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DEVELOPMENT AND RESEARCH OF METHODOLOGICAL AND ALGORITHMIC SUPPORT FOR INTELLIGENT CONTROL SYSTEMS

Narmin Mustafayeva

Abstact
The article presents the results software development and testing for motion detection. A study of the possibility of using robust, neuro-fuzzy and adaptive control algorithms in high-accuracy and reliability information systems has shown that when designing such systems, the developed principles can used and standard information systems structures can be built.

Keywords: intelligent systems, motion detection, information systems.

Introduction

The development of information technology in the 21st century will be associated with the development and creation of intelligent information processing and management systems in various environments and human activities. Today, computers have far surpassed humans in areas such as computation, word processing, and more recently even inference. However, they still lack flexibility and lag behind humans in many aspects, for example, in pattern recognition, problem solving with incomplete information, learning ability, predicting the results of a proposed action and developing control, taking into account the dynamics of processes in real life time. Currently, there is increasing interest in mobile mechatronic systems, which is associated both with the practical need to use such systems for the purpose of carrying out work in environments inaccessible to humans, and with the need to study the intellectual abilities of technical systems. Mobile mechatronic systems (mobile robots) beginning used to diagnose faults in extended and high-rise objects, monitor the environment, search for objects in hard-to-reach places, etc. At the same time, mobility itself can provided in various ways - these are traditional wheeled systems, and walking, rolling, as well as crawling and flying systems. What these systems have in common is multi-level control of their behavior. Typically, this is a three-level management system consisting of strategic, tactical and executive levels.

Control systems are being developed that provide autonomous execution of a limited set of operations and a number of predefined scenarios, however, as a rule, these are essentially deterministic actions, and their implementation is focused on high-performance computing platforms. The development trends of such systems reflect the feasibility of their implementation on embedded platforms that provide the possibility of distributed control and have, along with small overall dimensions, high reliability and low cost, limitations on computing resources. To implement promising approaches to building adaptive systems on such platforms, it is necessary to develop algorithms for adaptive behavior and object control, taking into account the computational performance of embedded applications. Such work with information, characteristic of a person, characterized by the concept of “flexible” information processing, in contrast to the traditional “hard” information processing and development of control of a computer system, which assumes the presence of completely specified information in an a priori specified world or problem area. This approach to information processing, which can called associative or intuitive as opposed to logical, has not yet been developed at all in the current information technology. It is appropriate to note here that the development of information technology occurred in conjunction with the evolution of computing systems. If such systems of the first generations made it possible to carry out digital processing of data and texts, create and use databases, then fifth-generation computing systems already make it possible to process knowledge, carry out logical inference, and thereby create the beginnings of their intellectualization. Such computing systems were some independent formations - a tool that was not organically included in the “composition” of natural and social processes, but only intended to perform some very important computational operations that reflected these processes.

Interaction a person or a team of people with a computing system was the need to develop a calculation program, debug it and present the results in a form convenient for human understanding, etc. However, it is clear that obtaining information for processing in computer systems is associated with carrying out various kinds of measurements of certain characteristics of the environment, and the results of data processing should make a decision on a particular action, in accordance with the control generated by the computer system, with subsequent monitoring of management results. Perhaps that is why at the end of the 80s of the 20th century a new paradigm of information processing and control systems put forward - the concept of “Intelligent Systems” [1]. Somewhat later, in the early 90s, in Japan, as a continuation of the “Fifth Generation Computing Systems” program, the “Real-World Computing-RWC” program put forward, motivating its appearance by the predicted requirements for the information needs of the 21st society century [2]. The essence of this program to search for algorithms that ensure the integration of new basic functions with the support of the following areas of knowledge: recognition and understanding, up to the perception of gestures or finger movements; understanding spoken language; logical inference and problem solving; development of information bases for specific areas of knowledge and decision-making algorithms based on statistical data under certain restrictions; methods of self-organization of complex information bases; solving modeling problems and organizing the user interface; recognizing a person’s intentions and working with broadband communication channels that he uses to transmit information (using gestures, sounds, drawings); development of display methodology, including virtual reality, to represent time-varying situations; autonomous and cumulative control, one of the tasks of which is to identify the fundamental methodology integration of perception and awareness, planning and action in the real world from the perspective of adaptation and cognition.

The concept of intelligent systems fundamentally assumes their interaction with the environment, the presence of motivation, the use of knowledge to synthesize goals, evaluate, make decisions and develop management, control real management results and compare them with the results of action predicted by a dynamic expert system [3]. Therefore, the research and creation of intelligent systems required the development of new information technologies. Partially, especially in the field of soft logic algorithms, they currently correlated with the RWC program. Information technology developed in intelligent systems and supported by computing and technical communications, generates changes in society. These changes penetrate not only into the industrial sphere, such as the system of rational distribution and production of new goods and services, but also cause a qualitative improvement in the way of life, stimulate the development of regions, as well as education and culture. Thus, in the field of information networks, the result will be a significant increase not only in the quantity, but also in the quality and variety of information requiring processing. Therefore, such a networked society would require a new technological base that will give everyone the opportunity easily and effectively use various information resources on the network.

In this regard, in various applied areas of information processing and management, the information environments of computing systems must reflect intellectual activity and be capable of collaborating with people in a real-world setting. Since an intelligent system is understood as a set of technical means and software united by an information process, working autonomously or in conjunction with a person (a team of people), capable of synthesizing a goal based on information and knowledge, with motivation, making decisions about action and finding rational ways to achieve a goal, then, in the technological aspect, the computing parts of intelligent systems must able to flexibly process information about the real world, as a person does, since many tasks in this world poorly defined and difficult to represent in the form of an algorithm [1].
The block diagram of the intelligent system shown in Fig. 1, it can see that the intelligent system consists of two blocks, in the first of which the goal synthesized, and in the second - the process of achieving the goal. In the first block, the initial component is motivation (the need for something), which is combined with information obtained using a sensor system about the state of the environment and the system's own state. When synthesizing the goal, knowledge used actively, i.e. Base on the knowledge stored in the system's memory, the environment and the system itself stimulated by trigger signals, and an active assessment of environmental stimuli occurs. Next, the information enters a dynamic expert system (DES) [3], which implements algorithms for the functioning of the action program, efferent excitations (control), and an action acceptor, which contains all the properties of the future result and serves to compare the predicted and actually obtained results. It is also essential for DES to have a knowledge base. The control developed in the diesel power plant implemented using actuators that change the state of the control object, and information about the parameters of the control result received via feedback 2 in the DES, where the parameters of the predicted and actual results compared. If, with developed management, the goal achieved, i.e. the difference between the outcome parameters satisfies the requirements, then the control reinforced; if not, then it corrected. If it turns out that the synthesized goal is not achievable, then the result parameters interpreted in relation to the goal and the goal is corrected (feedback 1).

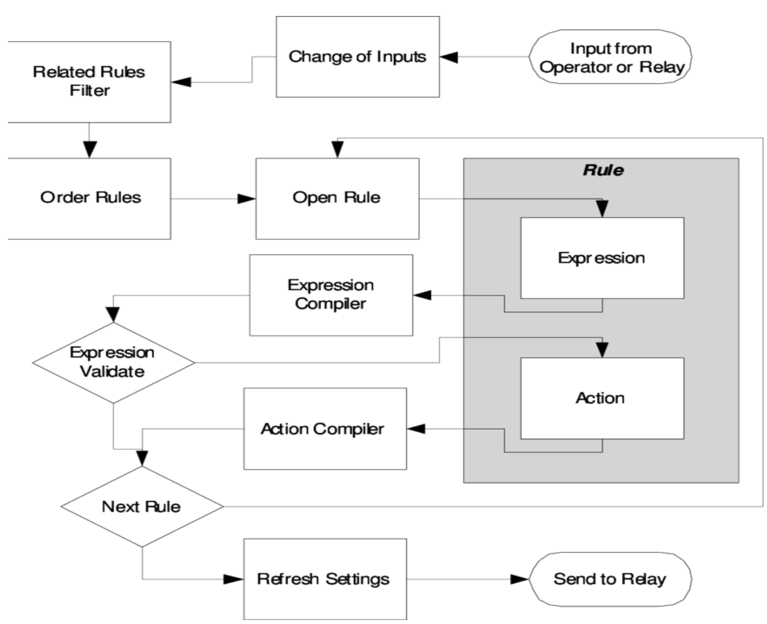

Figure 1. The block diagram of the intelligent system

From Fig. 2 also shows that information-processing technology should complement or replace the human function of processing it through automation and integration of logical and intuitive approaches. Historically, however, automation mechanisms have developed theoretically and technologically in relation to logic processing in traditional digital computers, and as such, sequential processing has become established as the dominant paradigm today. However, intuitive information processing has studied in areas such as pattern recognition and learning, the algorithms of which are implemented based on neural computing networks, on which parallel and distributed information processing can be implemented. However, intuitive information processing remains a poorly developed area of information technology.

Figure 2. Intelligent system model with the integration of two approaches to information processing

Video information can used to determine the position of a control object (CO) in space. As a rule, the task of determining position comes down to comparing the observed image with another, the position of which in space known in advance. This could be, for example, a map of the area or a previously obtained photograph. Having determined the position of the observed image (frame) on the map, it possible to recalculate the position of the op-amp in space. Thus, the problem of spatial orientation using a video image can reduced to the well-known problem of image matching (registration).

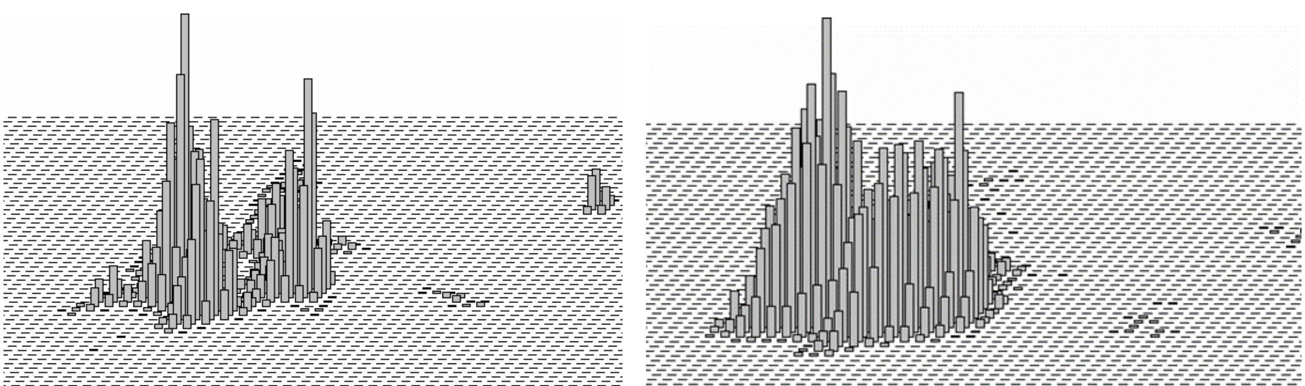

Figure 1. Distribution of errors in image matching (based on a sample of 20,000 measurements) in the presence of uncompensated geometric distortions:

a) Matching using the maximum of the matching function.
b) Comparison using the reconstructed maximum at the center of mass of the window.
The number of errors decreased from 26% to 4%.
Uncompensated geometric distortions include all spatial transformations that are not taken into account in the matching process. They may arise from uncertainties in the observation process or from inaccuracy in the observation model. The first group includes unaccounted nonlinearities of the optical system, deviation of the line of sight from the normal to the observation plane, etc. The second group includes the loss of some parameters from the search process due to the assumption of their immutability, errors in parameter sampling, and others. Most of these errors normally distributed around the design parameters.

Conclusion

The problem of self-organization of robust, neuro-fuzzy and adaptive control algorithms in intelligent systems to achieve the goal. The differential-model concept in the taxonomy of the macrophysics knowledge base for intelligent systems and the structural-algorithmic model of intelligent systems and its application in control problems are also considered. Parallel algorithms for information processing and control, including multitransputer information technologies, are studied. The application of intelligent systems in problems of computer vision, speech signal recognition, etc. considered as applied problems.

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ARTIFICIAL INTELLIGENCE AND ALGORITHMIC SOLUTIONS IN THE SOCIAL SPHERE

Sevda Salmanova

Abstract

In the last decade, the diffusion of digital innovations in the social group of young people has occurred at an accelerated pace. The article denotes an analysis of the attitude of young people to the idea of applying social ratings as one of the areas of application of artificial intelligence (AI) and algorithmic management practices in the social sphere. The empirical object of analysis was representatives of student youth in three countries. More than half of respondents in all regions indicated that the impact of AI technologies on people’s lives will have both positive and negative consequences. An analysis of the model situation—the possibility of widespread use of social ratings—records that about a third of respondents in all regions supported this idea. In the capital, most respondents did not approve of the idea of introducing social rating algorithms, while in other regions most respondents found it difficult to