UDK 46.209.73

S. S. Beknazarova

MODELLING OF MAIN CHARACTERISTICS OF EXPERT MEDIAEDUCATIONAL SYSTEM[1]

In this paper, we consider black-and-white (binary) images. They are easier to get, store, and process than images that have many brightness levels. However, since binary images only encode information about the object's silhouette, their scope is limited. In the future, the conditions necessary for the successful use of binary image processing methods will be formulated. Here, attention is focused on such simple geometric characteristics of images as the area of the object, its position and orientation. Such values can be used, for example, in the process of controlling a mechanical manipulator when working with parts.

Keywords: modeling, geometric characteristics, images, process of editing.

Media education system (http://mediaedu.uz) is a modern educational complex that aims to create conditions for targeted interaction of individuals with digital information and educational media resources to improve their professional competence and in the interests of their personal and cultural development[3]. The use of training expert systems based on the proposed principle in the educational process allows you to solve situational problems in the dialogue between the student and the system. An important advantage of this approach is that the learner is given the initiative to conduct a dialogue. the disadvantage of the system is the possibility of inadequate interpretation of the user's machine questions.

TIAV multimedia system — a unique modern tool that includes an interconnected set of automation tools for managing discrete-continuous processes in TIAV-multimedia system, aimed at improving the quality of the educational process.

Rational use of information resources necessary for TIAV system is an intensive factor, since with the same volume and composition of information resources used, the expansion of the development of new multicontents or its development will be the greater the "return" on each unit of these resources. The main components of the intensive factor are:

1. Improving the technical level of multimedia content development:

— creation of centralized systems for visual control and analysis of the progress of the multimedia process by the administrator-operator of the TIAV system programmer;

— TIAV system administration;

— automation of the multimedia process by developing a software package;

— improving and making changes to the software part of the TIAV system;

— changing multimedia processing schemes for TIAV objects taking into account the characteristics of the source information resources, improving the quality of multicontents;

[1] © Beknazarova S. S. Text. 2020.

— modernization of the used multimedia technology;

— improving the reliability and security of individual technologies and multimedia schemes in General.

2. Changing the volume and structure of the multimedia process:

— changing the specific weight of individual TIAV objects;

— relative decrease in the number of employees due to the increase in the volume of multimedia content development.

3. Bringing the multimedia process closer to the consumer of multimedia content to the sources of TIAV objects.

One of the Central and priority problems when creating a TIAV system is to determine the existing and, on this basis, the necessary ratios of intensive and extensive development factors. This can be done using factor analysis, the theoretical basis of which is mathematical models of various kinds. The subject of the analysis is to determine the influence of the volume and dynamics of multimedia process factors on the volume and dynamics of multimedia content, as well as on the interaction of the factors themselves [2].

The task of factor analysis of TIAV system functioning is to determine the degree of joint and private influence of individual factors on the level of multimedia content development volume.

The most common two methods of factor analysis are index and correlation. The first one is based on the decomposition of the overall index of the volume of multimedia content development by separate study into sub-indexes that characterize the influence of each factor. This method assumes that only the level of one factor changes from the base period to the one being compared, while the other factors remain unchanged. The second method is based on economic and statistical modeling and is recommended for evaluating the joint and private influence of factors on the level of multimedia content development volume under the condition of stochastic connection.

The considered methods of analyzing the functioning of the TIAV system allow us to determine the quantitative value of the isolated influence of individual factors. Meanwhile, the factors that determine the effectiveness of the system are interrelated and have a complex effect, which can not be considered as a simple sum of isolated influences. Therefore, when analyzing the functioning of the TIAV system, it is necessary to determine the quantitative value of the private influence of each factor, taking into account the influence of the entire population under consideration. The way to solve this problem is a multi-factor analysis, which allows us to reveal the essence of the multimedia processes that are taking place, to find out their role and features of their manifestation in time and space[3].

The effectiveness of using a TIAV system as a whole is determined by the extent to which specific features, limitations, and functionality of all its components were identified and taken into account when creating IT. The significant dependence of the system parameters on the accepted structure that determines their mutual influence has led to the emergence of such an approach

as optimization synthesis, based on mathematical modeling of the most important interactions in the system.

TIAV multimedia system — a unique modern tool that includes an interconnected set of automation tools for managing discrete-continuous processes in TIAV-multimedia system, aimed at improving the quality of the educational process.

The study of models taking into account system-wide requirements is the most important prerequisite for the effectiveness of the multimedia process. In these conditions, the main goal is to develop optimal design methods that should provide a mutually related solution to the complex of organizational and multimedia problems using mathematical models that allow analyzing the entire set of main factors and obtaining a set of acceptable solutions for multivariate design using computer technology. Only on this basis is it possible to purposefully design optimal technical solutions that can ensure the effective operation of the TIAV system.

The mode of operation of the TIAV system, as a rule, depends on the combined influence of many internal and external factors that determine the technological, organizational and other conditions.

The most important role in the synthesis of the functional structure TIAV system is the organization in space and time of information flows and information systems, internal implementing purposeful interaction of elements of structure and external implementing TIAV interaction of the system with other structural elements of the system.

Both internal and external links of the multimedia system are characterized by the composition of streams and addressing; TIAV links of the system are divided into input and output links by orientation.

The spatial-temporal organization of internal links TIAV system is mainly determined by the composition of its elements and their layout. When forming the TIAV system structure, it is mandatory to take into account the organization of external relations.

The end result of the procedure of the synthesis of the functional structure TIAV of the system is its structural — functional scheme — scheme information and information flows to indicate their conversion, summarizing the preliminary results of the spatial organization of multimedia process in unity of its components and a set of specifications to the diagram containing the qualitative characteristics of the basic, auxiliary and serving processes in the space-time dimension.

Cutting a specific range of colors in an image used to select some objects from their environment. The basic idea is to either (1) reproduce the colors of interest so that they appear on a general background, or (2) use the color-defined areas as a mask for further processing. The simplest approach is to generalize the method of cutting the luminance range. However, since the color pixel value is n-dimensional vector, the conversion functions for cutting the color range are more complex than the similar functions for cutting the luminance

range. In fact, the transformations of interest to us surpass in complexity all the color transformations considered so far. This is the fact that with any method of cutting the color range used in practice, each color component of the converted pixel depends on everything n color components of the original pixel.

One of the simplest ways to "divide" a color image is to display all the colors that lie outside the region of interest, into some neutral, non-striking color. If the colors of interest are enclosed in a cube (or hypercube, when $n > 3$) with rib length W and c center at $(a_1, a_2, \ldots, a_n)$ color space, which corresponds to a given prototype color, the set of necessary transformation functions is given by

$$S_i = \begin{cases} 0{,}5, & if\ a\left|r_j - a_j\right| > \dfrac{W}{2}\ for\ anyone\ 1 \le j \le n; \\ r_i, & in\ other\ cases; \end{cases} \quad i = 1, 2, \ldots, n. \qquad (1.1–11)$$

These transformations highlight colors around a given one, replacing all the others with the color of the midpoint of the used color space (a randomly chosen neutral color). In the case of the RGB color space, a suitable point is the middle of a segment of gray colors, i. e. the color (0.5, 0.5, 0.5).

Color conversions are feasible on most of the personal computers. In conjunction with digital cameras, flatbed scanners and color inkjet printers, they turn a personal computer into a digital photo lab that allows brightness equalization and color correction (two operations that form the basis of any high-quality color reproduction system) without using traditional chemical processing tools used in conventional photo labs. Although the luminance and color corrections are useful in various areas of image processing, our discussion will focus on their most common application — improving photographs and color reproduction.

When developing and improving these transformations, evaluation is carried out using a monitor; therefore it is necessary to ensure a high degree of color correspondence between the monitors used and possible output devices. In fact, the monitor must accurately reproduce the colors of the original image presented in a digital format, as well as the final colors of the image as they appear on the print. This is best achieved by using a device-independent color model that interconnects the color coverage of monitors, output devices, and other devices used. The success of this approach is defined as the quality of the color profiles used to display each of the devices in the color model, as well as the model itself.

Often, a binary image is obtained by dividing the normal image by a threshold. It can also be reached by dividing the distance threshold on an "image" based on distance measurements.

This function, which takes two values and is called a binary image, can be obtained by dividing the halftone image by a threshold. The threshold division operation is that the characteristic function is assumed to be zero at points where the brightness is greater than a certain threshold value, and one where it does not exceed it (or Vice versa).

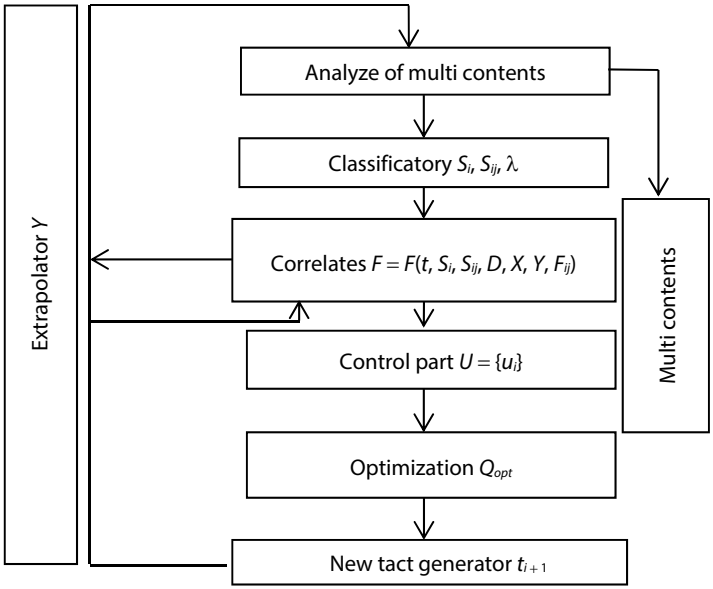

Fig. 1. *Algoritm synthesis software modules formed task-oriented management system TIAV — discrete — continuous processes multimedia system*

Synthesis algorithm software modules formed task-oriented management system TIAV — discrete — continuous processes multimedia system based on the concept of the formation of individual learning paths multi contents that takes into account the described features and apply the developed models and methods to solve the problem of class formation multi contents for individual training is given in Figure 1.

To implement the possibility of forming the initial set of alternative solutions in the system information is collected, both normative and expert estimates. Then processing subsystem expert estimates calculated consistency of expert opinion and their level of competence, allowing in the case of inconsistencies weed out unreliable data. The result of the operation of the subsystem is also the coefficient matrix closeness of the connection between of multi contents.

Formation of the initial set of alternatives is performed using a model of interaction multi contents, then realized the choice of class multi contents to be studied. Using temporal logic and model function implementation allows to generate a valid class multi contents, which is logically consistent sequence multi contents study.

Optimizing the solution obtained, subject to the limitations of time intervals learning multimedia system generates optimal individual learning paths, to meet the requirements of qualifying characteristics. Users of the system are

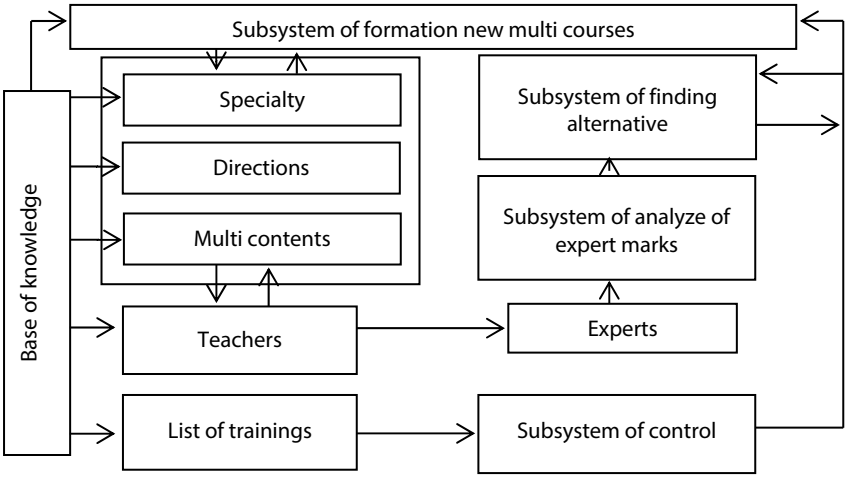

Fig. 2. *Model formalization and typing the information needed for automated decision management system TIAV — discrete — continuous processes multimedia system*

trained, teachers, experts, administrator. Access rights and data changes made on the basis of functional responsibilities and levels of management of multimedia process.

Model formalization and typing the information needed for automated decision management system TIAV — discrete — continuous processes multimedia system is shown in Figure 2.

Based on the developed models and building on them the concept of forming an individual learning path multi contents, implemented synthesis automated system for individual classes multi contents. The proposed class multi contents different from other training courses such properties as unique; lack of optimality; agility; incomplete description; organizational system.

Conceptually, a system that allows to take into account the described features and apply models and methods developed to solve the problem of class formation multi contents for individual learning, there is a system to support decision-making by optimizing the solution obtained, subject to the limitations of time intervals learning multimedia system generates optimal individual learning paths, can satisfy qualification requirements specifications. Users of the system are trained, teachers, experts, administrator. Access rights and data changes made on the basis of functional responsibilities and levels of management of multimedia process.

Considered the formation of the resulting algorithm multi contents class, based on the construction of the approximating models in the form of adaptive neuro-fuzzy networks; describes the stages of development of the approximating model projections for the three method of identification of nonlinear

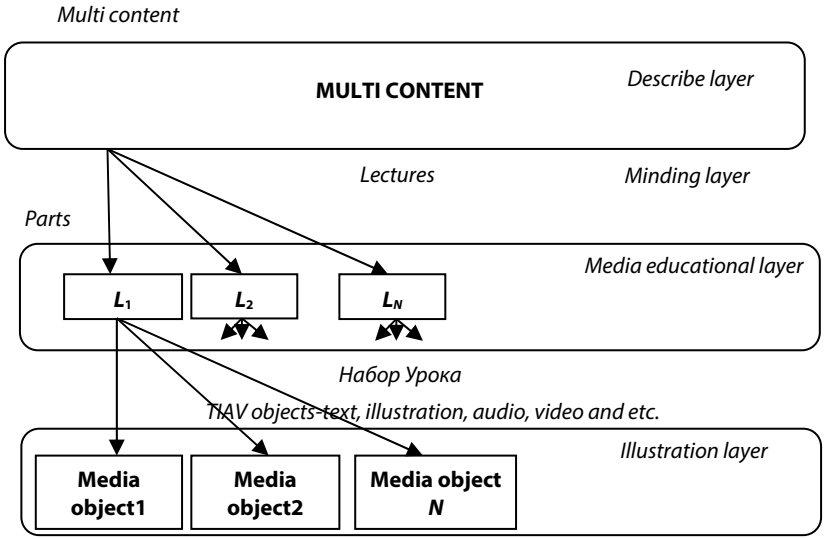

Fig. 3. *Graphical model multi contents*

dependence — with the help of the regression model, the fuzzy knowledge base of multimedia system and neuro-fuzzy model; A model formalization and typing the information needed for automated decision making in the management of multimedia processes, the possibility of taking into account different values of multimedia features.

According to the proposed model, an algorithm performed software implementation, describes the creation of multimedia software system, we calculate the cost-effectiveness of media education process.

Online system — Designer of multi contents Mediacourse Builder is designed for self-designing and creating multi contents. Each created multi content includes TIAV-objects — media text, animations, video, pictures, etc. Students can choose their interest multi content, study it and to improve our knowledge, in addition, the system provides an opportunity to test the knowledge gained by passing specific tests on selected of multi contents, it requires registration of listeners.

Structuring and preparation of teaching material multi contents carried out as follows, Figure 3.

The structure of the online system — Designer of multi contents Mediacourse Builder consists of the following main parts: an online database system — Designer of multi contents Mediacourse Builder and software kernel.

In fact database (DB) online system — Designer of multi contents Mediacourse Builder is a repository of all information portal, which is accessed through a software kernel. Portal database is a relational database — the most

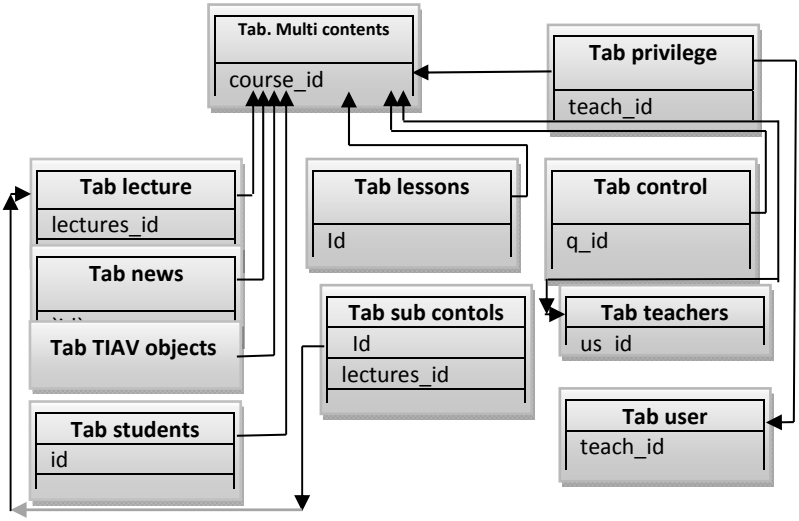

Fig. 4. *The circuit connection of database tables*

suitable and able to meet all the objectives in writing this kind of software. In accordance with the rules of relational database data base is divided into tables, in particular, and this online system — Designer of multi contents Mediacourse Builder. Online Designer of systematic multi contents Mediacourse Builder consists of the following tables: multi-course (courses), lectures (lectures), lessons (lessons), news (news), tests to check the level of knowledge (tests degree), Teachers (teacher), users (users), privileges (roles), videos (video). Figure 4 shows a diagram of the connection of all tables:

Online software core of the system — Designer of multi contents Mediacourse Builder, in turn, is divided into two systems: the online system for creating multi contents, online learning system of multi contents and consists of four modules: — admin; — Teaching; — Student; — Information.

Sometimes it is convenient to consider image components and holes in them as sets of points. This allows you to combine images using set–theoretic operations, such as combining and intersecting. In other cases, it is convenient to use Boolean operations point wise. In fact, these are just two different ways to describe the same actions on images.

Since the amount of information contained in a binary image is an order of magnitude smaller than in a halftone image that matches it in size, the binary image is easier to process, store, and forward. Naturally, a certain part of the information is lost when switching to binary images, and, in addition, the range of methods for processing such images is narrowed. Currently, there is a fairly complete theory of what can and cannot be done with binary images, which, unfortunately, cannot be said about halftone images.

First of all, we can calculate various geometric characteristics of the image, such as the size and position of the object. If there is more than one object in the field of view, you can determine the topological characteristics of the existing set of objects: for example, the difference between the number of objects and the number of holes (Euler's number).

It is also easy to mark individual objects and calculate the geometric characteristics for each of them separately. Finally, before further processing, the image can be simplified by gradually modifying it in an iterative way.

Binary image processing is well understood, and it is not difficult to adapt it to a fast hardware implementation, but you need to keep in mind the limitations. We have already mentioned the need for a high degree of contrast between the object and the background. In addition, the image we are interested in must be essentially two-dimensional. After all, all we have is the shape or silhouette of an object. From this information, it is difficult to judge its shape or spatial position.

Characteristic function b(x, y) defined at each point in the image. This image will be called continuous. Later, we will consider discrete binary images obtained by appropriately splitting the image field into elements.

Simple geometric characteristics. Let's assume again that there is only one object in view. If the characteristic function is known b(x, y), then the area of the object is calculated as follows:

$$A = \iint_I b(x, y)\,dxdy,$$

where integration is performed over the entire image I. If there is more than one object, this formula makes it possible to determine their total area.

Area and position. How do I determine the position of an object in an image? Since an object usually does not consist of a single point, we must clearly define the meaning of the term "position". Usually, the geometric center of an object is chosen as the characteristic point of the object (Fig. 2).

Another way to solve the problem is to try to find the angle of rotation θ, in which the matrix of second moments of size 2x2 has a diagonal appearance.

(In the Matlab package, operations for determining the center of mass, orientation, and other morphometric features are calculated using the IMFEATURE function.)

Projections. To calculate the position and orientation of an object, it is enough to know the first and second points. (This leaves a double-digit choice of direction on the axis.) To find their values, there is no need for the original image: it is enough to know its projections. This fact is of interest because projections are described more compactly and lead to much faster algorithms.

The problem of optimizing the multimedia process is characterized by a large dimension, due to the presence of a large number of elements that make up the multimedia process, as well as high parametricity, due to the complex nature of interaction within the TIAV system [4].

Quantitative and qualitative characteristics of the parameters by which subsystems interact with each other have a great influence on the choice of the optimal optimization strategy and the organization of the effective functioning of the system.

Output parameters characterize the state of the system and determine the conditions for the release of multimedia content. In the TIAV system, the output parameters are the parameters of the information flows of the process at the output of multimedia content development. Input parameters are parameters of input streams of TIAV objects or source multimedia content, as well as parameters of various environmental influences on the process of functioning of the TIAV system.

Internal parameters are divided into structural and technological. The design parameters of the TIAV system are the geometric characteristics of the hardware shaping of the system elements. Technological parameters are divided into parameters of multimedia streams and parameters of the technological mode of elements. Parameters of multimedia streams implement the interaction between the elements. These include the parameters of flow conditions and parameters properties of information flows.

In the article discusses and scientifically substantiates the basic concepts of a logistics multimedia system and information flow, describes the classification and characteristics of information flows and systems, information flow management, processing of logistics information, and organization of input information flows. Various points of view on the principles of flow control are described. The necessity of developing a unified system of principles for logistics management of a multimedia system is justified.

Reference

1. Horn B. K. P. robot Vision: TRANS. Moscow: Mir, 1989. 487 p., I l. ISBN 5–03–000570–6.

2. Rosenfeld A., Kak A. C.. Digital Picture Processing. Vol. 1, 2, Second Edition, Academic Press, New York, 1982.

3. Stoffel J. C. (ed.). Graphical and Binary Image Processing and Applications, Artech House, Inc., Massachusetts, 1982.

4. Grafton C. B. (ed.). Silhouettes a Pictorial Archive of Varied Illustrations, Dover Publications. New York, 1979.

5. Mitchell J. L., Goertzel G. Two-Dimensional Facsimile Coding Scheme, IBM Research Report RC 7499, Jan., 1979.

6. Beknazarova S. S. Models and software of the media education portal, LAP LAMBERT Academic Publishing GmbH&Co. KG, Saarbrucken, Germany, 2012, 178.

Author

Beknazarova Saida Safibullayevna (Republic of Uzbekistan, Tashkent) — Doctor of technical Sciences, associate Professor, acting Professor of the Department of “Audio-Visual technologies” of the Tashkent University of information technologies named after Muhammad al-Khwarizmi (100200, Uzbekistan, Tashkent, Amir Temur str., 108), e-mail: saida.beknazarova@gmail.com.

Бекназарова С. С.

Моделирование основных характеристик экспертной медиаобразовательной системы

В данной работе рассматриваются черно-белые (бинарные) изображения. Процесс получения, хранения и обработки изображений, имеющих много уровней яркости. Однако, поскольку двоичные изображения кодируют только информацию о силуэте объекта, их область применения ограничена. В статье сформулированы условия, необходимые для успешного использования бинарных методов обработки изображений. Здесь внимание сосредоточено на таких простых геометрических характеристиках изображений, как площадь объекта, его положение и ориентация. Такие величины можно использовать, например, в процессе управления механическим манипулятором при работе с деталями.

Ключевые слова: моделирование, геометрические характеристики, бинарные изображения, процесс редактирования.

Информация об авторе

Бекназарова Саида Сафибуллаевна (Республика Узбекистан, г. Ташкент) — доктор технических наук, доцент, врио профессора кафедры «Аудиовизуальные технологии», Ташкентский университет информационных технологий имени Мухаммеда Аль-Хорезми (100200, Узбекистан, Ташкент, ул. Амира Темура, 108), e-mail: saida.beknazarova@gmail.com.