technology today

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Seeing Inside the Human Body Via the Ultrasound Postage Stamp Sized Patch

Do you like to use your smartphone to take selfies? Depending on your age you might be surprised to learn that the first photo of you was probably taken way before you were born; using current Ultrasound medical equipment. Your mom probably still has the photo and I am sure she can describe how excited she was to meet you for the first time. We are going to look at a major breakthrough which shrinks the equipment and process performed by today's ultrasound equipment down in size so the hardware that creates the ultrasound is a stick-on patch the size of a US postage stamp. See photo 1 and 2.

The Massachusetts Institute of Technology (MIT) and Mayo Clinic engineering breakthrough will change the size and place where an ultrasound might take place after the device receives proper approval for medical use. To understand the advancement, you first need to understand how an ultrasound is done today. A doctor or medical technician places a wand on your skin closest to the organ that is under study. This wand is an ultrasound transducer that produces sound waves that create images as they bounce off your internal organs and return to the wand. A gel is used to create an acoustical bond between your skin and the wand which focuses the sound waves straight into your body. This wand is always placed at the closest skin location to where the organ that needs to be viewed is located. The technician or medical doctor, doing the procedure, can see in real time on a monitor, what is physically taking place and also record the images.

The MIT breakthrough shrinks the part of the equipment that creates the ultrasound images into a stamp size unit that can be adhered to your skin at the location above the organ under study. See photo 2 again. This self-contained ultrasound probe generates the sound waves and then records the bouncing back waves for conversion into images. It is bonded to your skin using a hydrogel adhesive that has the same acoustical properties as the gel used between your skin and the wand on a standard ultrasound system. The patch can continuously record what is going on inside your body for up to two days while you are physically at work or at play. To actually see the images that the ultrasound patch recorded, the device currently needs to be attached to computer hardware to convert its recorded data into images.

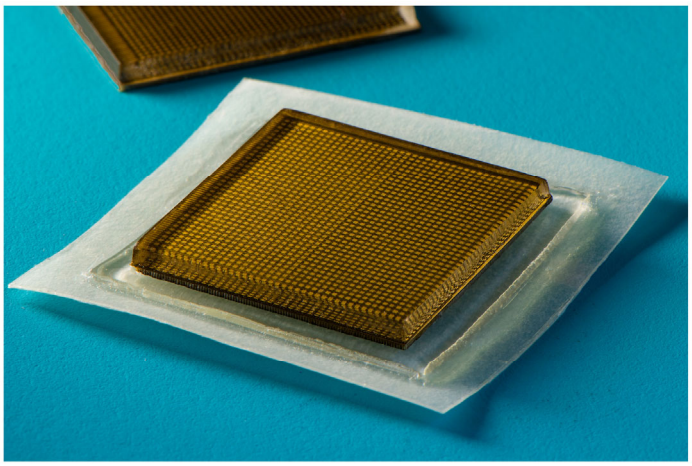

Photo Credit: Felice Frankel MIT

MIT engineers designed an adhesive patch that produces ultrasound images of the body. The stamp-sized device sticks to skin and can provide continuous ultrasound imaging of internal organs for 48 hours.

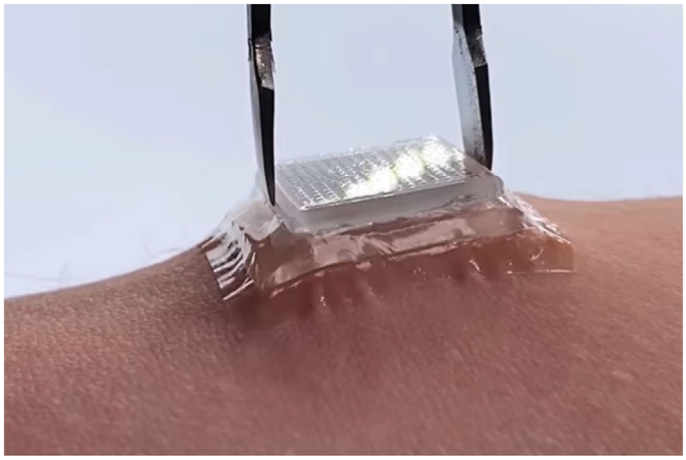

Photo Credit: MIT

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The team's next goal is to add Bluetooth to their patch so the data can be sent to your smartphone, converted into images and then transmitted directly to your doctor's office for diagnosis. Even without this next advancement the patch, once medically approved, could be used in hospitals or as an outpatient device to record what is going on internally over an extended period of time in much the same way patients today are given a heart monitor to wear at home to record how their heart functions under normal working conditions. This video can further your understanding of how this ultrasound patch works and what the researchers hope to achieve in the near future. https://www.youtube.com/watch?v=Kn2J8W4csNc

Taking it a Step Further

Your teacher will determine a grade appropriate approach to this assignment. Medical imaging includes many different scanning technologies besides ultrasound. Working in small groups explore a scanning system. The possible scanning technologies to be explored could include X-rays, Computed Tomography (CT scan), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET scan). Each group shares what they have learned as a presentation.

Alan Pierce, EdD, CSIT is a technology education consultant. Visit www.technologytoday.us for past columns and teaching resources