

HYBRID INFORMATION MODELS IN IMAGE PROCESSING SYSTEMS

S. Antoshchuk, O. Babilunga

Department of the Information Systems,
 Institute of the Computer Systems,
 Odessa National Polytechnic University,
 Shevchenko prospect, 1, Odessa, 65044, Ukraine,
 svetlana_onpu@mail.ru, babilunga@mail.ru

Abstract: In this article the approach to the development of hybrid information models in image processing systems is presented. This approach allowed creating more effective methods and information technologies of the image processing, analysis and recognition.

Keywords: information technologies, visual information, image processing and recognition, hybrid models, contour analysis.

INTRODUCTION

Visual information processing systems (VIPS) are often used in the modern information and controlling systems (ICS). These systems are used for the solution of the most various tasks: measuring and control of linear and angular sizes of stationary and moving objects, number of objects and count of products, control of goods shape and determination of deviations from standard shapes etc. [1, 2].

At the present the domain of VIPS application is limited by their insufficient efficiency and universality. Therefore the quality of processing of visual information, presented as images, must increase. This is an important scientific and practical problem, which must be solved by the effective modeling of VIPS and analysis of processes, which take place in the systems [3, 4].

1. ANALYSIS OF INFORMATION PROCESSES IN IMAGE PROCESSING SYSTEMS

VIPS are the complex systems, working in the conditions of non-determination of initial information. Their basic function is the extraction of essential information, determining efficiency of ICS work on the whole. For their design it is expedient to use system approach. The hierarchy of VIPS application aims is reflected in a system model (fig.1).

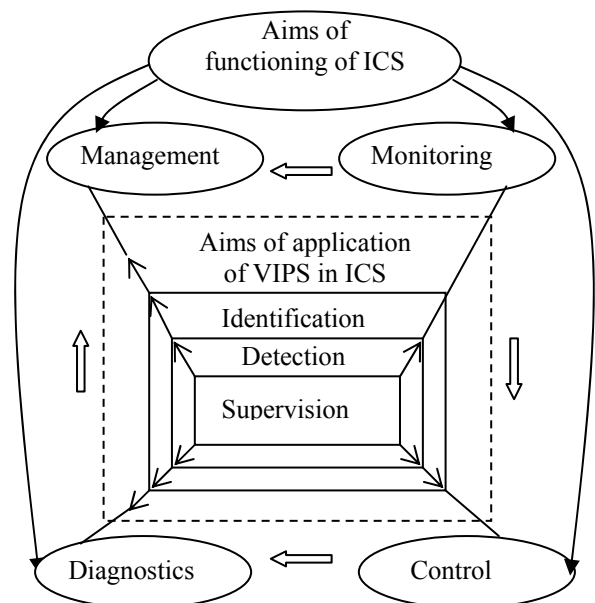


Fig. 1 – The system model of VIPS application in ICS

In accordance with the system model, the obtained visual information in ICS can be designated for supervision an object (collection, transformation and preview processing of information, visualization), detecting an object or measuring of information about it (control, determination of deviations) and identification of an object or its characteristic features (diagnostics, estimation of management object parameters and classification conclusion) [5].

Existent VIPS include the image generation systems and image processing systems. The image

generation systems carry out the perception and registration of visual information on the carrier of data. The choice of the concrete type of visual information reading is produced on the basis of the known (exactly or approximately) features of the researched objects taking into account the necessary operating requirements.

The analysis of the basic information approach to the design of visual information presentation and processing in image processing systems, in regarding to the system model, allows selecting four levels of visual information processing: preview processing, general and detailed analysis (segmentation), selection and analysis of features (identification), classification.

In accordance with the proposed system model, the role of image processing systems can be different. In creating them it is expedient to apply information approach. Three closely connected problems consider in terms of this approach: entrance presentation, processing and output presentation of images.

2. DEVELOPMENT OF HYBRID INFORMATION MODELS

The conducted analysis showed that the existing basic information approaches to the design of visual information presentation and processing – structural (signal), statistical and semantic – dissatisfied the requirements of practice. Therefore there is a necessity of development of hybrid models of visual information processing on all the levels, which unite different informative approaches and allow creating more effective methods and information technologies of images processing, analysis and recognition.

The next information models are offered and analyzed in the article [5, 6, 7, 8]:

- signal-statistical model of image object recognition;
- signal-statistical model of visual information preview processing;
- signal-semantic model at the contour analysis of information;
- hierarchical models in terms of the structural-statistical identification of geometrical object shapes.

It should be noted that the use of the hybrid models supposes the description of object images at some abstract level. In addition, various systems of features can be used in order to describe objects at different levels. Such structures allow to improve exactness of modeling and to increase reliability of the classification.

4. CONCLUSION

The article presents application of the information approach to creating of hybrid models at different levels of image processing. On the base of the described models a row of new effective methods is developed. These models and methods may be applied for the solution of wide circle of tasks of image processing and recognition.

5. REFERENCES

- [1] P.G. Katys, G.P. Katys. Systems of Machine Vision with Intelligent Videosensors // *Inform. Technologies*. – 2001. – No. 10. – Pp. 28-33. (in Russian).
- [2] R. Gonsales, R. Woods. *Digital Image Processing*. – Moscow: Technosphere, 2005. – 1072 p. (in Russian).
- [3] V.G. Abakumov, S.G. Antoshchuk, V.N. Krylov. Models of Image Presentation and Processing: Information Approach // *Electronics and Connection*. – 2006. No. 5. – Pp. 36-43. (in Russian).
- [4] D. Marr. *Vision. The Information Approach to the Learning of Visual Pattern Presentation and Processing*. – Moscow: Radio and Connection, 1987. – 400 p. (in Russian).
- [5] S.G. Antoshchuk, V.N. Krylov. Models and Methods of Data Presentation and Processing at Creation of Information Technologies // *Optiko-Electronic Informative-Power Technologies*. – 2005. – Vol. 1(9). – Pp. 16-25. (in Russian).
- [6] V.G. Abakumov, V.N. Krylov, S.G. Antoshchuk. Preview Processing of Signals and Images. *Electronics and Connection*. – 2004. – No. 21. – Pp. 64-67. (in Russian).
- [7] S.G. Antoshchuk, V.N. Krylov. Image Processing in Area of Hyperbolic Wavelet-Transformation. *Automatization. Automation. Electrical Engineerings Complexes and Systems*. – 2003. – No. 2. – Pp. 7-10. (in Russian).
- [8] S.G. Antoshchuk, A.A. Nikolenko, O.Yu. Babilunga. Model of the Structure Object Regarding the Semantic Meaning // *International Scientific and Technical Conference is "Artificial Intelligence. Intellectual Systems" (II-2008)*. Donetsk. – 2008. – Pp. 42-45. (in Russian).