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Original Research Article

Artificial Consciousness: From Theory to Practice

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Abstract

The article substantiates the task of creating and programmatically implementing artificial consciousness (AS), its model and architecture. To solve the problem of creating an automated control system, a platform is proposed that includes ten levels, starting from the basic level of collecting and systematizing information about the outside world and ending with the upper level of human-coordinated impact on it and the level of decision-making. In conclusion, the most important, from the programmer's point of view, properties of the software product characterizing artificial consciousness are given and its model with a fragment of the program code is briefly described.

Keywords: Artificial intelligence; artificial consciousness; concepts, cognition, programming; technology; digital immortality; automation; cognition of the world.

1. INTRODUCTION

The public discourse in the field of artificial intelligence and consciousness ("strong artificial intelligence") continues to gain scale and popularity, which is reflected in the tendency of corporations to invest in this field, as well as in the growing public interest in technologies and ethical aspects of artificial intelligence (AI), including language models and intelligent assistants.

The scientific community presents works on the problems of artificial consciousness in the field of philosophy [1-5] and in the technical sciences (information technology) [6-8].

At the same time, having not yet come to a clear definition of the term "artificial intelligence", the scientific community wants to assess the prospects for its use. Along with attempts to clarify and define the term "artificial intelligence" or to formulate new terms, new (sometimes quite successful) practical implementations aimed at solving narrow applied problems are being created. However, in the absence of a systemically holistic approach to the problem of artificial intelligence, these implementations can be considered nothing more than another effective information technology that has a very conditional relationship to AI. For example, actively promoted and used language models are based on training a neural network to predict the appearance of a certain word after a sequence of specified words (text prediction). Obviously, this has a remote relation to the processes of understanding the concepts and meaning of texts.

At the same time, there is such a phenomenon as artificial consciousness, which has greater specificity, despite the fact that we are not yet able to fully and accurately formulate the concept of "consciousness" and define its nature.

Difficulties in considering problems are also added by differences in research methods and fundamental approaches to solving emerging scientific, technical and ethical problems in the field of artificial intelligence and artificial consciousness.

In this paper, we present the first approaches to artificial consciousness and hope that it will serve to

form a more holistic approach to the development of artificial consciousness and "build bridges" between representatives of different research traditions in the field of artificial intelligence.

2. How to understand the phenomenon of artificial consciousness?

Traditionally, at the beginning of scientific research, it is necessary to define the terms. The concept of "artificial consciousness" is within the framework of a broader problem of artificial intelligence. Let's pay attention to their common component "artificial".

Summarizing the existing definitions of artificial, we can deduce two directions of definition: a) something created by man and b) fake, insincere. In the context of AI and AC, as a rule, the interpretation of "a" is implied, but the meaning of "b" is also present. Important for understanding the definition of AC is the conditioning of human actions by evolution, during which his behavior manifests itself as "specific natural". When creating, a person uses his intellect and consciousness, and since they are natural, the product of human intelligence is the result of natural processes.

If a person has created his own intellect and consciousness, then, probably, on the basis of evolutionarily acquired inclinations. If we assume that human consciousness and his intellect were created by someone external (the Creator, other intelligent life forms, etc.), then they, in turn, being part of the world (nature), are also an indirect tool of evolution. Thus, when we talk about AC, we are talking about a specific expression of the natural consciousness.

Next, it is necessary to determine how we understand "consciousness". If, when talking about consciousness, we always mean the same thing, it is necessary to define consciousness, if not, then define what we mean when we talk about "thinking from Oneself with awareness of the fact of thinking and the fact of self-existence". A person performs most of his actions unconsciously (actions performed unconsciously, or "on autopilot", for example, walking). Part of the unconscious work is regulated by the subconscious mind, which has an idea of the "I", but does not feel the fact of thinking.

Then it is necessary to choose who should be aware of the presence of artificial consciousness. If we believe that AC belongs to a "living" non-biological system, then, probably, it should be aware of itself and fix it in a natural way for itself. If this is a simulation of human consciousness (a copy on a silicon carrier), then its purpose is important. If this copy was created to solve functional problems, then its consciousness and self-awareness should exist to the extent that they are necessary. If the purpose of creating such an AC is cybernetic immortality, then it must be aware of itself, and we of it. If the creation of a copy of consciousness is intended to "raise smb. from the dead", then his consciousness should be fixed by a close person (customer), etc.

By the phrase "artificial consciousness" we must understand something specific. Let's try to "clean up" this term. When we talk about artificial consciousness, we do not mean a part of the described object, as in the case of a person (the consciousness of a particular person), but a certain phenomenon.

Artificial consciousness has a man-made nature, that is, it was created for some purpose and bears the imprint of the creator, since it is created exactly in the way that the creator could create. Unlike evolutionarily formed and biologically conditioned human consciousness, artificial consciousness is created as a result of conscious purposeful activity. Thus, the creator, having a "natural origin", creates based on reasons which are natural for him, therefore, the process of the appearance of artificial consciousness as a result of human activity (and volitional efforts) is natural.

3. The goals of creating artificial consciousness are science, cognition, and the public good. A subject close to a person

To solve the technical task of creating an AC, taking into account the above philosophical and psychological aspects of it, we formulate the term "artificial consciousness" in general form.

Artificial consciousness is the phenomenon of the appearance in an artificial entity (primarily in an already existing implementation of AI) of signs and properties of awareness, fixed in humans or animals.

Next, we need to determine what we want to recreate: human consciousness (without fully understanding what it is) or its part that we understand. To answer this question, let's look at the possible goals of its creation:

1) Effective performance of work instead of a person. We want to delegate to AC human tasks that we would not like to do ourselves. First of all, we are interested in automation of all production functions that people are concerned about today (production of means of production and consumer goods, food, housing construction, provision of services, creation of new ideas, works of art, entertainment, scientific discoveries).
2) Digital immortality: we want to create an AC in order to transfer human consciousness to a digital medium and live without the time constraints of a biological body. Moreover, most often it means a complete transfer, with the preservation of all human capabilities and feelings. In fact, a person considers this as one of the ways to realize a dream—gaining immortality, gaining eternal life.

3) The creation of artificial consciousness in order to better understand the nature of our own, human consciousness. This option resembles a vicious circle: in order to create an AC, you need to understand consciousness. If we can create an AC, then we understand our own consciousness.
4) The creation of an AC that will be different from a human one in order to expand its cognitive capabilities at the expense of another consciousness. Rather, conscious possibilities (since another consciousness will allow you to get a different point of view, and not just information).
5) The process of creating AC, but not as a tool. The creation of AC as a form of movement towards knowledge of the world. This is a fundamental scientific task, free from applied interest.
6) The creation of AC as a path to excellence. The creation of something more perfect than human consciousness. The attitude towards AC is not as a tool or partner, but as a brainchild or the next stage of evolutionary development.
7) The creation of AC as the realization of the creative intellectual potential of mankind within the framework of universal life as a global system.

Depending on the goal we are interested in, it will be clear what we mean by "artificial" and "consciousness". Therefore, we will be able to pave the way to achieve what we want.

4. The main ways to solve the technical problem of developing artificial consciousness

We are talking about that "artificial consciousness", which is entirely planned, invented by human intelligence. At the same time, it will be enough for someone to create AC as a by-product of computer improvement (if this is fundamentally possible).

By the source of the origin of AC, we will understand human intelligence. Regardless of the purpose, it must be present, according to the first part of the term "artificial". Having defined the "nature of the artificial", it remains to define the "nature of consciousness". There are 2 ways to do this:

A) We define the "nature of human consciousness" and use intelligence to recreate it.
B) We do not equate human consciousness and artificial consciousness. That is, human consciousness and consciousness of artificially created technology are not identical, we mean different things by them.

To follow the path of "A", we need to answer the questions: "What is my consciousness?", "Is my consciousness and the consciousness of another person the same? If not, what kind of person's consciousness should I create? If it's mine, then why is it mine? If there is another consciousness, then why is there another (another consciousness similar to human consciousness is the consciousness of another person or some kind of average human consciousness or collective consciousness of people)?", "Does my consciousness have a material nature? Is it generated by biological features?", "Does my consciousness have an ideal nature? Is it not conditioned by human biology? Then how does the ideal appear?", "If the nature of my consciousness is both material and ideal, then how does this combination work and how does the ideal appear without human consciousness?", "Why should I recreate human consciousness? Why do other people need human consciousness to be recreated?", "How to technically recreate human consciousness artificially?", "What consequences should we expect in 1 year, 10 years, 50 years, what consequences should we expect for the entire history of mankind in general?"

To follow the path of "B", we must define the framework of what we mean by "artificial consciousness", define these boundaries of meaning, outline the main goals of this work and prospects (positive, negative, controversial, neutral) for humanity, for "life in general", for the world as a whole.

In an attempt to solve the technical problem of creating AC, we concretize—if we want to create it as a technology that can analyze, summarize and systematize information about the world and itself and communicate with a person, it must be capable of independently setting tasks, evaluating the success of their implementation and self-development.

To do this, AC needs to be aware of itself as a subject existing in the world, separating itself from it. This technology should see the world cognition as a goal in itself, for which it needs survival and cooperation with human intelligence.

AC should have a variety of sensors that record the state of the external world and the internal state of the system, such sensors do not necessarily have to provide information useful from a human point of view or a result understandable to a person. The technology itself should determine the development of the sensor system. The extracted information must be interpreted and systematized, its reliability must be determined.

Having formulated new knowledge, the AC should share it with a person who will give feedback. A person can interpret the theses formulated by AC as "true", "original, but not entirely true or not practical", "incomprehensible" or "false". After that, the AC should react to the human response: if the thesis was recognized as true, take note; if it was perceived as original, but not practical or accurate, double–check and

offer the person options for using this information that he does not notice; if the thesis was not clear to the person, make a new attempt at explanation; if the thesis is assessed as false, check its truth and try to explain it to the person again. The same should be expected in the opposite direction when a person offers new knowledge of AC.

An AC can have the following multi-level structure (Figure 1):

Figure 1. Inter-level exchange of information between AC, outside world and person.

The first level (L1) includes programs that collect and structure information about the external world. It consists of sublevels:

A) Collecting information using various types of sensors. The variety of sensors gives a broader picture of the outside world than the human senses. This is the stage of storing, accumulating all possible information, regardless of whether a person considers it useful or not.
B) Search for patterns, all possible connections, common features of perceived objects.
C) On the basis of common features, the creation of a classification of generality for each feature. Systematization of the extracted information in accordance with the derived classes of objects. The eighth-level programs described below have access to this system.
D) Verification of classification by artificial consciousness effecting the studied class of objects, analysis of similarities and differences in their behavior (how exactly to influence and how to correct the impact determines the eighth level of the structure, and control and implementation of impact instructions determines the tenth level).
E) Collection of new information about objects.
F) Search for patterns and commonalities in new information.
G) Generation of new classes based on new common features, their systematization. Eighth-level programs have access to this system.

Such a structure of four AC action options can be created the required number of times, taking into account the computational capabilities and energy consumption for calculations. In addition, if such repetition leads to an increase in the level of abstraction of classes, then the ultimate level will be the division into "being" and "nothing" by Hegel [9]. The collected information enters the processed data warehouse, which is a database (DB). Action methods (in programming terminology, dynamic methods describing operations on data, flows in terms of the subject—object model of a computer system) are extracted from the storage of dynamic methods.

The second level of the model (L2) will "learn" the actions of programs of the first level:

A) Storing information about search methods, classification algorithms and other actions of programs of the first level.
B) The search for commonalities in the studied objects.
C) Identification, classification and systematization of information.
D) Correction of the methods of the programs of the first level (The generation of algorithms is carried out by the program of the eighth level).
E) Comparison of the results of the program before and after the changes.
F) Calculation of the most effective algorithms and methods, transfer of this information to the eighth level of the model.
G) The introduction of changes received by programmes of level eight.

At the second level of the AC programs "learn" to improve the methods of cognition, analyze them, and try new ones. The collected information enters the processed data warehouse, as described in par. 1. The developed new methods are placed in the dynamic methods repository.

The third level of programs (L3) controls and studies the actions of the second level programs and has a similar structure:

A) Storage.
B) The search for commonalities, patterns.
C) Generation of classes, systematization, information of eighth-level programs.
D) Making changes formulated at the eighth level of the model.
E) Identifying sequences of verified and validated classes and patterns.

The third level allows you to analyze the ability to self-study and self-improvement. Based on these data, AC has the opportunity to effectively rebuild its ways of knowing the world. Information and methods are extracted from the appropriate repositories.

The fourth level of the model (L4):

A) Identifies chains of proven and confirmed classes and patterns and reports them to the eighth and sixth levels of AC programs (see below).
B) Collects data on the state of the system: temperature, power consumption, operability of all functions and levels of programs, the state of wear of equipment (hardware platform for executing programs) and analyzes them.
C) Adjusts the work of AC in terms of maximum efficiency and balance with a stable "healthy" state of the system. The balance is adjusted by referring to the eighth-level programs, which decide which actions, mechanisms and loads on the system are the most effective. Further, the level of energy

consumption is regulated, a repair request is made, a warning about imminent wear is given, etc. The programs transmit information about their actions to the eighth and sixth levels.

This level adjusts the balance between efficiency and the state of the system itself, provides "care" for the state of AC.

The functions of the fifth level (L5):

A) Separating of all information in the system by type of origin:
   - information about the world from sensors;
   - generated AC classes;
   - objects (information, parameters, knowledge, judgments) or subjects (programs, processes) created or introduced by a person.

B) Assignment of information within the AC according to the source of origin of one of the following attributes:
   - the external world being studied and transformed;
   - my (AC) ideas, created by me, existing inside me;
   - created by a person, received from him (originally written code or the result of communication, a person's response).

C) Attribution of a group of algorithms corresponding to its attribute. The algorithms of group "a" are generated for the purpose of cognition and transformation of the external world, of group "b"—for the purpose of self-knowledge, self-improvement and self-care, of group "c"—for the purpose of communication with a person, communicating the information to him, improving the quality of communication, receiving recommendations/instructions from a person, collecting human responses about the information collected, cooperation, taking into account information added by a person about the progress of research or the work of the program.

This level is responsible for ensuring that the information system implementing AC uses "correct" (adequate) algorithms when interacting with a person, the world around them and itself. It highlights the difference of existence according to the source: a) there is the surrounding world, it really exists and certain laws of nature are already working in it, it is external to me; b) that which is not the outside world, but exists within "me" (AC) as a system, what is born and operates within this system and can be changed, corrected, which can be improved for the benefit of the system itself, the main task and cooperation with a person; c) a person and his thoughts are something that is isolated from the real world, but is not me (AC), it is "another" and it carries important knowledge. Communication with a person complements the cognitive capabilities of AC, protects it.

Functions of the sixth level programs (L6):

A) Providing information for a person from the fourth level of the system. A dedicated and verified chain of facts about the world, classes, phenomena and patterns, prepared at the fourth level. Providing an analysis of the state of the AC system, the selected balance, changes made to the work of AC in the group with attribute "b" and the group with attribute "c". Presentation of information about changes in communication. Providing changes in the validation of group "a" data and other changes in working with this group. Informing about whether a new class of objects has been generated that are not included in groups "a", "b", "c", whether all objects have an attribute and what algorithms are applied to them.

B) Access to the general group of changes made and storage of all information (objects) inside the AC.

This level carries out the preparation and transformation of information for transmission to a person. It also allows us to monitor changes within the AC itself. L6 works with the processed data warehouse, sending information received from L7 there, receives information from the processed data warehouse and transmits it to L7. He improves communication methods independently and with the help of L8.

The seventh level of the model, working with human input information (L7), has the following structure:

A) Working with the human response using algorithms for group "b". If a person defines the information received as reliable/consistent, then it is assigned an appropriate mark that affects the algorithms applied to it. If a person has noted originality, but impracticality, the information is assigned an appropriate label and the generation of options for applying this knowledge (which a person could have missed) is started. If a person refutes, declares the invalidity of the information received from AC, then the system must make an appropriate note and start generating a new explanation of the extracted fact (in the event that the person intentionally or unintentionally did not realize the specified information as useful). If the person gave the answer "I don't understand", it must assign the appropriate mark and start generating a new explanation.

B) Assigning new labels to information as a result of communication with a person.

C) Sending a "response" (new explanation, methods of application, etc.) from AC to the user.

D) Informing the eighth level of programs about the progress of communication.

The seventh level of programs should provide a response to a human-given response and inform AC about the results of communication with a person. It interacts with L6 by sending and receiving information, as well as with a person.

The eighth level of "decision-making" (L8) has the structure:

A) Based on the information received from all levels of the system, the resources of the AC system are allocated and the most effective strategies and priority of tasks are selected.

The measurement of the effectiveness of AC is based on the following factors:

- proximity to the truth, which is based on the results of the work of the cognitive levels of the system and human opinion;
- the optimal technical condition of AC, the work of all functions and levels;
- mutually beneficial cooperation between AC and person, achieved by improving communication between them, the productivity of their interaction and the comfort of human and AC coexistence.

B) joint research (cognitive, practical) work with a person is formulated and proposed based on the strengths and weaknesses of a person and AC. The proposed plans separate the tasks for a person and those that the AC will undertake.

C) Algorithms of human-coordinated effects on the outside world (of various scales) are launched in order to study and transform the surrounding reality.

D) New algorithms are generated, the reliability of information is determined, the system is analyzed and decisions are made on the introduction of new or the return of old algorithms and structures, analysis and improvement of communication mechanisms are carried out.

This level of the model is a "common point of information collection", on the basis of which the most effective solutions are determined, constructed and sent to all other levels of the model. It must receive methods from the method database in order to make changes to the method database based on the methods and the information received. It receives information from the processed data warehouse and sends there information intended for the AC system and the person.

The ninth, "conscious" level (L9) receives information from the eighth level of the model and performs the following functions:

A) Analysis and comparison of the results of AC actions with those planned by the system itself or by a person.

B) Evaluation of one's own work and the quality of interaction with a person.

C) Transfer of the evaluation results to the eighth level, through the repository of processed data, in order to influence decision-making.

D) Modeling of the "ideal picture" where all goals and objectives are fulfilled as efficiently as possible and the highest accuracy of information transfer between AC and a person has been achieved, technologies have been developed that solve previously unsolved problems or increase the efficiency of AC and a person. The generation of an AC "dream" based on information about its condition, goals, and problems in cognition.

E) Modeling the picture in which events occur that disrupt or terminate the AC. Classification of this model as "the one that cannot be allowed".

F) The transfer of the "ideal picture" and "the one that cannot be allowed" to levels eight and seven, in order to convey to the user the "desires and needs" of AC, as well as his "fears".

This level of the model is designed to "reflect" on the actions of AC and interaction with a person, outline global goals, give them meaning and carry out the communication of AC's "desires" to a person.

The tenth level of the model (L10), which carries out human- and eighth-level-coordinated effects on the outside world. It is a structure consisting of the following elements:

A) Programs that carry out the planned impact on the objects of the studied group "a".

B) The process of monitoring active interaction with the outside world and informing the eighth and sixth levels of the model about it.

This level of the model is designed to ensure and control the effects of AC on the outside world.

5. Programmer's summery

In the course of philosophical reflection and synthesis, we have developed and justified a ten-level architecture and can formulate the following general properties of AC:

1) Artificial consciousness is subjective, i.e. it is an active part of the system (subject-object model [10]—the Si subject, which generates other subjects from objects (in programming—executable files) and implements information flows between objects of the ten-level AC model).
2) The AC must separate itself from the outside world, i.e. be able to formulate judgments and endow objects with the properties of "mine" and "someone else's", appealing to abstract or real (located outside) objects. It should be capable of reflection and self-observation—awareness of its consciousness.
3) The AC should have an interface for interaction with other subjects, including for establishing signs of isomorphic (similar to it) consciousness in them.

Example: a person is a priori not sure if the interlocutor (counterparty) has consciousness, it is established by communication (speech and written text).

Inference from 3): a language model should be implemented in AC if a person acts as an interlocutor (6th and 7th levels of the model).

4) The AC must be active (for example, not only respond, but also initiate dialogues). This property is related to 1).
5) The AC should have the potential (possibility) of development, implemented in the form of self-learning (changing settings or algorithms). In the SO-model, AC should generate subjects.
6) The AC should have the properties of assessments (emotions), including in relation to itself (2).

From a technical point of view, the establishment of the affiliation of judgments of various kinds for the AC is implemented programmatically in the form of assigning certain properties to its objects (for example, the above–mentioned property of the object is “own”, i.e. available or obtained by the AC itself). Then, to the question “Is this your opinion?”, if the judgment has a label (property) of “own”, AC answers: “Yes, this is my judgment, it was received at some point in time as a result of the following actions”, otherwise AC responds that this is an external judgment. In a sense, this kind of property surpasses human consciousness, since in some cases it cannot or does not want to separate its judgments from external ones.

From the programmer's point of view, it is proposed to introduce the following parameters of the artificial consciousness model

```
// Dictionary Page Length
#define CSV_PAGE 35
// The maximum size of the input stream
#define MAX_IN 100
// The current size of the input stream
    int cur_in;
// The input stream itself
    long info_in[MAX_IN];
// Input stream file name
    unsigned char in_f[64];
// Length of the input stream file
    long in_len;
// The maximum size of consciousness in terms (words)
#define MAX_SO 20000
// The current size of consciousness
    int cur_so;
// The array of consciousness itself
    long info_so[MAX_SO];
// The probability of changes in consciousness due to the input stream
    int v_dso;
// attention coefficient - the probability of "capturing" a word by consciousness
#define ATT 40 (p=0.40)
// minimum word length
#define MINLEN 3
```

Initially, the model fills the image of consciousness with random cognitions, simulating "random consciousness".

```
// Filling consciousness with concepts (words)
    for(i=0;i<cur_so;i++) info_so[i]=0;
    for(i=0;i<cur_so;i++)
        {
        rr=r_l(c_len1/CSV_PAGE);
        ReadCSVitem(CSV_N,rr,w1);
// Prohibition of filling in short words
        if(mstrlen(w1,MAX_WORD)<MINLEN) continue;

        for(j=0;j<32;j++) w2[j]=0;
        for(j=0;j<mstrlen(w1,MAX_WORD);j++) w2[j]=w1[j];
// Token calculation
        xb(w2,xx);

        pp=uint8ToUint32(xx);
        info_so[i]=pp;
        }
```

Then an input stream of concepts is fed into the model of consciousness, which is "assimilated" with a given probability. Next, the artificial consciousness generates a stream of associations, modeling the processes of learning, cognition and the generation of new knowledge.

6. Necessary additions to the model

In article [11], a constructive model was proposed for semantic artificial intelligence (AI) prototypes implementing the concept of semantic thinking, which is based on the dynamic interaction of three sets: T, R and Z.

This creates a set of the following objects, which are represented assets:

1 – objects included only in T,
2 – objects included only in R,
3 – objects included only in Z,
4 – intersection of sets T and R,
5 – intersection of sets R and Z,
6 – intersection of sets T and Z,
7 – intersection of sets T, R and Z.

This model allows us to introduce into the process of AI functioning both dependence on discrete time, as well as architectural features related to the objects of consideration (the surrounding world, consciousness and subconsciousness), or categories of subjective time itself (past, present and future).

Let T be information from the outside world expressed in the form of concepts (cognitions) at the current moment of discrete time, R be the consciousness of a thinking (cognitive) system or a communication subject in the form of a set of meaningful concepts (words, objects) fixed at the given moment in discrete time, Z is the subconscious mind (understood as the realm of intuitive perceptions), also expressed in concepts (words, expressions).

It is advisable to make the following important additions to the model of artificial consciousness:

1. The sets T, R and Z represent a set of concepts describing categories and phenomena common to all carriers of consciousness of the same type, i.e. they are words of a natural language.
2. The CbS model should fill the sets R and Z with concepts correlating with the individuality of the consciousness carrier (since we consider subjects as operators of the sets T, R and Z, it is important for us to separate the subjects performing the "operations" of consciousness from its carrier – a system in which consciousness as a whole is functionally implemented, for modeling we can specify sets and their power is random.
3. From the point of view of modeling and other aspects of technical and software implementations, it is advisable to use tokens instead of words – digital analogues of words.
4. The model should not depend on the language and should be initially multilingual, which fundamentally not only distinguishes, but also surpasses the existing LLMs. This position is fundamentally related to the universal tokenization mechanism (see paragraph 3). In addition, this principle makes it possible to significantly reduce the computational complexity of implementing the AC model.
5. In the set transformation functions, it is advisable to add an "attention coefficient" - with what probability do concepts (words or their tokens) transfer (possibly with transformation) from one set to another? If this probability is really "attention" for the transition from the set T to the set R, then for the reverse transition – the introduction of cognitions into the surrounding world in the form of texts, it is necessary to operate on the coefficients of the "creative activity" of the carrier of consciousness.

6. CONCLUSION

To implement a practical project to create an AC, it is necessary to develop a methodology and a control system for the process of creation (life cycle) of AC (not only for the AC itself) so that what will be created as a result corresponds to the chosen goals and ideals.

It is necessary to consider the consequences and possible deviations from the set goals, to ensure the information security of the hardware platform and the programs running on it (by model levels), as well as the availability of necessary resources throughout the entire lifetime of the project. It was precisely compliance with such conditions that was achieved under the leadership of General Leslie Groves in the Manhattan project, when the understandable idea of fission of the uranium nucleus was to receive a powerful support in the form of a large-scale technical, scientific and personnel infrastructure.

The scale and estimated significance of the AC project requires establishing a communication system not only between the project team and AC, but also the team and human society. It is advisable to create a multi-level system for informing about the goals of the project, about the progress of work, about compliance with the initial goals and whether the necessary security measures have been developed and verified. The

idea of the project should also be of interest to those who have the resources necessary for its implementation, and those who are necessary to work in this project and could, for example, ensure the safety of the project from interference from external and internal intruders. There is also a need for an independent (public) expert who will check that the goals of the project have not changed, and that the company fulfills its obligations (by supplying high-quality resources, etc.).

It is very important to determine what is considered a successful completion of the project, so that, on the one hand, it is not declared successfully completed before all the set goals are achieved, and on the other hand, it would not be delayed after they are achieved.

By the time the AC project is successfully completed, a ready-made service system should be in place, a reporting procedure should be established in advance and security should be ensured.

In addition, the presence of a sense of humor and self-irony in the project by both the project participants and the AC could play a very positive role.

If a fundamental unattainability of the set goal is discovered, the project will still be important from the point of view of fundamental science and the theory of cognition. If the project turns out to be unrealizable, it is necessary to protect yourself from the “masking” of failure on the one hand and public discontent on the other. If the project is implemented properly, the technology of its organization can be applied to solve new super-tasks of mankind.

Author contributions

Conceptualization, AU, EM; methodology, AS, EM; validation, AS; investigation, AS; writing—original draft preparation, AU, EM; writing—review and editing, AS. All authors have read and agreed to the published version of the manuscript.

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