MODELING OF THE AUTOMATED SYSTEM OF TRAINING SPECIALISTS FOR THE JUDICIAL SYSTEM

Nodir Raximov[1], Jo'ra Kuvandikov[2] and Usnatdin Xafizadinov[3]

[1]Department of Software of Information Technologies, Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, Tashkent, Uzbekistan
[2]Applied Mathematics and Informatics Jizzakh Branch of National university of Uzbekistan named after Mirzo Ulugbek Jizzakh, Uzbekistan
[3]Second year student of Tashkent University of Information Technology named after Muhammad al-Khwarizmi

ABSTRACT

The research involves developing mathematical and information-functional models for the automated system that trains specialists for the judicial system. These models aim to determine the characteristics of how information and educational resources interact, while considering the student's educational level and specialization. The study also includes justifying a comprehensive target training program for specialists, considering the information interaction among elements within the automated training system. Furthermore, the research investigates the effective interaction of the learning process and methodical information management algorithms within the system.

KEYWORDS

Information, information resources, information systems, distance education, judicial system training, automated learning systems (ALS), information and communication technologies (ICT), Uzbekistan's education system, educational standards, information-functional model.

1. INTRODUCTION

Nowadays, commercial resources such as software, information platforms, and telecommunications systems are being utilized for training specialists within the judicial system. However, a majority of these resources are hosted on foreign information platforms, potentially impeding domestic development. Examining the financial performance of Zoom Video, a company that heavily leveraged resources for distance education during the pandemic, reveals remarkable growth. In the period of October-December 2020, the company earned $882.5 million, marking a 369% increase compared to the same period in 2019. Profits surged by 17 times, and throughout 2020, Zoom Video reported a 326% surge in sales compared to the previous year. Notably, a substantial portion of the financial resources invested in this company originate from Uzbekistan's education system. However, it's important to note that Zoom Video is not a dedicated educational platform. Presently, discussions within both the scientific community and mass media revolve around the digitization of Uzbekistan's social and economic life. Some experts tie digitization processes to contemporary trends while doubting the necessity of digital transformation across various aspects of public life. Conversely, others predict an era of artificial intelligence capable of resolving virtually any societal challenge. Nonetheless, recent global and local events, particularly those associated with the viral pandemic, highlight the inadequacy of digitization and informatization of socio-economic processes in effectively addressing the complex challenges faced by the state under demanding, non-standard circumstances. It's

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essential to recognize that the digitization of education is not exclusively synonymous with the shift to distance learning, as distance education is merely one method of delivering educational content. The convergence of law and computer science has sparked significant research and development at the intersection of law enforcement, yielding versatile and widely applicable outcomes. In the domain of education, training specialists for the judicial system using computer technologies and automated educational processes presents distinctive nuances. These nuances stem from the unique demands of solving professional challenges within the legal realm.

2. AUTOMATED LEARNING SYSTEMS

2.1. Examining the potential for establishing Automated Learning Systems (ALS)

Socio-legal regulation is undergoing a new phase of development [6]. Notably, changes have occurred within its model, particularly due to the influence of digitization on the judicial system of the Republic of Uzbekistan. The contemporary processes of digitization and informatization are guided by the normative documents of the Uzbekistan state [14]. These documents outline the objectives, tasks, and measures for implementing Uzbekistan's internal and external policies in the realm of information and communication technologies. The overarching aim is to foster the development of an information society and the establishment of a national digital economy. The "Strategy for the Development of the Information Society in the Republic of Uzbekistan until 2030" recommends that state bodies and local authorities within the Republic of Uzbekistan's territories amend their strategic planning documents in alignment with this legal framework. Within the priority scenarios for advancing the information society in Uzbekistan, special emphasis is placed on creating national technological platforms for online education, online healthcare, a unified electronic government infrastructure, and a national electronic library. The execution of this strategy is outlined by the decree of the Government of the Republic of Uzbekistan, which approved the implementation of the national program "Digital Economy of the Republic of Uzbekistan." This program's implementation adheres to the goals, tasks, directions, scope, and timelines stipulated for the main measures of the Republic of Uzbekistan's state policy aimed at establishing the necessary conditions for the Republic's digital economy development. In this context, the production of digital data becomes the primary factor driving socio-economic activities across various domains. The primary areas of focus within the program encompass regulatory and legal framework [6], personnel and education, the cultivation of scientific and research capabilities, technical foundations, information infrastructure, and information security [5-7, 11, 15, 16]. Aligned with the objective of preparing citizens for the digital economy's demands and cultivating qualified specialists for it, the vocational education system must craft a competency profile for every student within educational institutions. This approach ensures that the digital economy is supplied with proficient personnel who have personalized developmental trajectories in accordance with state educational standards (SES). Educational institutions are achieving this through the integration of electronic learning technologies [3, 17]. Legal education's content and direction mirror educational standards and programs, constituting integral components of the professional education system. State educational standards delineate the obligatory minimum of educational programs, the upper limit of the student's academic workload, requirements for graduates' competency levels, and encompass methods for objectively evaluating graduates' educational levels and qualifications, irrespective of their mode of education [1, 13]. Vocational education programs encompass state-prescribed mandates for the fundamental content and competence level expected of graduates. These mandates are set by the corresponding state educational standards and qualification prerequisites for professional training. Additionally, vocational education programs encompass curricula, academic plans, practical training, and internship schemes. The vocational education framework extends to a network of educational institutions authorized to offer vocational education programs based on

granted licenses. Presently, professional personnel training in Uzbekistan is conducted by institutions of higher and secondary vocational education, including universities, institutes, and vocational schools. The status of these institutions varies based on their scope, level, and diversity of education programs. The vocational education system incorporates governing bodies as an essential element. The supervision of general personnel training is under the purview of the Ministry of Science and Higher Education, in conjunction with various other pertinent governmental bodies. Direct oversight of educational processes rests with management bodies within educational institutions. It's crucial to understand that electronic or distance education systems [7] cannot be separated from the broader context of a unified professional personnel training organization. The operation of Automated Educational Systems (AES) involves an array of interconnected automated information processes or technological operations. These processes encompass the manipulation of educational, scientific, and methodological data, in tandem with the active participation of various information stakeholders: educators, learners, support staff, management and supervisory bodies, as well as diverse sources and consumers of information utilizing various informational resources and environments. Information stakeholders and their corresponding operational environments are deeply intertwined, mutually influencing one another, resulting in a comprehensive dynamic personnel training system, particularly within the context of introducing the digital economy [15]. The existing multi-level vocational education system boasts a hierarchical organizational-informational structure. Within this structure, coordination is executed in accordance with the principle of managing the interactions among administrative components (management bodies like the Ministry of Education and Science, Ministry of Education, secondary education system, and higher and secondary vocational education systems). This orchestration aims to construct the educational process aligned with the dictates of state policy. The overarching objective is to establish the essential organizational, legal, and economic prerequisites to meet the needs and expectations of Uzbekistan's economy for proficient experts. This involves judiciously allocating state budget resources to their training, augmenting the caliber and efficiency of vocational education, and ensuring a standard of professional competence among personnel. These endeavors are realized through harmonized coordination and digitalization in tandem with the normative legal frameworks of the Republic of Uzbekistan.

2.2. ALS Modeling

At the conceptual level, the information-functional model of Automated Learning Systems (ALS) establishes the initial state of the controlled entity within the Information-Learning Environment (ILE). This state is determined both by the nature of the system itself and by its intended purpose. The model views the ALS as a dynamic system capable of transitioning between various states, each involving its constituent elements or subsystems. The ultimate objective or target function of the ALS is determined by the specific requirements placed upon it, whether they relate to education, vocational training, scientific proficiency, or multifaceted competencies. This purpose is contextualized within a certain timeframe. Simultaneously, the information-educational environment is conceptualized as a sequence of scenarios that necessitate specific adaptations to ensure the object's existence and the governing body's efficacy during the designated training period (T) [5]. The ALS comprises a collection of hierarchically interconnected complex subsystems, each possessing a defined level of organization and autonomy. These subsystems encompass human operators as well as sets of automation equipment situated in distinct physical locations. Within the ALS, management functions are integrated into a unified multi-loop system. This amalgamation seeks to improve the effectiveness of the educational and training procedures for professionals. The attainment of educational objectives and the resolution of didactic tasks associated with specialist training are achieved through the ALS's Educational Institution Learning Environment (ALE) (Figure 1).

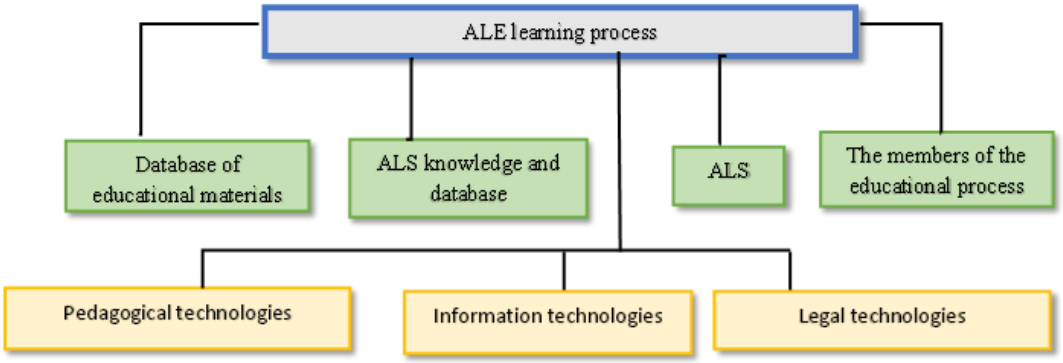

Figure 1. Generalized structure of the (IEE) for training specialists in the judicial system.

This environment facilitates seamless access to educational and scientific information, enabling swift responses to updates, and streamlining the effort, both in terms of resources and organization, required for searching, processing, and storing such information. Decision-makers responsible for managing the educational process gain the capability to predefine discussion topics or questions, allocate time as needed, and collect opinions from relevant stakeholders. This process significantly enhances the quality of analysis and the subsequent decisions made in the specialist training procedure [16]. The training of specialists extends beyond temporal boundaries; it's also distributed across physical spaces [10]. At its present stage, the education of highly qualified professionals is an intentional, dynamic, hierarchical system built upon an integrated information framework that comprises an amalgamation of functional systems. The realization of educational objectives and the resolution of didactic tasks for training specialists within the judicial system result from the establishment of a virtual environment concerning the subject matter, structure, and instructional approach of the lesson. The classroom model fosters bidirectional and multidirectional interaction among participants in the educational process. It involves simulating various educational scenarios and evaluating the efficacy of participants' actions in terms of decision-making efficiency. Utilizing specialized information and mathematical software in the shape of a formalized representation of knowledge about the educational process within an automated system becomes feasible through the creation of an information-mathematical model within the realm of the respective discipline. This model is established based on an understanding of the subject matter and includes both logical and data-driven aspects. It also incorporates a linguistic model for representing knowledge [5].The target result of the activity of ALS is to realize the desired trajectory of its internal movement:

$$F:\neg\langle Z(ti), Ub(ti)\rangle , \quad Ub0(ti+1);$$
$$Ub0(ti+1) = F(Z(ti))\, Ub(ti),$$

where F is a formalized expression of knowledge about the processes of training specialists within ALS. The practical application of targeted hierarchical integrated ALSs shows that they jointly (simultaneously) use three main types of tools and resources:

1) real (it is the main one and is represented by a set of communication networks and automation tools in ALS);
2) energy (ALS determines the possible intensity of work processes, in its absence, processes are determined by external factors or stop altogether);
3) information (one of its parts determines and ensures the structural stability of ALS, the other determines the meaningful nature of educational processes).

Employing an unchanging conceptual and logical model of automated management systems designed for intricate dynamic entities, such as an Automated Learning System (ALS) tailored for legal professionals' training, the functioning of the ALS can be illustrated through an automated educational system management scheme extended across a specific timeframe. The control object (P) in ALS performs the target function:

$$Y(t) = F\{X(t)), U(t)\},$$
$$U(t) = U(t) \cup UQb(t) = Y\{X(t), Y(t), YX(t), Qb(t), P(t)\}$$

Here U(t) is the control action produced by ALS [6, 8] (information utilization efficiency) based on information about the state of the learning process, which is an organized set of many physical processes occurring in different subsystems. and educational resource H) ensures the effectiveness of the educational process in order to achieve the given goal of specialist training, taking into account the competencies; UH(t), UQb(t) are the control actions aimed at achieving the desired result YH(t) and the required performance of the training resource Qb(t), respectively.

The formalized view of knowledge about the working processes of ALS combines arrays of educational, educational, methodological, organizational and other information about the algorithms used for learning, management and the values of control indicators of management efficiency. Learning process in T range of control of ALS activity. The external state of the system is described by the ALS state:

$$Ua(t) = X(t) \cup E(t) \cup Y(t).$$

Each external state of the system corresponds to its internal state described by the vector Ub(t). The overall condition of the educational system at a specific moment comprises a blend of its external and internal states:

$$Uc(ti) = Ua(ti) \cup Ub(ti).$$

Transition of the system from one state to another under the influence of external and/or internal influences characterizes the learning process in time, and the ordered pairs t_i.

- A complete set of ALS situations is called a situation or an element of the educational process.
The creation of the information-functional model for the automated training system tailored for preparing specialists in the judicial system enables the organization of educational procedures, tracking the absorption of content, and the enhancement and oversight of the effectiveness of the framework for implementing digital technologies in the realm of distance education (Figure 2). Structurally, this model incorporates interactive human-machine procedures within the Automated Learning System (ALS) to establish a user-friendly interface for interacting with the system. Presently, technologies facilitating human-computer interaction, such as machine vision and voice communication systems, have undergone extensive development. The functional constituents of these human-machine procedures encompass a distinct assortment of elements [12]:

- The Database and Knowledge Base (MBB) Correlation Component: This component, aligned with the ALS objectives, enables modifications to the MBB structure and the systematic incorporation of relevant information.
- Situation Information Filling and Clarification Component: Operating during the educational process, this component tracks the trajectory of specialist training throughout the entirety of the educational journey [4].

- Visualization and Interpretation of Educational Materials Component: This element addresses the presentation of diverse information formats (text, graphics, audio, and video data) through computer technologies (e.g., video projection tools, screens, interactive displays, audio and video conferencing systems).
- Training Process Optimization Method Selection Component: This module facilitates the selection of optimization methods (refining the objective function), permitting adjustments to training objectives throughout the entire process. Adaptations are made in response to professional competencies and the clients' educational requirements [2].

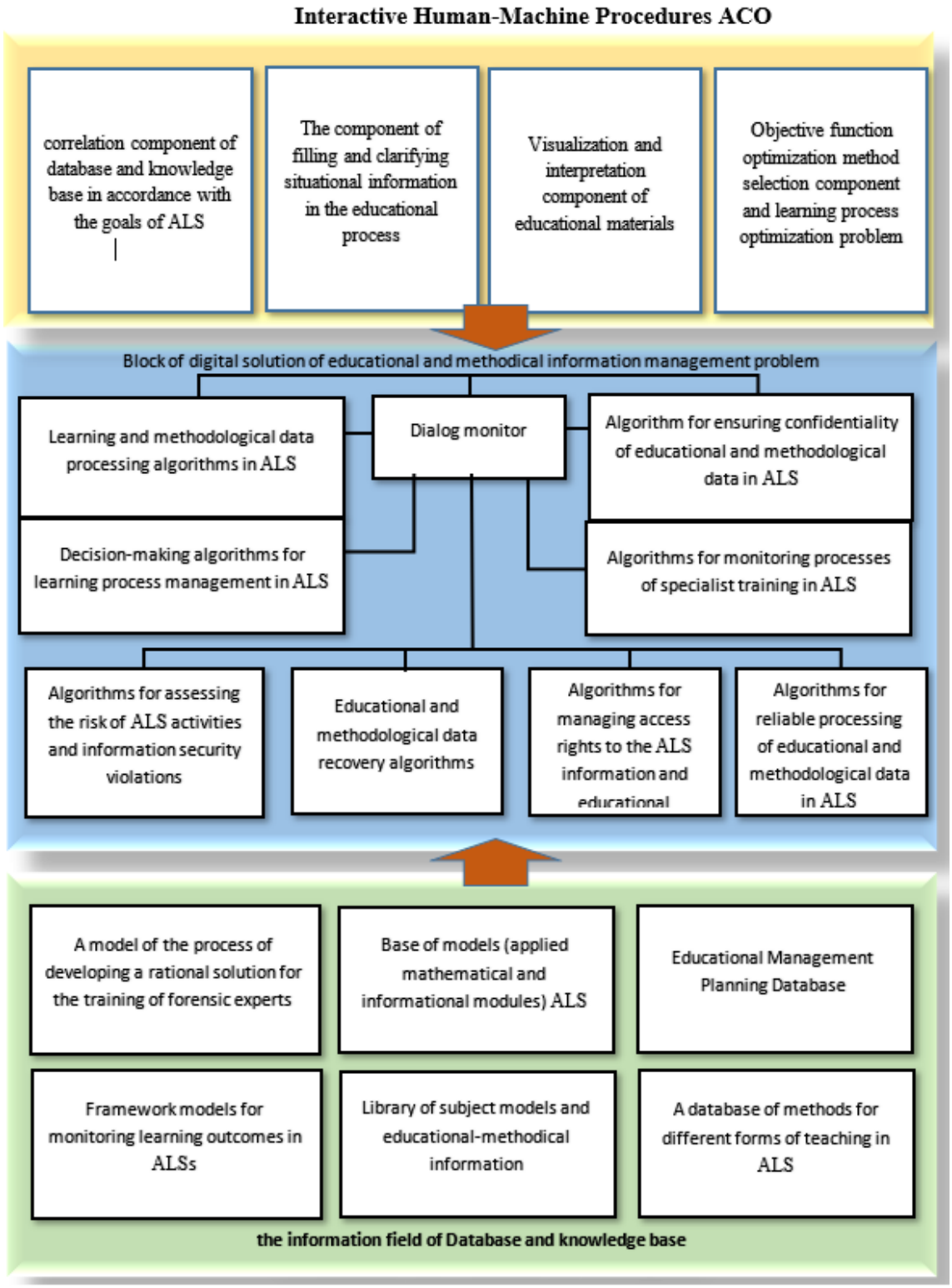

Figure 2. Information-functional model of ALS for training specialists for the judicial system.

For the numerical resolution of the educational information management quandary, the block-form model element consists of a collection of algorithms. These algorithms furnish mechanisms for management processes, logical processing, control procedures, privacy measures, and more. In the context of the Automated Learning System (ALS), the utilization of these algorithms depends on factors such as applicable educational standards, the requisite set of competencies, the pertinent complex subjects, and the adopted system of educational process management and oversight. Educational, methodological, scientific, and auxiliary data are stored within the database. The formation of these information resources is guided by the objectives of the ALS. Furthermore, access control algorithms facilitate the creation of data arrays with varying security levels, encompassing open data, materials for official use, and confidential information. Algorithms designed for ALS risk assessment and information security contribute to ensuring the continual and dependable operation throughout the training process, rendering it highly effective. This becomes especially critical when employing distance education technologies, as the necessity to deploy recovery algorithms in case of the loss of instructional, methodological, scientific, and other pertinent data becomes more pronounced. In the current landscape, public information and telecommunication networks are often exploited by malicious actors for nefarious purposes. Given the current state of digital technology development, achieving 100% protection against external attacks and internal user errors remains unattainable. Consequently, the information security system's demands are elevated [11]. The content housed within the Database and Knowledge Base (MBB) information realm warrants special attention. This structural component within the information-functional model of the Automated Learning System is tasked with addressing information provisioning. The information field encompasses an assortment of models encompassing various types and contents. These models serve as solutions for teaching subjects across diverse specializations and levels of readiness. This element encapsulates the distinctive aspects of training judicial system specialists, encompassing content specifics, model design, and MDB architecture.

The creation of an information-functional model for the Automated Learning System tailored for judicial system specialists permits the systematic incorporation of information and communication technologies available at the present stage of development. This integration aligns with the objective of achieving trainee education objectives. Constructing the ALS structure upon the information-functional model addresses the challenge of efficacious information technology utilization across all stages of specialist training for the judicial system. This model not only factors in the temporal dimension in terms of a given educational process but also accommodates enhancements to the ALS through the integration of emerging information technologies and the development of more advanced learning, management, and control models.

3. CONCLUSIONS

Thus, current approaches to creating educational systems based on the use of a combination of information technologies that allow solving certain educational tasks are ineffective. The creation of information systems based on web-technologies, MDB of training and educational information, videoconferencing systems, etc., does not allow to solve the tasks of targeted and effective training of specialists for the judicial system. The absence of a systematic approach to addressing the challenges associated with establishing a digital educational system hinders the activation of educational procedures, taking into consideration individualized learning [9] and the stipulated competencies. The development of the information-functional model of ALS enables the simulation of the educational process through information assets and technologies, while the application of information-functional modeling within ALS automates the training processes for judicial system specialists as per demand. This is achieved utilizing existing computer systems, as well as standard and specialized software programs. Regarding the implementation of videoconferencing systems for the benefit of individual educational institutions or a group of

institutions under the purview of the Ministry of Education and Science, this undertaking doesn't pose significant challenges. In state institutions and closed educational facilities, Uzbekistan-made systems of this kind have been accessible for over a year. In Uzbekistan, the most widely used software products are for creating educational content, monitoring the knowledge of listeners, and solving organizational problems, but the lack of systematic modeling of the processes of training specialists in the judicial system does not allow effective automation of this area.

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AUTHORS

Nodir Rakhimov was born on September 16, 1982, in the Samarqand region of the Republic of Uzbekistan. He holds a D.Sc. in Technical Sciences. Currently, he serves as the Head of Department of Software of Information Technologies, Tashkent University of Information Technologies named after Muhammad al-Khwarizmi.