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Topic 1

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Inexpensive access to 3-D ultrasound

Almost every doctor's surgery has an ultrasound scanner. Medical ultrasonography allows us to see an unborn child in its mother's womb and helps to detect gall stones or identify tumor-like lumps. It plays a particularly important role in the early detection of breast cancer. Three-dimensional sonography can provide especially informative images, for instance allowing the structure of tumors, their growth pattern and their blood supply to be clearly distinguished from healthy tissue. Although 3-D technology has been available since the 1990s, it remains prohibitively expensive. Physicians and clinics wishing to upgrade from 2-D to 3-D technology usually have to invest around 50,000 euros in new equipment.

In collaboration with the software company MedCom, researchers from the Fraunhofer Technology Development Group TEG and the Fraunhofer Institute for Biomedical Engineering IBMT have succeeded in producing a considerably less expensive solution for physicians: The scientists have developed a system that enables conventional 2-D ultrasound scanners to be upgraded to provide 3-D images for as little as 400 euros. The question is, how? "We fit the ultrasound transducers with inertial sensors that can determine the exact position and orientation of the probe," explains Dr. Urs Schneider, project manager at the TEG. "Specially developed algorithms then allow us to reconstruct a three-dimensional image from the data thus obtained." The inertial sensors are small, inexpensive semiconductor components that are sensitive to movement in any direction. Such sensors are normally very imprecise, especially when determining equatorial coordinates. However, the special algorithms developed by the TEG engineers enable the exact calculation of spatial coordinates. The margin of error of the sensors could therefore be reduced from around 10 degrees to less than one degree. For the first time, a highly accurate, low-cost navigation system is available that can easily be integrated into existing ultrasound scanners.

This inexpensive upgrade makes it possible to improve standards of healthcare, particularly in eastern European countries: Patients there too can now benefit from better diagnostic capabilities. Schneider expects the new system, which consists of a small device installed with the necessary software, to be commercially available later this year.

For further information:
Dr. Urs Schneider
Phone: +49 (0) 7 11/9 70-36 30
Fax: +49 (0) 7 11/9 70-39 94
urs.schneider@teg.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT
Steinbachstraße 15
52074 Aachen, Germany
Press contact:
Axel Bauer
Phone: +49 (0) 2 41/89 06-1 94
Fax: +49 (0) 2 41/89 06-1 21
axel.bauer@ilt.fraunhofer.de
www.ilt.fraunhofer.de