ab. This experiment has been used today to test the intelligence of a subject. In order to find the exact definition of intelligence, Hunter et al. used computer simulation to determine these components and basic strategies in complex tasks. These basic components and strategies are specialized intelligent modules. Based on these early studies, Sternberg proposed triarchic theory of intelligence. According to this theory, the basic building blocks of these information processing are used in the experience of adapting, shaping and selecting the environment. He found that the best understanding of intelligence is reflected in the relevant cognitive task unit of the novel or in the process of customary automated processing tasks. After careful experimentation, Sternberg believes that intelligence must include three main aspects: analysis, creation and practical thinking. In contrast, Gardner of Harvard University believes that the structure of intelligence is not a single module, but contains eight distinct intelligent factors: language, mathematical logic, space, musical talent, physical muscle perception, interpersonal, inner and purely naturalistic. Each of these functions is a distinguishable module, and they are more or less independent in the brain. Although Gardner could not design some experiments to directly verify his theoretical model, he proposed various experiments to prove his theory. In recent decades, other intelligent theories have also tried to directly graft information into the physiological processes in the brain, and to reveal the true physiological interpretation of intelligence. For example, Hair and his colleagues used positron emission tomography (PET) tests to obtain electronically scanned images of the individual's brain that typically consume less glucose when dealing with complex tasks. Experiments have shown that people with high IQs are often able to accomplish the same task with less effort than ordinary intelligent people. In 1992, Vernon and Mori attempted to directly connect the measurement speed of nerve conduction with the intelligence. Although these studies have some problems, and have not found a suitable

solution to reproduce the real picture of intelligence, the basic research on intelligence in cognitive science and psychology is still vigorously moving forward. In general, in psychology, the scientific inquiry of intelligence has generally experienced the cognitive process of "from the external to the inner". The choice of different research methods and orientations makes the definition of "intelligence" still unresolved. This inconsistency has also been expressed in different degrees in the philosophy of mind that focuses on intelligent research.

IV. CONCLUSION

For the word "intelligence", people are already familiar with it. Unfortunately, in the discipline of research intelligence, there is no clear definition of "smart" and a consistent definition. On the one hand, the unclear definition of "intelligence" has led to many chaotic theoretical arguments that have hindered the dialogue and integration of relevant disciplines in the study of intelligence. On the other hand, what exactly does "intelligence" point to? Different answers to this question not only form different orientations of intelligent research, determine the ultimate fate of their research results, also make many intelligent researchers often go astray in the wrong intelligent standards and indulge in the wilderness of technical details. This phenomenon is particularly prominent in the study of artificial intelligence (AI). Therefore, answering what is intelligence requires constant exploration.

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