

Virtual Reality Healthcare: 3D Medical Imaging Technology

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August 2015

EchoPixel's 3D Medical Imaging Platform

California-based EchoPixel, Inc.¹ has developed and received FDA clearance for its True 3D Viewer; a software platform that enables medical professionals to translate 2D imaging data from MRI and CT scans, for example, into interactive 3D images.

Remarkably, these images can be manipulated in an open 3D space by the user through the use of a handheld stylus device. This is made possible by the fact that the True 3D software platform integrates with next generation displays that are capable of mid-air image projection.

EchoPixel explains that "evaluating medical image data sets, such as the ones acquired by CT, MR, Ultrasound or any other 3D modality, as fully interactive real time virtual reality views of tissue and organs offers an opportunity to redefine medical visualization and expand diagnostic, surgical planning, and image guided treatment capabilities."²

EchoPixel is a privately held, venture backed company located at the Fogarty Institute for Innovation in Mountain View, CA.

The Advantage of 3D Imaging Technology

To be sure, medical professionals already use systems such as General Electric's *Vivid E9 with XDclear*³ to view and manipulate 3D imaging data on 2D displays. That may be sufficient for many applications; however, Stanford University's Radiology 3D and Quantitative Imaging Laboratory co-director, Sandy Napel, explained some key advantages for the technology in a recent interview with Smithsonian.com.

Napel, who also sits on the Advisory Board for EchoPixel, referenced testing of the technology for virtual colonoscopies that is taking place at the University of California, San Francisco, as an alternative to a colonoscopy:

Using CT scan images, this technology can really reproduce [the] tube-like colon, re-create it floating in space, and nothing has to actually enter the body. You can rotate the image at different angles, cut it in half and search the interior surface for polyps. It's a way of visualizing the colon that has great potential to improve how quickly you could look at 100 percent of the interior.⁴

¹ EchoPixel website. *True 3D Viewer 1.0*. Available at: <http://www.echopixeltech.com/clinical-product/>

² EchoPixel website. *Technology*. Available at: <http://www.echopixeltech.com/swihs-technology/>

³ GE Healthcare Website. *Vivid E9 with XDclear*. Available at: http://www3.gehealthcare.com/en/products/categories/ultrasound/vivid/vivid_e9

⁴ Handwerk, Brian. *Medical Holograms Are Now Part of the Surgeon's Toolkit*. Smithsonian Website. March 27, 2015. Available at: <http://www.smithsonianmag.com/science-nature/medical-holograms-are-now-part-surgeons-toolkit-180954791/?no-ist>

3D Medical Imaging and Printing: A Natural Fit

Dr. Maki Sugimoto, an associate professor at Kobe University and University of Tokyo has been a pioneer in the development of 3D body imaging and surgery navigation systems; however, his focus has centered further on the use of 3D printers in order to make personalized human organ models using the same sort of 2D imaging data from MRI and CT scans used by EchoPixel.

Sugimoto uses OsiriX, the open-source 3D body imaging software developed by a Swiss-American team. From the imaging data and the models built through this software, Sugimoto has developed organ models, in collaboration with the medical engineering firm Fasotec Co., based in Chiba, "that not only have the look, but also the weight and the texture of real organs, with the option to highlight blood vessels, bile ducts and/or even tumors inside."⁵

Key benefits of such models for doctors include the opportunity to better understand and prepare for, or even practice for, surgeries. The models can also be seen and handled by patients so that they can better understand their condition, as well as their surgical and other treatment options.

Viewing the Technologies

Several videos of Sugimoto's presentations at different TEDx events have been posted on the TED.com website on this subject, including more details on the materials being developed and used to create very accurate and life-like models.⁶ In April of this year, Sugimoto himself actually posted a video on his YouTube channel that demonstrates the OsiriX-based imaging software in a lab and operating room environment, with some inclusion at times of selected models that were presumably based on body imaging scans and created with the kind of Bio-Texture Modeling discussed in his TEDx presentation a few years ago in Osaka (see link in footnote).⁷

Pioneering the Technologies: Now & Looking Forward

The title of Sugimoto's video, *World 1st Holographic Patient-Based Augmented Reality Surgical Navigation*, is perhaps a bit confusing. This title implies to someone unaware of these technologies, that everything shown is completely new. As we have learned, Sugimoto is a true pioneer in the use and development of the OsiriX software. He has played an instrumental role also in the development of bio-texture models of human organs based on the human imaging scans, as interpreted through this software. And, the video demonstrates the use of these at once, in a surgical environment.

But, similar testing is being conducted elsewhere, as evidenced by the University of California colonoscopy tests. And, the existence of venture-backed companies such as EchoPixel seem an early indication of growth in this particular area of healthcare.

⁵ Otake, Tomoko. 'Printed' copies of human organs can help surgeons and patients alike. The Japan Times. January 30, 2013. Available at: http://www.japantimes.co.jp/life/2013/01/30/digital/printed-copies-of-human-organs-can-help-surgeons-and-patients-alike/#.VbgLep3D_cs

⁶ See, for example, *TEDxOsaka - Maki Sugimoto - Bio-Texture Modeling*. Available at: <http://tedxtalks.ted.com/video/TEDxOsaka-Maki-Sugimoto-Bio-Tex;search%3Amaki%20sugimoto>

⁷ Sugimoto, Maki. *World 1st Holographic Patient-Based Augmented Reality Surgical Navigation*. YouTube. Available at: <https://youtu.be/T7Gq0Z6dN2A>

Research and development by the likes of Sugimoto, and early testing of EchoPixel's True 3D Viewer bring to light exciting and leading edge areas of healthcare technology. These advancements seem further to promise important benefits over products offered by large companies like GE. Virtual reality is clearly taking on a greater role in our healthcare. Researchers, universities, and companies appear to be advancing quickly and independently, but very much in-step.