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STEREOSCOPIC IMAGE FEATURE MATCHING DURING ENDOSCOPIC PROCEDURE

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Biomedical engineering is one of the most promising areas of human activity. The development of mankind without the development and implementation of biomedical technologies is not possible. Among such fields of biomedical engineering, a special place should be given to information processing and analysis technologies [1]. Multidimensional data analysis allows the registration of significant information, taking into account various features [2]. Thus, the analysis is possible taking into account age, gender and individual characteristics [3].

A particularly important type of information is the image, which represents the spatial distribution of the function of two variables. Their analysis and processing have their specifics [4]. It depends on the area of application. The most widespread in medicine images have become in the analysis of tomographic sections [3-4], microscopic images [5-7], etc.

In surgery, surgical navigation systems have recently become widespread [6]. Optical navigation systems are most often based on the optical method [7]. The essence of the method is the simultaneous registration of images of the surgical scene from several views [8]. This method is used in other fields of medicine. For example, among a wide range of methods for tremor analysis [9-15] researchers are developing an optical method.

Another important area of information processing and analysis is a three-dimensional reconstruction by projection mappings. One of the most objective medical methods is endoscopy. Endoscopy is a method of a visual examination of the internal cavities of biological beings using a specialized device - an endoscope. Therefore, the work is devoted to the analysis of endoscopic images for reconstruction tasks, namely the search for matches on pairs of images.

There are a significant number of endoscopes. Among them are stereo endoscopic systems, which allow recording a couple of pictures - the stereo image.

The work used a video stream lasting 26 seconds 640x480@30FPS [8].

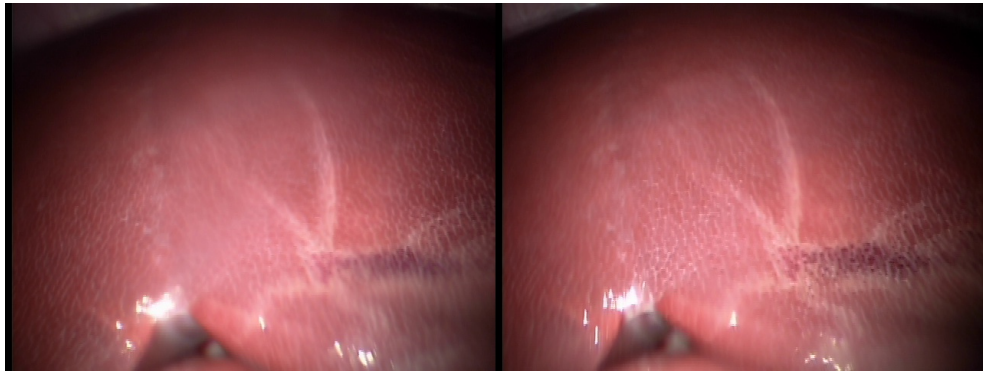


Figure 1 – An example of stereo endoscopy images: a – left, b - right [8]

The registration of stereoscopic images is schematically shown in Fig. 2.

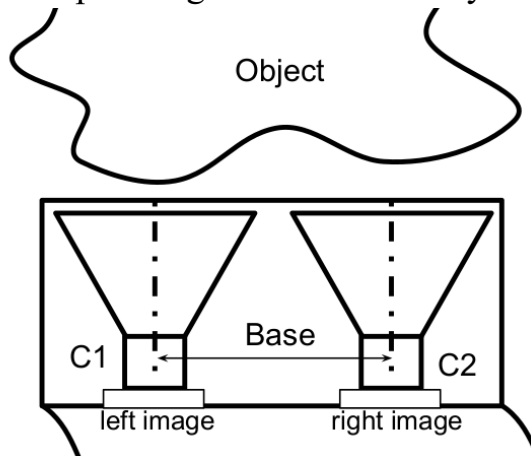


Figure 2 – A schematic diagram of stereoscopic image registration

The OpenCV library was used in the development of the functionality. To search for specialized special features in the image, the image from the color space BGR was converted into a monochrome image. Next, the ORB method was used for each image. ORB is a combination of the FAST keypoint detector and the BRIEF descriptor. The search for matches was calculated by pairwise comparison of descriptors.

The result of the program is shown in Fig. 3.

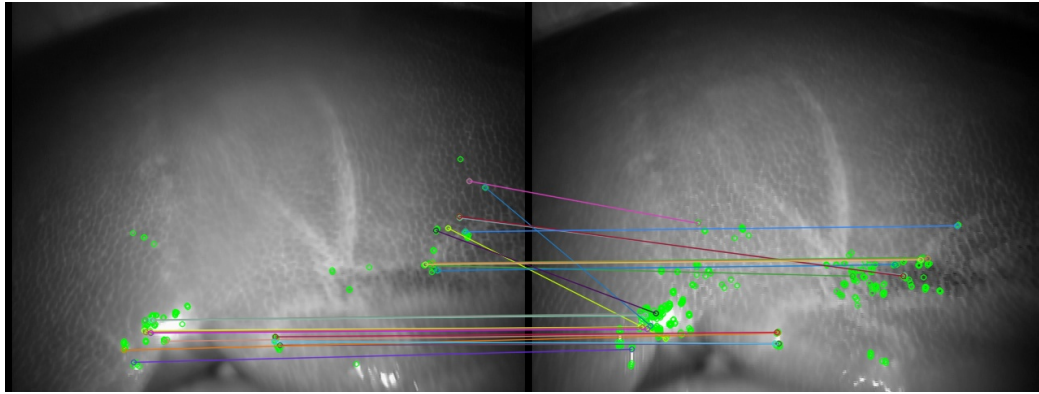


Figure 3 – An example of features image matching of endoscopy stereo pair of images

As can be seen from the figure, the use of the developed software allows calculating pairs of corresponding points, which in the future can be used for three-dimensional reconstruction. The number of points for each frame is not large enough, so the 3D reconstruction should use the entire video stream. To increase the number of points should also conduct a study on setting the parameters of the detector.

The study tested the stage of finding matches on stereo pairs of endoscopic images. The next stage of research is the reconstruction of three-dimensional data based on the registered corresponding pairs. The obtained results show the prospects of the study. The use of such technology in everyday medical practice during endoscopic studies should improve the quality of medical procedures.

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