Evaluation of geometric parameters of branches of three-dimensional tree-like and cross-linked structures using the example of an image of a cardiovascular system

N.Y. Ilyasova[1,2], A.V. Kupriyanov[1,2], A.V. Ustinov[1,2], A.G. Khramov[1,2], V.G. Baranov[2]
[1]Image Processing Systems Institute of RAS,
[2]Samara State Aerospace University

Abstract

An image of a cardiovascular system is used as an example to consider a class of images containing branches of cross-linked and tree-like three-dimensional structures. The paper describes one of the methods of obtaining three-dimensional coordinates of heart vessel scanning points based on the results of processing two image projections. The work proposes a set of basic geometric characteristics describing the objects of two-dimensional and three-dimensional structures. It presents the methods for calculating the proposed parameters, as well as the algorithms for evaluating the properties of a heart vessel, taking into account the three-dimensionality of the initial area in the analysis of the heart images.

Keywords: three-dimensional tree-like and cross-linked structure, image a cardiovascular system, three-dimensional coordinate, image processing, heart image.

Citation: Ilyasova NY, Kupriyanov AV, Ustinov AV, Khramov AG, Baranov VG. Evaluation of geometric parameters of branches of three-dimensional tree-like and cross-linked structures using the example of an image of a cardiovascular system. Computer Optics 2002; 23: 48-52.

Access full text (in Russian)

References

[1] Branchevsky SL, Durasov AB, Ilyasova NYu, Ustinov AV. Methods for estimating geometric parameters of retinal vessels using diagnostic images of fundus. Proc SPIE 1998; 3348: 316-325.

[2] Brantchevsky SL, Vasiliev YuV, Durasov AB, Ilyasova NYu, Ustinov AV. Method for the distinguishing and quantitative evaluation of the elements of pathological patterns in the retina (pathology of microciculation). Proc SPIE 1995; 2363: 236-242.

[3] Yang C-W, Ma DJ, Chao SC, Wang CM, Wen C-H, Lo CS, Chung P-C, Chang C-I. Computer-aided diagnostic detection system of venous beading in retinal images. Opt Eng 2000; 39(5): 1293-1303.

[4] Ilyasova NY, Ustinov AV, Baranov VG. An expert computer system for diagnosing eye diseases from retina images [In Russian]. Computer Optics 1999; 19: 202-209.

[5] Bronstein IN, Semendyaev KA. Mathematical Handbook for engineers and college students [In Russian]. 13th ed. Moscow: "Nauka" Publisher; 1956.