Graphic search model for analyzing search solution of task by specialists

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Abstract. The article describes the concept of creating an assistant system that allows to use patterns of behavior. The information pattern of actions is dynamic and changing each time of selected computing period with the manifestation of multiple signs of similarity of new received information with the existing. The advantage of the method used is an optimization mechanism that uses human capabilities to recognize and extract valuable information from the overall received stream by analyzing only the areas on which the user's gaze is focused. Thus, the analysis of really important information is carried out, greatly simplifying the work of recognition algorithms. By the nature of the movement and the amount of time the gaze is focused on the object, it is relatively easy to determine whether the information is important for the user, whether the same or similar information has been encountered before, whether it has been read, as well as its characteristics, which are complexity and completeness. The secondary level of information processing is the construction an associative table what's allowing to obtain a compressed volume of information interacting directly with user of system by associative dependences of consciousness and his reaction to external familiar stimulus.

1. Introduction

Currently, there are several unresolved problems in creating AI. The use of technologies that transfer part of the tasks from computing power to a person will make it possible to create a symbiotic system that expands the capabilities of human consciousness, complementing them with operational calculations and analysis of what is happening along with the optimization biological memory. The starting point for the possibility of creating such systems is the development of mass and cheaper augmented reality systems, mobile, peripheral devices and cybernetic implants. An important characteristic for the developed concept is the energy efficiency and compactness of the system, which allows it to work even when communication networks and other services are unavailable.

One of the most controversial ideas is Elon Musk's Neuralink project, which develops a technology for implanting thousands of electrodes in the cerebral cortex, allowing the simplest functions to be read and interpreted as a digital signal through subsequent processing by a compact processor with a specially built architecture.

This approach is complex due to the low knowledge of the brain and, if we take as a basis that each brain is a chaotically formed system for a certain percentage, and for accurate implantation, a non-trivial study of the activity of various parts of the brain. An alternative is to consider the possibility of installing several million electrodes capable of evenly covering all departments and leveling the error in the development of the centers of the brain in everyone by linking a set of electrodes with general biological
development norms at the genetic level. But if you look at the essence of the problem, then, according to the authors of Neuralink, this is just an input-output device that allows you to increase the bandwidth of data exchange between machine interfaces and the human brain [1].

Undoubtedly, the technologies of cybernetic implantation will develop and receive strong support in society when crossing the border of the carrying danger and impact on the life of the individual using the amount of advantages they provide, but so far it is too early to speak of rapid development, since even at the medical level, their use is extremely local and mediocre nature, and the regulatory framework and tough legislation in the medical field will be a significant brake on the development of such technologies.

This article proposes to consider an alternative approach to the development of interfaces that allows receiving the same amount of information per unit of time from a person by means of standard input and output means and progressive observers of the tracking of the gaze on a certain object.

2. Methods
The main core of the system is supposed to be built on the eye tracking technology that allows collecting information that is important in the opinion of the user of the system, since the main organ of human perception of information is vision. In the case of tracking the place of focus of the gaze, there is no problem in determining the user's interest in information due to the linear dependence of the gaze focusing time on the value of the information viewed and its type. Interest in information can be represented in the form of linear functions that are different for each type of information (text, graphic, abstract, etc.). Representation in the form of functions is due to the need to enter constantly changing variables, ranging from physical features such as the clarity of display, viewing angle, illumination level and ending with the intelligibility and sign of information, as well as the psychophysical state of the user affecting his concentration, the ability to perceive the information being viewed. Most of the information about the user is provided by the position of the pupil and the speed of its movement, in turn, the focal area can be individually configured for each user.

To implement the system, it is most rational to choose a functional programming method for describing a set of functions and functional subroutines of continuous computation, and also strikingly different in computing performance in comparison with the object-oriented development approach and the ease of entering variable states into the main function in real time. The application of the functional approach to solving the problem will lead to a collision with many problems that arise when using it, if you do not apply a modular approach to creating a system with inclusions of iterative processes that allow you to extract data from a continuous flow to correct the states of the system in certain operating modes.

2.1. Acquisition and normalization of data
Since the storage and processing of video information requires the use of a large amount of both computing power and information storage capacities, the system should be built on real-time processing by isolating information and converting it into text form, complementing and updating the semantic table, which is further used both to provide information directly from it and to generate a new one in the form of a comparative analysis for each day of the system operation according to simple characteristics of the amount of information received, the time of concentration and the amount of information from different areas.

At the second stage of the system development, it is supposed to provide an analysis of the user's actions and judgments based on the received information. A subsystem of this type should be separated from the main generator and not use its physical resources in the form of memory and processor time in order to avoid the appearance of unstable states in a continuous flow of information that can create a large number of paradoxes in the primary data obtained [5].

The third stage will be data compression by means of forming the dominant associative tables synchronized with the user's thinking and capable of providing information that creates a persistent and clear association in the mind, capable of transmitting to the user both graphic and textual information
previously assimilated. An obligatory criterion for such an entry in the table will be a stable form of reproducibility of the result of influencing the user with a predictable result [3].

2.2. Regulatory framework

The entry of this technology into the public market will undoubtedly be accompanied by fierce opposition from the legislative structures, as it brings up issues of privacy, the benefits of the system and several ethical issues. An example of this counteraction can be considered the Google glass technology, which is based on the collection of a large amount of information both about the user and about everything that surrounds him; subsequently, it stores and processes all information on remote servers, which endangers information security, and also provides the opportunity to use the collected information by government structures and invasion of privacy.

In order to avoid such legal problems, all information must be processed locally in a continuous flow for personal devices, but this does not solve issue related to collecting of information about the world around the system in real time, which can undermine the privacy of someone's. When using a network of devices in a scientific or business environment, it is implied the aggregation of information on a single server with additional processing and averaging, which is quite successfully regulated by the current situation in the scientific and business community.

2.3. Obtaining the minimum required amount of data

Obtaining the minimum amount of data and their quantitative characteristics is complicated by the specifics of each of the areas of application of the system. Thus, for a user performing only a set of sequential actions, there will be practically without problems with the correct operation of the system and the absence of missed actions and steps, as well as without significant distortion of the sequence, leading to an unsatisfactory result or leading to unstable states in the operation of the system. However, when considering complex areas requiring a variety of actions and making judgments, it becomes problematic to track the factors and parameters that affect the decision made by a specialist. When a high level of uncertainty is reached, the system will most likely enter an unstable state due to the construction of erroneous associative tables that require immediate user intervention to correct them.

Let's look at a simplified scheme for obtaining the desired result in the form of a sequence of activities to achieve the working model of the system used for business or scientific purpose in figure 1:

![Figure 1. System workflow diagram for clinical trial.](image-url)
System workflow description:

- User or users use selected program and try to do list of actions or regular things.
- Tobii Eye Tracker 4C system catch screen and coordinate where to user look, track actions.
- Marked part of screen what should cut area from video stream and named it as a coordinate of center pixel of area by OCR.
- Select part of areas stream and send it in Analyze module.
- Analyzer compare cut area with list of pre-selected areas. If compare true – counter in database increased, else fragment stored in unsorted database, coordinates included in special table with link on fragment in unsorted space.
- Calculating index of important for each fragment based on frequency of looking at selected area. If index ~95%, area included in database associative table.
- Analyze module produce reports for debugging system and connect with other 3rd party apps by API library.
- With collected users’ actions and areas of looking we can generate code for repeat user actions by program.

3. Applicability
The main application of the system involves the use of a person or a group of people as a computing center that allows solving complex problems for computing. Such systems can be implemented in the form of assistants in everyday life or specialized centers that solve the simplest tasks after being trained by a group of specialists and receiving a full set of data that allows you to work autonomously.

The use of assistants expands the possibilities of memory based on the associative series allowing you to memorize and subsequently refer to previously studied or viewed information. Since, according to a study carried out at the Massachusetts Institute of Technology, the human brain stores about one Petabyte of information that does not have a strict data structure, and the overall operation of the system is presented as a dynamic one with a frequent amplitude of change [6]. The created system is designed to perform a function under a processor that helps consciousness to access the necessary information by manipulating incoming and outgoing information without affecting the biological level as implants do.

Significant places of applicability are medical organizations, scientific centers, paramilitary units, emergency response services, the law enforcement system and other areas requiring a decision in real time based on the experience of actions performed in each situation.

4. Future development
The development and application of the system consists in specialization for a specific area of use, since universality implies a limited change in the system and its components. Working with data can be carried out with minimal software and hardware and is not an obligatory part of the system, which allows you to build it into existing ones, allocating some resources for its operation.

One of the massive areas of application is augmented reality in the form of an assistant in everyday life, which will contribute to a more conscious behavior of the human individual, since with prolonged contact with the same person, the system can easily identify patterns in actions and in the future can provide an assessment of events for the user in real life time.

Since the main idea of the system being developed is its compactness and isolation from centralized systems, the development of performance takes place in the context of optimization and modernization of algorithms for searching and comparing information in associative tables. At the last stages of the merging of the system with its user, the associative table should repeat the associations that arise in the consciousness of the individual and allow quick access to information by exciting certain informational connections in the human brain, which in turn will make it possible to almost completely abandon the storage of graphic information in the body of the system and use the possibilities human mind to perform tasks of storing and accessing information.
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