

## Hitech Briefs by Karel Smrcka

### **New simulation tool progresses radiotherapy**

Radiotherapy is one of the most effective forms of cancer treatment, undergone by roughly a third of all cancer patients. Scientists at the Fraunhofer Institute for Computer Graphics (IGD), together with industrial partners MedCom and Medintec of Bochum, Germany, have developed a simulation system called EXOMIO, which helps to improve the accuracy of radiation therapy and reduces treatment planning time to a matter of minutes. The product has obtained worldwide clinical accreditation.

Once cancer has been diagnosed, patients generally have three fundamental treatment alternatives: surgery, radiotherapy or chemotherapy. None of these options is particularly comfortable, and they each have positive and negative aspects. Radiotherapy is the only choice in certain cases, such as fast-growing tumors, in the post-operative treatment of breast or lung cancer, some prostate types and many others, where radiotherapy is often used to prevent the regrowth of malignant tissue.

Physicians refer to the patient's medical analysis records and computer tomography data to determine the number, position and intensity of the applied beams of irradiation. But this is not sufficient. "A large part of the preparatory work consists in simulating the radiation therapy using low-power X-ray beams," explains Professor Georgios Sakas of IGD. "This involves placing the patient on an examination table, where he or she is required to remain completely immobile for up to an hour. Even the slightest movement could compromise the accuracy of the ensuing treatment – every millimetre counts." The sites destined for treatment are literally 'drawn' on the patient's skin using an indelible marker pen. These outlines must not be changed or washed off for the duration of treatment, which may last many weeks. This preparatory phase of treatment represents a considerable inconvenience to the patient, and involves high personnel, time and other costs for the clinic. The new technique allows the physician to simulate treatment realistically and accurately on the basis of computerised tomography (CT) data, without inconveniencing the patient and without tying up precious resources. In fact, the patient doesn't even have to be present.

"EXOMIO is a tool for the medical profession," says Sakas. "It has a simple, intuitive user interface that enables the physician to evaluate threedimensional images as easily as conventional X-ray images.

The greatest advantage of the preparatory simulation is that it offers more flexibility in the location and number of areas to be targeted by the irradiation source. Without having to subject the patient to hours of discomfort, the physician can experiment

with various alternative treatment plans before deciding on the best choice. After simulation, the prepared therapy plan is passed on to the radiologist who calculates the required doses." Meanwhile, this new, more flexible therapy planning tool is being used by over 60 clinics in 19 countries. Examples in Germany include the radiation clinic in Offenbach, the university hospital of Tübingen and many others. The software gives medical professionals an ideal means of studying treatment of individual tumors and investigating alternative treatment options. The ability to lower or raise the dose and limit damage to healthy tissue has a beneficial effect on the patient's well-being and his or her prospects for recovery. Professor Nikos Zamboglou of the Offenbach Cancer Clinic also sees other positive aspects for the patient. "This software allows us to show patients what the therapy involves, how it works, and where the irradiation treatment will be applied. This helps them to better understand and thus place more trust in the therapy." The 3D-simulator EXOMIO has attracted considerable interest in expert circles throughout the world. It was selected as a finalist in the 'health' category of the renowned Stockholm Challenge Award, out of a total of over 600 competing international information technology projects. This award focuses more on potential benefits for people and society than on technology as such. The jury praised the many positive features of the simulator, which runs on a standard high-performance PC, requires no major investments, and significantly reduces treatment costs while at the same time producing superior results. EXOMIO thus clearly meets the objectives of the challenge, as the chairman of the jury, Professor Alfonso Molina declared during the prize-giving ceremony.

The EXOMIO simulation makes radiotherapy easier to bear for many patients, because the treatment can be prepared more accurately, in less time, and at lower cost.