

New imaging technologies in forensic work and the medical practice

Interview with András Fehér, project director of iCollWare Ltd.

The iCollWareLtd. closed its R&D project, identified GOP-1.2.1-09-2010-0012, the goal of which was to study, how the management model of the forensic medical expert's work can be supported by leading 3D modelling and data capture technologies. In the framework of the project – among other activities – they tested the suitability and applicability of the object and terrestrial scanners in the areas of law enforcement as police crime investigation, necropsy, procedures taking place in the autopsy room, and also sought to elaborate best possible practices. We interviewed the project's director, who, beyond summarizing their achievements, also told us about the possibilities of further use of the experience gained in the project.

– On the 11th IME National Conference on Health Info-communications you chose an astounding title again: "How's the scanner got to get in the medical bag?" Beyond awareness-raising how do you think the raised issues realistic are?

– Of course, it is a slight exaggeration from the point of view, whether a scanner really fits into a medical bag, but the question as to how the 3D scanners are now part of a medical practice, we have to answer a clear yes.

– Could you give some examples?

– If you look at the well-known scanner manufacturer's websites and try to find out whom they are mainly manufacturing their products for, it must be recognized, that in addition to the traditional use in the manufacturing industry, health industry gets the most attention. Dentists, trauma surgeons, orthopaedic surgeons, plastic surgeons, dermatologists are using these devices in large numbers and in diversifying areas.

– How can we explain this rising trend?

– Primarily by the rapidly decreasing price of the 3D devices. The tools are getting smaller in size, are more accurate, the programs processing the scanned files are becoming better and the number of the well trained professionals in these technologies is growing.

– Why did you start to deal with 3D technology in the iCollWare Ltd.?

– Our R & D project has the title of supporting forensic work with an administration model by creating a horizontal framework system, developing a model system using advanced 3D modelling and data capture technologies add-

ressing the forensic medical field. In this project – among other activities – we have carefully tested the applicability of the object and the terrestrial scanners in the field of law enforcement. Practical tests of the scanners, comprehensive documentation of measurement results, efforts to elaborate best practices all have constituted a part in our analysis of crime scene investigation, necropsy and the procedures in the autopsy room.

– What is the point in the 'deployment' of such devices in crime investigation?

– First and foremost, that the "other side" is getting more prepared. By the way, the 'NCIS', 'Bones' TV series viewers every day can see, what kind of technological arsenal is available for law enforcement today. The 3D scanner is also one of them. In the process of establishing evidence, it may be very important, that the 3D documentation can be retrieved and presented any time with an unaltered content and even the smallest detail can be re-analysed again. Other hypotheses, concerns may arise, which then can be modelled and examined in a 3D space.

– What solutions and tools did you develop?

– We studied the traditional photogrammetric methods, terrestrial laser scanners, surface scanners, body scanners and the so called economical solutions; the latter mainly because we wanted to see whether they could be competitors to the aforementioned devices. In view of the very scant financial situation of health care, it is also an important consideration.

– What kind of experience was gained with the different devices?

– The photogrammetric techniques, which in our case are primarily photo 3D solutions, provide cheap, fast and spectacular results. Nowadays, a middle-grade camera and an affordable piece of software are sufficient. An expert with a little experience in photography and computer science can produce 3D models. This technology has improved a lot in recent years, but is still not fully matured, precise and reproducible. For medical applications, the terrestrial laser scanners do not come into play, so they are mainly recommended for forensic work. In medical practice the object scanners and body scanners can be used and in many areas they have been fully accepted and proven. In addition, we have tested the Kinect devices known from computer games, because we believe they are also rapidly evolving, becoming more able and less expensive. However, in our view they are still not suitable for medical applications, including 3D reconstruction.

– On the basis of what technical characteristics do you think that the object scanners could be suitable in turn for 3D reconstruction in medical practice?

– They're small in size, weighting less than 1 kg, capture even 20 000 points per second, have a geometric resolution of 0.1 mm and an accuracy of about 50 microns. Of course, in medical application only those devices can be suitable which create true-colour, textured picture. With these devices a few minutes are required to complete a scan and a 3D model can be created also within an hour. More accurate and higher-resolution devices are slightly larger in size and measuring by them requires more preparations.

– What kind of results can be achieved by the researched technologies?

– We can obtain precise, correct size, walk-through 3D models with photorealistic impression. We can provide

initial documentation for a new analysis or examination by the experts, which is identical to the original and unalterable. It can support the establishment and verification of hypotheses. More effective tutorials, 3D reconstructions can be created. Possibility will become a reality for 3D printing. Recent news reported, that a broken limb has been fixed with a mould designed and printed in 3D in such a way.

– What is your point of view about the practical benefits of using the researched technology?

– For example, in further underpinning the expert's opinion. We can provide initial documentation for another expert's assessment, which is identical to the original and unalterable. It can open up new perspectives in other fields of expertise and as we have previously pointed out, it is a technology the use of which is getting faster and increasingly affordable. The models produced with 3D are outstandingly suitable for educational purposes.



Figure 1

The detailed 3D model of the car damaged in an accident, makes possible to analyse the deformations in details and thus to draw conclusions on the impact's strength and the circumstances of the accident, etc.

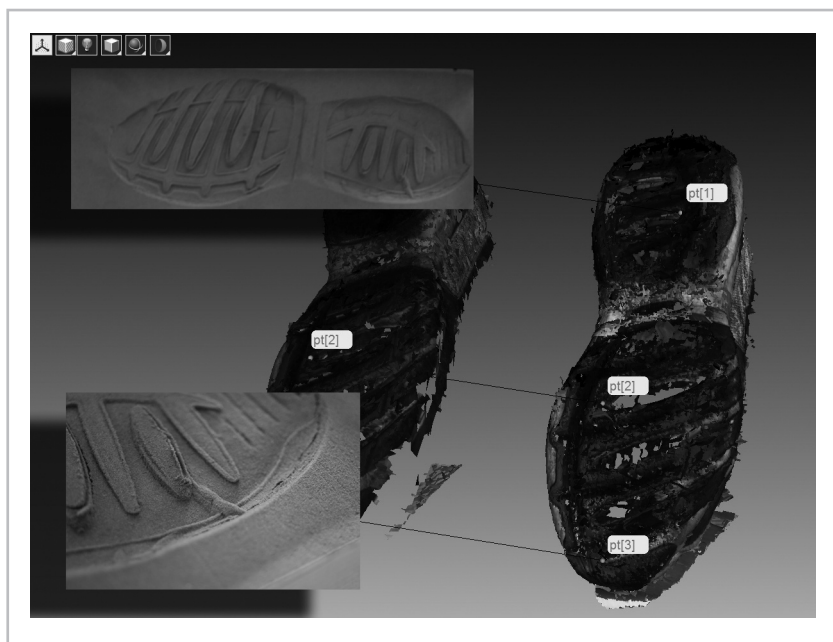


Figure 2
A 3D model produced from a footprint measured by object scanner, on the basis of which matching the footprint and the suspect's footwear can be quickly and precisely confirmed or excluded.

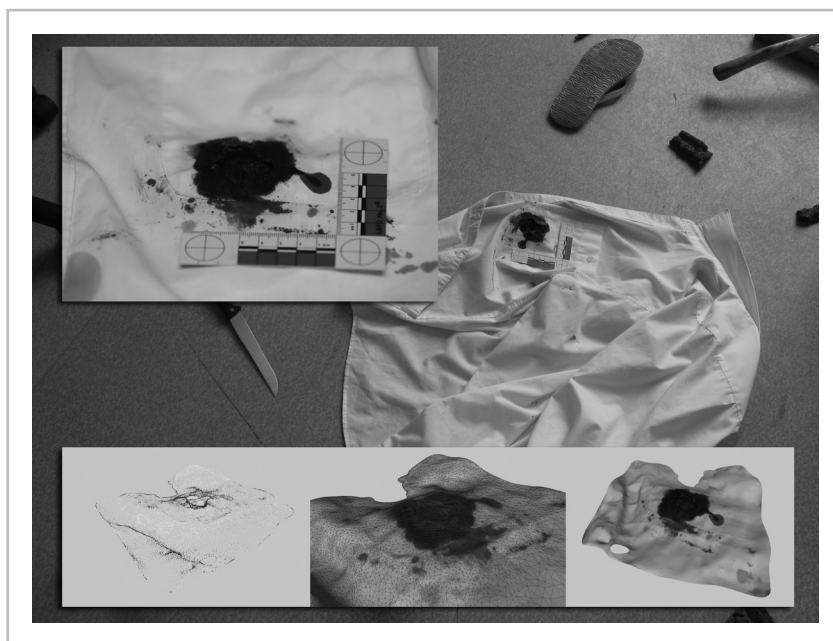


Figure 3
3D scanning of the crime scene and the individual evidences (like the blood-stained clothing seen on the image) provides an excellent tool to document them in an objective and unalterable form, that may be used in the investigation any time later.

BIOGRAPHY



András Fehér is Director of Consulting, HUMANSOFT Ltd. He is electrical engineer by original profession, and later received MBA degree in economics and quality management. He has been en-

gaged in designing, developing and deploying of health information systems for more than 20 years. He was involved in research of teleradiology in several high profile universities. Mr Fehér is the Director of iCollWare project and also supervisor of several other research projects.