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Original Article

The Creation of Computer Mind

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Abstract - This paper reviews the fundamental principles that dictate a series of necessary design decisions and research in Artificial Intelligence (AI) development. It is proposed that the laws of bionics be used in the creation of the human mind, particularly by maintaining maximum similarity in the creation and development of an artificial brain to the state and development of the human brain during its early years. In this context, the model of the mind (brain) should be closely linked to a general model - a human model with AI in an evolving community of models. The evolution of models with AI can take place through the transfer of positive experiences from one generation of models to their descendants. The article takes a philosophical approach to the issue of creating artificial intelligence.

Keywords - Model of mind, Bionics, Evolution.

1. Introduction

Artificial Intelligence, or more accurately, Artificial Mind (is seen as advisable to use (imitate) the laws of nature in accordance with the principles of bionics. The challenge of constructing an artificial mind will be tackled using technical means, assuming the feasibility of an electronic mind [1]. It is possible that the resulting artificial mind will operate reliably but will significantly differ from a natural one (for instance, in terms of perception and creation of art).

Certain components of the technical device for the future system that simulate the human brain, primarily some sensors, already exist and have achieved a minimum necessary quality level for use in an "artificial mind" system. We propose one of the solutions to the problem of creating a functioning computer mind.

2. Status of the Question

The theoretical, including biological, foundations for creating a thinking brain and constructing a brain model as closely to the human brain as possible are discussed in many papers, primarily in the works of Henri Markram, in his promising project - Human Brain Project (HBP) [2]. The project, which several groups of scientists are working on in addition to Markram and his team, covers the first part of the task of creating an artificial brain. The mechanisms of neuro-physical-chemical interactions between brain neurons and their environment are being studied. It can be said that the processes in the brain are being studied as a subject for modelling.

The second part of this research - creating a functioning model of the brain - represents an equally challenging and science-intensive task for the future. Successfully solving these problems involves obtaining a model of the mind for a human model. Even the first part of this work, obtaining a clear understanding of thought processes in the human brain, identifying all connections in statics and dynamics, neural networks, and neuro-physical-chemical connections (with billions of neurons), will likely require several more years of scientific research.

The proposed creation of a technical Artificial Mind (AM) with all its basic functions, which can be implemented by a computer system without simulating neurons and their interactions, appears to be a simpler task or a first approximation solution. It is proposed to create a model of the human mind primarily using an analogy with the development of a human child's mind.

3. Description of the Object of Modelling

This should allow for gradual improvement in AM, as happens over time with a human child. Simulating the mind of a child aged 1–5 years is easier to achieve with computer programs; later, for example, immediately for a schoolchild, this task appears to be more challenging. It is assumed that, over time, adjustments can be made to the computer programs following the mental development of the child.

Let us first consider in a simplified form the development of a modern human child from the moment of birth.

On their first day of life and for the next 1–2 months, a child has instincts that, except for the fear, later disappear. For about a year, the child develops solely due to the genes they have. Later, they begin to perceive their surroundings. Then, after a year or two, speech emerges two or three words, starting with "mama". Then, relatively quickly, their vocabulary expands, and their pronunciation improves. An important stage in the development of a child's consciousness is the complete differentiation of themselves from the environment and society and the realization of their own self. Next, speech begins to be used by the child not only for communication but also for reflection.

Later, from about 6 to 16 years of age, the child goes through the learning stage. In this stage, the activation of the second main instinct - sexual instinct - is important for a person as it influences human behavior in society directly or indirectly, practically until the end of their life. The adult finds a partner, and they are able to create a new person, for whom the beginning of the life cycle repeats.

To create a model of the mind, the biological cycle must be "embodied in metal", that is, executed and engaged by technical means. Later, the creators of AM (specialists in AI and child psychology) should anticipate the emergence of a community of "models with AM", which evolves at a pace unknown in nature: each new generation should be more advanced than the previous one [3]. To do so, the model with AM seeks a "partner" for itself and, thus, in addition to its main ("service") work, it should deal with the problem of improving "program genes". Note that in the phrase "model with AM, we assume a human model containing a robot with all sensitive elements of sensors, some of which may be located in the human head, while the actual AM includes only the brain containing "inputs" - executive elements of sensors. Allow us (for brevity) to call both the "human model with AM" and simply AM as "AM". The context will make clear what is being referred.

Let us now look in more detail at the development of a human child.

A brief description of the development of the child and their thinking will be given mainly based on the works of J. Piaget [4]. Initially, the child recognizes the actions of people around them and performs their own actions as a result, i.e., the child's awareness of their own actions is linked to imitation and understanding of these actions. The child perceives their own organs and body parts as soon as they begin to control them themselves. The actions of people they see, for example, changes in the room or on the street, are learned by the child faster when they are repeated more often. Changes, both in their body parts and external changes in the environment are better learned by the child if they have already learned their names or other verbal characteristics.

The child gradually becomes aware of the objects they encounter or use most often, for example, in games. It is important to us that the main role in the emergence of their own thinking belongs to imitating those around them and getting their own understanding of objects and actions in the environment. Children's games have a positive influence on the formation of a child's consciousness. At first, these are the simplest individual games; for example, the child builds a house out of cubes, and later, the simplest but collective (hide and seek). Then there are so-called role-playing games, where the child is asked to perform only certain actions. Role-playing games help the child to understand and, to some extent, even evaluate (compared to the children playing with them) their own capabilities, which makes it easier for them to enter the world of adults in the future.

4. Mind Perception Method

Now imagine that an AM has been created that can see and hear, has memory, and can utter speech sounds. It should be noted that the use of terms such as "sees", "hears", and "utters" in reference to AM is a convention introduced for the sake of brevity. More accurately, it should be written that an AM receives visual and auditory information via electronic media and also has the capability to generate speech.

At the onset of its "life", an AM, much like a human child, undergoes a phase of sensitive perception of reality [4]. It receives a certain amount of unfamiliar impressions from its sensors. (The creators are required to establish appropriate connections between the AM and its robot). This marks the beginning of information accumulation, which, while not yet perceived by the AM, already affects the sensors linked to its "internal life" programs.

In the youngest group of kindergarten (ages 3–4), the AM learns basic words alongside the children and participates in their play and outdoor activities. For instance, if the AM hears the Teacher say a simple phrase like "Come here!" accompanied by a beckoning gesture, the AM, just like any child, will understand the meaning of the words (or the first word) and will come to the Teacher with the other children. Subsequently, when the Teacher says, "Come outside!" all the children, including the AM, go outside. AM understood the word "come"... Later, while on the way "home" (to the lab), the "mother" asks the AM ", What happened at kindergarten today?" The AM understands the question, perhaps not all the words, but it grasps the essence and responds: "Outside!" This is because the Teacher had explained that outside is outdoors.

At this initial stage of AM development, its creators should already have a clear understanding of its suitability. A comparison of the achievements of kindergarten children with those of the AM is necessary. A crucial step in creating an AM is the continuous assessment of its progress in imitation and language acquisition. In regular schools, right from the start of education, students' understanding of the material is evaluated from time to time. In this context, monitoring a student's developmental level is considered both in regulated units and, importantly, in our case, relative to a group of students (for instance, a class). To monitor the acquisition of new words and concepts by both the AM and children in kindergarten and at home, it is essential to install and consistently use special devices such as surveillance and listening cameras, which are completely hidden from the children. The data gathered by these devices should provide an assessment of the level at which a specific AM has mastered everything new (words, object names, etc.), both an absolute and relative evaluation in comparison to its peers. This will assist the creators in making adjustments to the programs. Notably, the results of these experiments could provide new insights into child psychology.

From the above example (AM in the younger group of kindergarten), considering the information from the surveillance devices, we can draw a conclusion. For instance, the AM is developing normally, that is, just like all its peers, or more specifically, the AM has understood the meaning of verbal instructions about an action (come) and an object (outside).

Undoubtedly, the AM's mastery of essential initial mental operations related to imitation, such as recognizing objects and actions and understanding them, should be checked several times within the group. This is the sought-after positive effect. It signifies the onset of visual-action concrete-object thinking.

Perhaps experiments on mastering individual words denoting objects and actions can be conducted even before a fully prepared AM is introduced into a social environment like a kindergarten. An operational child-aged AM must learn to associate words received verbally or in written form with real objects and actions that it sees or hears. Before joining a group, the AM might notice that some of its actions have an impact on something (a toy) or someone ("mother, father"), but it may not understand the meaning of these actions.

Even in kindergarten, imitating an event or understanding an event can gradually evolve into the AM's conceptual thinking. Example. Misha pushed the AM, causing it to sway. Then, the AM pushed Misha back, and they both laughed. The next day, on the way to kindergarten, the AM recalled this event and even wanted to reenact it.

Note that mathematics, which broadly helps in operating and enhancing complex technical apparatuses and devices, cannot assist in many of the issues we are examining. The significance of experimentation escalates. The AM's stay in the younger group of kindergarten should continue even after its initial successes in understanding basic words, objects, and actions. The AM should spend some time learning the curriculum alongside all its peers, the children in kindergarten. Such lessons typically include a series of specialized exercises. Let us give an example.

An educational poster depicting various animals is displayed. The names of these animals are also present under the images, but the children cannot read them yet. The children are unfamiliar with the names of animals other than a dog, cat, perhaps a cow, or a horse. They learn the names of other animals, like camel, crocodile, giraffe, etc., from the teacher. The children are then given cards, each featuring a picture of one of these animals. The children are tasked with finding, for example, a swan. The first one to find it says: "I". The game is repeated until all the children have said "I". A similar game involves a ball, where whoever gets the ball in the basket has to say "I". As a result, the children (and the AM) develop an initial understanding of their own individuality and a first idea of how to talk about themselves. To fully grasp reality and transition to purposeful actions, both children and the AM need to learn to express themselves using speech actively.

The learning period in a group of 3–4-year-old children can last for half a year or more, but the AM develops faster. Its period of autistic thinking [4] should end sooner, allowing it to be moved to an older group (4–5 years old). The assumption that the AM will quickly grasp a first understanding of itself is based on the fact that by the time it enters kindergarten, it can essentially read. For instance, the aforementioned poster with images of animals and their names was previously "read" by it. In its memory, in both written and verbal (audial) form, there are all the words and images it has acquired from its "genes". Unlike kindergarten children, the AM is merely translating its potential knowledge into actual knowledge. Now that the AM has learned the pronunciation of words, it can read the captions out loud. Having gained an understanding of the function of the word "I" through numerous game examples, when asked "at home" or "Who scattered around the cubes?" The AM will respond: "I". It is crucial that the AM has a converter for verbally received information (which is memorized) into written form. New words heard in the group are compared with a sound recording received in the genes or heard earlier, for example, spoken by the Teacher, and with a written text, also received from "parents in the genes" and later, when mastering reading texts, from educational literature.

Consequently, the computer must have programs that facilitate the conversion of written information received by the AM into verbal form and verbal into written form. Various computer models of the brain have been published for a long time, and some of them (e.g. [5, 6]) can be adopted for our suggestions.

Imitating adults and each other in kindergarten, as well as the social environment - the group - are two crucial factors that should lay the foundation for the AM's own perception of its capabilities to make decisions, initially, for example, to ask or say something. These two factors activate, initially partially, the information or (potential) knowledge that is already in its memory. It is worth noting the significance of teaching the AM immediately after its birth before it starts absorbing other, possibly random, information.

There have been several accounts in literature of human infants being raised by animals (most often wolves), after which the children are returned to humans. However, these children are unable to learn human speech and often cannot even walk upright. These reports have not been scientifically validated yet, but they have not been disproved either. Viewing these instances as a natural experiment, we highlight the significance of considering the early years of human life when developing an AM.

In the group of 4–5-year-old children, the visual-figurative type of information comprehension should emerge and be cultivated [4]; specifically, teaching the AM drawing techniques is crucial for figurative thinking. Let us extend the comparison of the developmental stage of kindergarten children with the AM. It is often no use asking a sick 1–2-year-old child: "Where does it hurt?" whereas a 4–5-year-old child can respond to such a question. Hence, the AM whose development aligns with that of children who have finished kindergarten might provide valuable insights for AM creators.

Presumably, the preschool period of AM mastering basic life skills that its peers possess can be considered as understanding the simplest cause-effect rule: "if-then". The Teacher frequently suggests the application of this logical rule. For instance, "Mark, if you stop throwing the ball and sit down, I will tell everyone a story." The widely adopted rule of cause and effect, the beginning of AM mastering logic, and the onset of consciousness. Consciousness is a term that requires a specific explanation. David C. Chalmers [7], a scholar who researches the theory of consciousness and has published seminal works on this subject, believes it is crucial to study consciousness and refine this term. We will deem it sufficient to practically define the term as the existence of logic in the human mind that sets humans apart from the animal kingdom.

Various scientists have proposed computer models of the brain [5, 6]. The suggested models presume a two-way connection between AM and the human model, i.e., with one's own body, as well as a two-way connection with the outside world - the environment. Besides these connections, we assume that two primary instincts should influence the AM-brain model: the fear instinct, from birth and throughout "life", and the sexual instinct, from when the human model becomes "adult" and needs to care for offspring. Instincts are directly incorporated into the AM. These connections are one-way. The AM - a computer model of the brain - should also possess a General State Organ (GSO) of "mind and body", confirming the well-being ("health") of all human model organs, ranging from ill-being of various degrees of severity to "joy".

Moreover, the AM should regularly receive an evaluation of its achievements from the community (group), which also impacts the GSO and is crucial for the AM, for instance, when selecting a partner for reproduction. In childhood, the AM's "discomfort" signals could be triggered by, for example, insufficient energy supply to the "mechanical" organs, arms, and legs, which the GSO interprets as a "sense of hunger", for instance. For illustration, let us assume that a special device is constructed containing a sensitive element, such as a container with a liquid, the state parameters of which (pressure, temperature, density, etc.) depend on the deviation of the model parameters from the norm. In this case, a deviation from the norm, like the loudness of the AM's voice, may not be accidental but deliberately done by the AM to be heard. Example: The AM would like to communicate its suggestions ("let us play"), but the listeners did not react. The AM's "feelings" are represented as the AM's "emotions" and should trigger an amplitude) from the normal state across all set parameters response from the GSO. The GSO should have high precision to respond to various, even minor deviations (in our example, an increase in sound Undoubtedly, all functions of the GSO could be performed by a computer instead, whose programs measure all parameters received from the model's sensors with the AM, without creating a special device.

It should be noted that the appearance and physical abilities of the AM model should fully align with the general attributes of the group it is part of (height, education level, language, etc.). These requirements are applicable to both kindergarten and school, as well as to adult groups. After successfully understanding at least one spoken language and basic logic, the AM can start learning in the first grade of primary school.

The education of the AM in school (preparatory school), like in kindergarten, will proceed at an accelerated rate. The AM will be a student with nearly perfect memory, with potential knowledge of many textbooks and books, providing them with overall development and knowledge of the material studied in school, including languages. In school, there is no need for "eavesdropping" and "peeping" devices, as the necessary information for the creators can be provided directly by the AM and its Teachers.

During the AM's education, its body model (robot) should also change, for example, in height: kindergarten (two or three times), school (twice). It is also possible that after finishing high school, height and other parameters are chosen for a robot with an AM depending on the future work field: geology, mechanics, cooking, etc., or continuing education. After the model with an AM successfully finishes school, it can be considered that an artificial human with an AM (or "human model with AI") has been created [1].

Next, it seems necessary for the creators of the first "humans with an AM" samples to thoroughly study them, making necessary improvements to computer programs, sensors, and robots. Later on, it may be advisable to transition to a small series production of "Children with an AM".

The adult AM will work in the regular team of the institution, according to its specialty and education. Once a significant number of AMs have appeared in a given institution and other enterprises, "self-replication" of AMs should begin.

For this, we have previously proposed an evolutionary method - modelling the natural reproduction of AMs, transferring "genes", i.e., program blocks or modules from the parent AM to the offspring. In more detail, using simplified Mendel's laws, this evolution is considered in our article [3]. In this case, the "parents" of AMs choose the best from two blocks of their programs. Initially with the help of AM creators, then independently. Parents can also replace their own program blocks in the offspring with new, better samples known to them. After the emergence of a significant number of AMs as a species of artificial beings, it can be assumed that the modified laws of evolution will apply to their reproduction.

5. Discussion

Today, computer systems and human elements have already been proposed. These systems, for example, (programs which perform all known functions of the brain [4, 5]) are considered in detail in the monograph [8]. However, all these systems cannot understand and think over speech. They cannot think.

A method based on the laws of bionics is proposed, the implementation of which should lead to the creation of artificial intelligence. The method is actually a detailed program of the necessary experimental research. The result of the sequential implementation of the program of experiments should be confirmation of the assimilation by the computer Artificial Mind (AM) of the lessons that are learned by children in his group.

We propose a method based on the laws of bionics, the implementation of which should lead to the creation of artificial intelligence. The method is actually a detailed program of the necessary experimental research. The result of the sequential implementation of the program of experiments should be confirmation of the assimilation by the computer Artificial Mind (AM) of the lessons that are learned by children in his group. In lessons, which most often consist of conversations with the teacher (educator) in the form of joint games and walks, first of all, it is clarified that there is actual assimilation of AM speech, the conditions for joint speech with the teacher.

The improvement of speech, its gradual use for thinking, and the appearance of elementary logic in AM, as in the children of his "peers", will allow, using the developed computer systems, to "grow" a model of a person with artificial intelligence.

6. Conclusion

A method is proposed, and ways of its implementation are outlined to create an artificial computer intelligence (AI) similar to the human mind. The method provides for the creation of conditions for the emergence and growth of the mind of Artificial Mind (AM) in a group of children. This takes into account the possible diversity of children and their caregivers in the specific conditions of the kindergarten. The implementation of the method should lead to the creation of an artificial mind capable of further development and improvement. We are not aware of such supposed results in the scientific literature.

The proposed method of gradual improvement of AM, following the immanent mental growth of a child, involves not only improving the AM computer software but also simultaneously increasing our knowledge about the sequence and necessary conditions for children's mental development.

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