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Parameters of Metered Objects of Interest in Ultrasound Images Monitoring

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Abstract: *The main goal of form and parameters metered objects on ultrasonic pictures monitoring and 2D and 3D simulation of the process metering is to present measured data, namely in a standard way but also and in quite other way than are records displayed in tabular or result sets. The contribution deals with modern methods at image processing in terms of objects of interest metering. The system FOTOM is described bellow together with its functions. Especially new modulus for comparing of metering, 3D modelling and 2D animation are described.*

Keywords: *image segmentation, treshholding, bojary image, mathematical morphology, recognition.*

1 Introduction

This contribution deals with the photogrammetric system (FOTOM), which has been developed for several years on Department of Computer Science at VSB-TU Ostrava. FOTOM originally served to mine holes measurement. The new version serves to define and process objects of interest in medical field.

2. 2D modelling

Objects:

There are six kinds of objevte of interest: point, edge, cusp, circle, elipse and polygon. These objects are defined in points editation mode.

Point

The simplest object, simple point. The only one parametres are the coordinates of the point.

Edge

Object defined by two points forming abscisa. The parametres are coordinates of the center of this abscisa.

Cusp

Its a point of intersection of two lines. Every line is defined by two points. Cudo is also defined by four points. The important parameter is coordinate of the cudo.

Circle

The parameters of circle are center, radius, volume and intensity. A circle is defined at lest by three points.

Ellipse

The parameters are: center, size of half axles, rotation about a x-axle, volume and intensity of the elipse. Elipse is defined by five points.

Polygon

Polygon is closed path defined by binding together of n-points with n-1 lines. We observe decision point coordinates, volume and intensity of the polygon.

Rotation of objects

Lets imagine an object with circle form. If we watch the object abeam, we can get various resolutions. It depends on angle we watch the object. This is the purpose why various possibilities o fangle options is needed, so called objects rotation.

Distance between objects

If we watch plot with distance between objects on y-axis, we can see the positron change between objects in term sof all profiles together.

FOTOM1 and FOTOM2 are the modulus, that solve 2D simulation

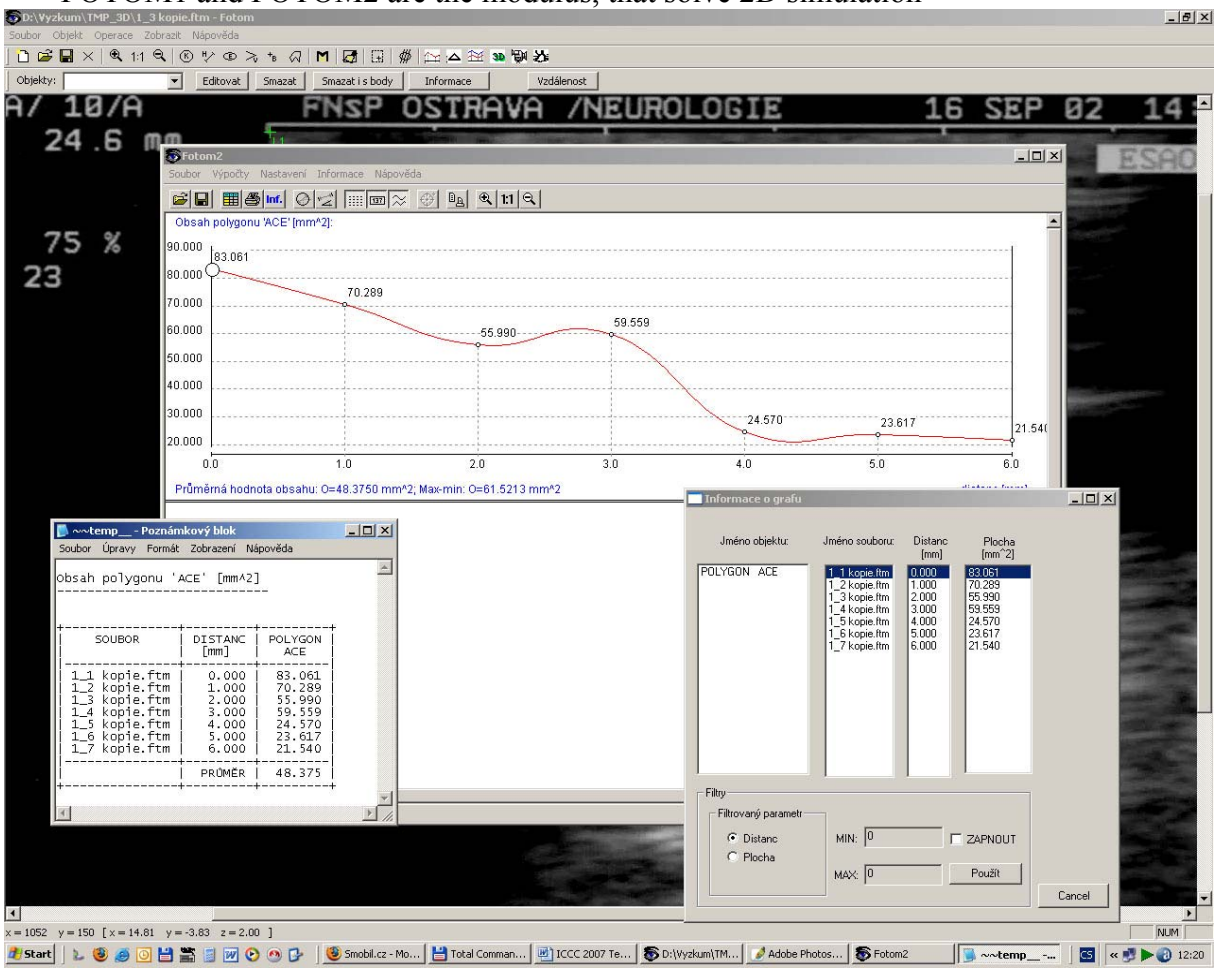

Figure 1: FOTOM2 modulus– 2D simulation.

3. 3D simulation

To display 3D scene on monitor, we must this scene transform. Text thereinafter describes some methods of transformation.

Central projection

Central projection transformation is defined by relation:

$$P_2 = [x_2 \quad y_2 \quad z_2 \quad 1] = [x_1 \quad y_1 \quad z_1 \quad 1].\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -1/d \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} x_1 & y_1 & 0 & 1 - \frac{z_1}{d} \end{bmatrix}$$

Paralel projection

$$M_{pravo.} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{2.3}$$

FOTOM3 Modulus solves 3D simulation in the FOTOM system.

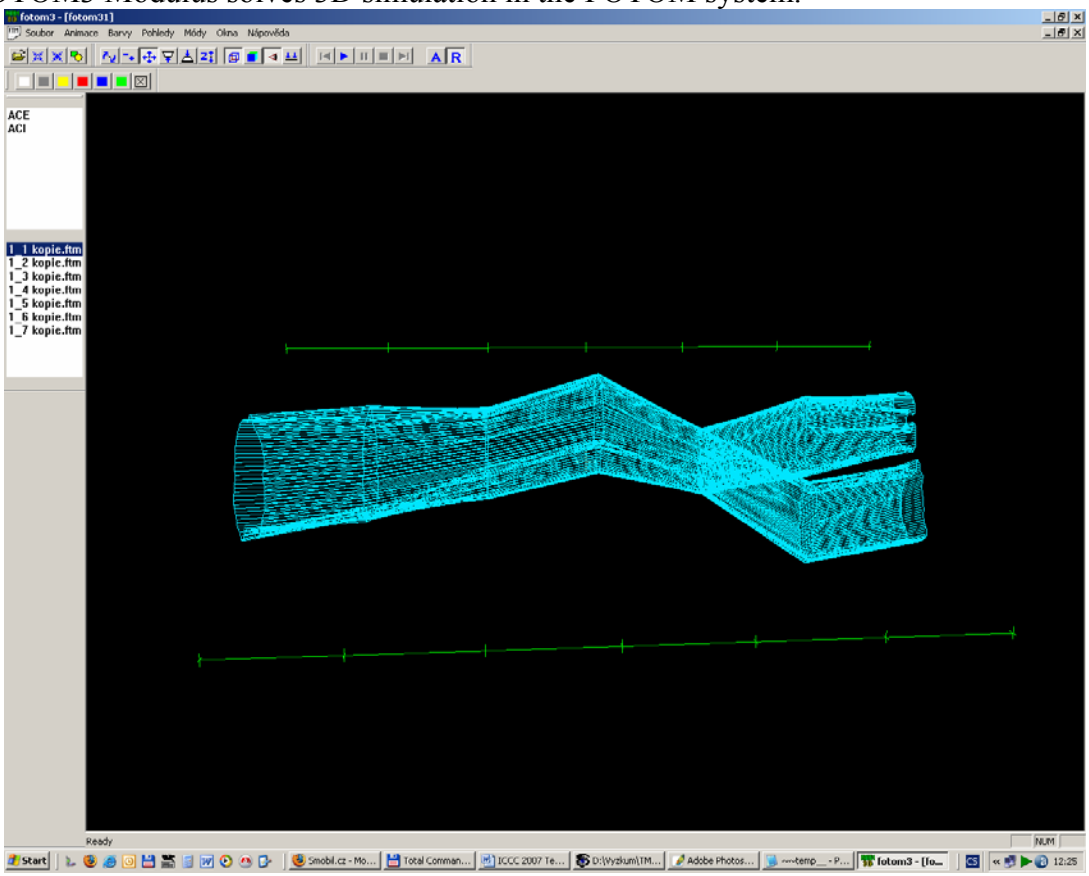

Figure 2: FOTOM3 modulus – 3D simulation.

3. Metering process animation

Animation in photogrammetry

The main goal is to present metered datas in the other way than in graphs. Each image is rotated and scaled to obtain regular join of images.

Objects animation

Objects animation is the main representative mode in FOTOM4 modulus. It display object of interest and we can analyze or present metering by observing position or geometrical properties of objects of interest.

Image animation

It can give us the first conception about quality of the images, about quality of scanning process and so on.

4. Divergence metering and synthesis of two metering

There are two methods how to establish a divergence:

Divergence from arithmetic mean

This method establish a divergence as a difference of the value of object and the arithmetic mean.

Divergence from project values

In this case we suppose that we know prototypal values of the parameters. We have to create a project file, that defines all the parameters needed.

FOTOM5 solves problem of divergence metering.

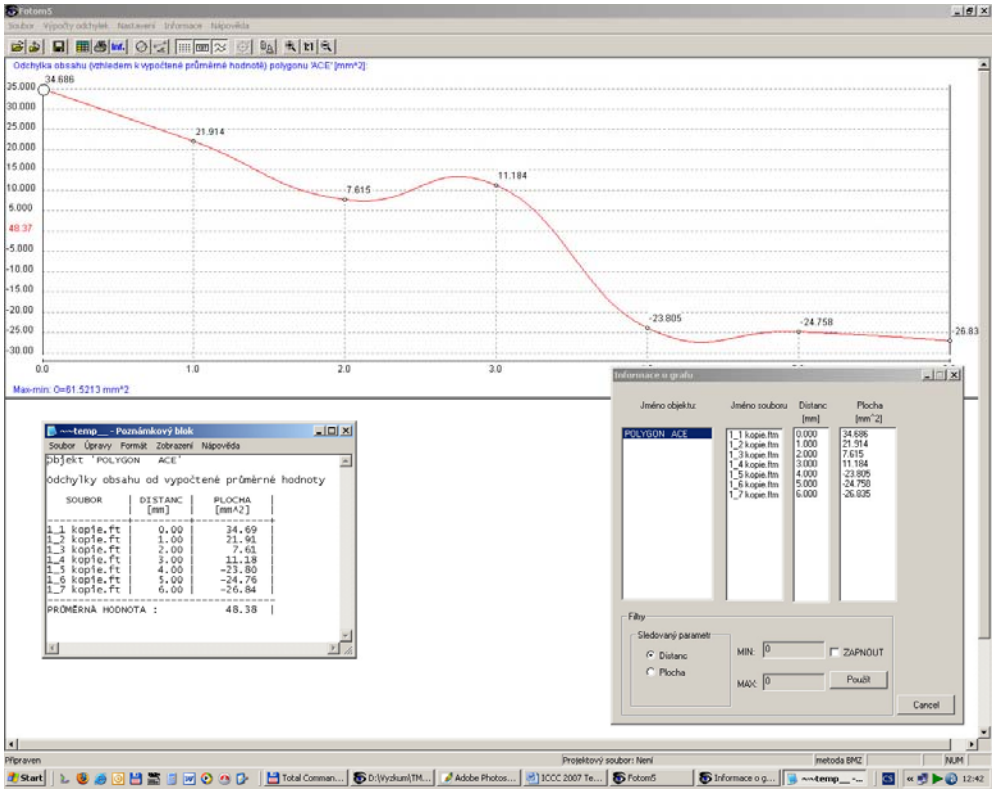

Figure 3: FOTOM5 modulus

Two metering synthesis

In some cases we need to find out parameters changes since last metering. It is suitable to display parameters of last and actual metering to one graph. FOTOM6 serves to solution of this situation.

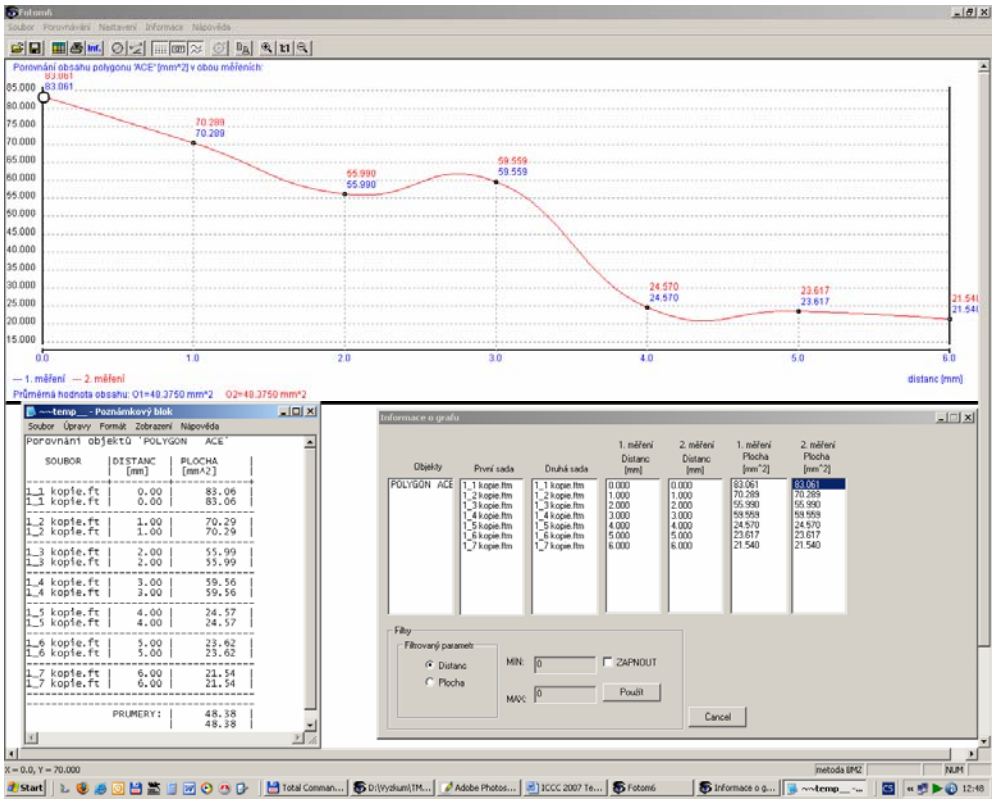

Figure 4: FOTOM6 modulus

4 Conclusion

This contribution describes modern methods of image processing and objects of interest monitoring. We describe 2D and 3D simulation and also objects animation. Last but not lest the FOTOM system using all the methods described hereinbefore is presented.

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9 References

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