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 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 photogrammetry system (FOTOM), which has been developed for several years on Department of Computer Science at VŠB-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 parameters are the coordinates of the point.

Edge
Object defined by two points forming abscisa. The parameters 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 ellipse. Ellipse 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:

\[
P_2 = [x_2 \ y_2 \ z_2 \ 1] = [x_1 \ y_1 \ z_1 \ 1] \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & -1/d \\ 0 & 0 & 0 & 1 \end{bmatrix} = [x_1 \ y_1 \ 0 \ (1 \ -z_1/d)]
\]

**Parallel projection**

\[
M_{pravo.} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}
\]

(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 data in a different 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 displays objects of interest and allows analyzing or presenting 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 to establish a divergence:

**Divergence from arithmetic mean**

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

**Divergence from project values**

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

FOTOM5 solves the problem of divergence metering.

![Figure 3: FOTOM5 modulus](image-url)
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.

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 least the FOTOM system using all the methods described hereinbefore is presented.

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9 References