Augmented reality in operating theaters

Doctors have long been confronted with the problem of identifying the precise location of lymph nodes affected by cancer. Researchers at Fraunhofer IGD in Darmstadt are now presenting a technology which assists doctors in locating such nodes during operations.

(Darmstadt) Despite recent advances in medicine, many operations are still very difficult to perform and entail risks. Doctors need to demonstrate great skill in the operating room since they are limited to estimating the exact location of organs, blood vessels and diseased tissue during surgical intervention. Together with partners, researchers at the Fraunhofer Institute for Computer Graphics Research IGD in Darmstadt have now come up with a technology which helps guide doctors during operations.

Assisted by augmented reality (AR) during operations
The researchers have developed an innovative augmented reality system for lymph node removal from cancer patients as part of their 3D-ARILE project, funded by the ZIM program, the German central innovation program for SMEs. “Augmented reality assists doctors by providing visual markings during operations. AR glasses overlay the position of the lymph node as a virtual mark,” explains Dr. Stefan Wesarg, Head of Competence Center „Visual Healthcare Technologies” at Fraunhofer IGD in Darmstadt. “The technology helps to guide the doctor, indicating where they need to make an incision and ensuring they have excised everything that they need to.” Before operating, doctors inject an infrared dye into the patient. This dye then accumulates in the affected lymph node, making it visible and ready for removal. The node is then captured by the infrared camera and reconstructed in 3D. Fraunhofer IGD scientists provided the software required to generate the 3D image.

Advantages for patients
This new system not only helps doctors, but also offers advantages for patients. Indocyanine green (ICG) dye is now used instead of the radioactive detector substance administered previously. Less harmful to the human body, this dye also presents a good alternative when used in combination with an infrared camera and AR glasses. It enables doctors to mark affected lymph nodes and remove them completely.
Fraunhofer IGD is working on the 3D-ARILE project in cooperation with Trivisio Prototyping GmbH and the Clinic for Dermatology at Essen University Hospital.

You can find more information at: AR-System for lymph node extirpation

Image: AR glasses overlay the position of the lymph node as a virtual mark. (Rights of use: Fraunhofer IGD)
Institute profile

Founded 30 years ago, Fraunhofer IGD has become the world's leading institution for applied research in the field of visual computing. Visual computing means image and model-based IT. In simple terms, it describes the capability of transforming information into images (computer graphics) and extracting information from images (computer vision). The numerous application scenarios include human/machine interaction, interactive simulation, and modeling situations.

Our developers at the sites in Darmstadt, Rostock, Graz, and Singapore develop new technical solutions and prototypes all the way up to the market readiness stage. In collaboration with our partners, this results in application solutions that are custom-tailored to customer requirements.

Our approaches facilitate the work with computers and are efficiently used in the industry, in everyday life, and in the healthcare sector. Our research highlights include assisting people in the Industry 4.0, the development of key technologies for the Smart City, and the use of digital solutions in the field of Individual Health.

Through applied research, we support the strategic development of the industry and economy. Especially small and medium-sized enterprises as well as service centers can benefit from this and be successful on the market with the help of our leading technologies.