

ENDOSCOPIC PANORAMA IMAGING

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BACKGROUND

Limited keyhole vision constrains any endoscopic procedures for gastroenterologists and laparoscopic surgeons alike. In order to visualize the surrounding context during diagnosis and surgery, the camera-equipped endoscope has to be moved continuously and therewith, moved away from the site of intervention. The captured scene becomes visible only temporarily and any correlations between the situs and its anatomical periphery must be associated by the surgeon.

Furthermore, documentation is based on individual image frames with impaired vision or whole video sequences, which are cumbersome to transmit and archive.

OUR SOLUTION: ENDORAMA

With the development of so-called stitching technologies, endoscopic panorama images with high spatial resolution are possible by way of post-processing continually captured image sequences. These technologies allow depicting multiple fields of view of the endoscopic camera simultaneously. Due to the high computational effort of conventional methods, such pictures generally cannot be stitched together »online« during the intervention, but are available only at a later point in time. Hence, the Endorama system has been developed to circumvent this limitation and to be able to capture and use panoramic pictures in real-time during the endoscopic procedure.

The calculation of the panoramic images with Endorama is based on a sequence of image operators, which are applied to any new image of the connected camera. After distortion has been corrected in the endoscopic image, the image features are used to spatially align the image sequence. By this way the scene captured by the endoscope is gradually established as panoramic image at a data rate of 8-10 frames per second. The latest image is constantly projected onto the panoramic image, thus always providing the endoscopist with real-time perspective in the anatomical context.

BENEFITS

Panoramic pictures with mapped live images provide the anatomical context throughout endoscopic procedures. The anatomical context can be updated through a simple movement of the endoscope at any time, facilitating surgical orientation and visual overview of the operating area. No special hardware or sensors are necessary.

Using one or more panoramic images improves the documentation and quality assurance of endoscopic interventions. They provide a quick overview, hence allowing simple archiving and easy transmission.



Figure 1: Context view of the interior of the bladder during cystoscopy. The current image is highlighted in the center; the context is stitched from the video stream.

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Endorama has not yet been certified as a medical product. Fraunhofer IIS presents this functional prototype with the aim of engaging partners for further development as well as for production and marketing.