

 **Hacker News** new | comments | apply | show | ask | jobs | submit login

Show HN: An open-source ultrasound imaging dev kit side project
(echopen.org)

122 points by [kelu124](#) 88 days ago | past | web | 43 comments

[bencollier49](#) 88 days ago

Yikes! This is brilliant innovation, but it should come with a pretty serious warning somewhere about the potential dangers of medical ultrasound. While the jury is still out about a lot of things, there are major reasons why the NHS in Britain discourages expectant mothers from having private "4D" scans and additional procedures.

<http://www.nhs.uk/news/2010/02February/Pages/Warning-over-so...>

Brilliant to see you doing it though, and I'd be fascinated to see it paired with AI to make swifter diagnoses in order to cut down the length of exposure required for various measurements.

[maho](#) 88 days ago

> Yikes! This is brilliant innovation, but it should come with a pretty serious warning somewhere about the potential dangers of medical ultrasound. While the jury is still out about a lot of things, there are major reasons why the NHS in Britain discourages expectant mothers from having private "4D" scans and additional procedures.

This is an overstatement of the available evidence. The link you post says so itself:

> These studies have found no evidence that ultrasound affects mortality around the time of pregnancy or birth, or has any effect on childhood cancers. In randomised-controlled trials there has been 'weak evidence' that it may affect whether a child is right or left handed (known as handedness), which the reviewers say may be the result of confounding, rather than actual causation.

I cringe when I read well-meaning but irrelevant warnings like the one you gave. To me, these warnings are somewhere between naysaying and spreading FUD. The NHS wants to make sure that millions of people don't take unnecessary ultrasounds, since a tiny risk, multiplied by millions, equals a few unnecessary deaths/left-handed children. The individual risk of unnecessary ultrasounds, however, is extremely low compared to the usual risks of pregnancy and childbirth.

Many medical devices are unnecessarily expensive (and suprisingly badly designed, from a user-interface standpoint). There are already enough regulatory hurdles in place that prevent disruption of the medical device markets, let us not add to these hurdles by being overly cautious!

[bencollier49](#) 88 days ago

I think it's worthwhile pointing out that the warning isn't against taking *necessary* ultrasounds, but *unnecessary* ones. And if there's a tiny risk from an unnecessary procedure, then why take it?

And the concern with the device in the link is that it's an *unregulated* ultrasound device which could, in the hands of someone well-meaning

but ill-advised, deliver a dose of ultrasound far in excess of that deemed safe by regulators.

kelu124 88 days ago

The usual comment we hear on usage of this is that OSH equipment like a simple hammer would have to present a disclaimer such as "Can be fatal if used wrongly -- bashing one's head with this device may prove dangerous" - but doesn't bring a lot to the debate.

That being said, open source medical hardware is quite a new field, and lot of aspects need to be matured.

jabits 88 days ago

Many years ago my grandfather owned a retail shoe store in Appleton, WI (back before malls). They used an x-ray machine to aid in sizing shoes. As a kid, years after it was put out of service, I came across it in the store basement. The device was about the size of a washing machine, made of a fine cabinet wood, and had a crt on top that allowed customers an x-ray view of their feet with the new shoes on. Fortunately it was no longer working when I found it.

The point is, lack of evidence is no reason to assume a non-invasive procedure is safe. There should be many "hurdles" in place to prevent unsafe medical devices. This is an area where very few consumers can analyze the risk.

aaron695 87 days ago

This is a nice story, but total FUD.

Do you actually have evidence of any large amounts of harm this did to people?

This attitude is why people don't use vaccines. Fear. It overall hurts the population.

mrfusion 87 days ago

Combining the two topics... why can't we use ultrasound to size shoes? Anyone want to work on that with me?

semi-extrinsic 87 days ago

Because there are many small air gaps between the shoes and the feet. The impedance mismatch would be huge, and likely throw your signal deep into noise territory. Have you seen the amount of jelly they spread on your skin for medical ultrasounds? I don't think having to submerge your feet in liquid when trying out shoes would win many customers.

mrfusion 87 days ago

But in this case you just need a very rough 2d outline. I believe some stud finders use

ultrasound. This might be more similar to that than a medical ultrasound.

CyberDildonics 87 days ago

Are you seriously equating electro-magnetic radiation at a frequency high enough to be de-ionizing with the compression of fluids?

The difference here is that we know how both of these things work.

pc86 88 days ago

I don't want to devolve the thread but I have to say I chuckled at the thought of "unnecessary left-handed children."

kej 88 days ago

I think his warning is appropriate, not so much because medical ultrasounds are dangerous, but because your homemade device probably doesn't have the same level of testing and oversight that your doctor's does.

We know that ultrasound machines can cause warming and cavitation, and while these effects are minor when part of an ultrasound at the doctor's office, it's not hard to see how a homemade device that emits more radiation than necessary could exacerbate those effects.

DanBC 88 days ago

> The NHS wants to make sure that millions of people don't take unnecessary ultrasounds, since a tiny risk, multiplied by millions, equals a few unnecessary deaths/left-handed children.

The NHS warns against un-needed tests because of the risk of false positive results and un-needed treatment. The test itself has minimal risk, but most treatment has some more risk.

dharma1 88 days ago

It's not just NHS - <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm095508.ht...>

I've read about ultrasound induced bubbles destroying tiny amounts of tissue - probably not a huge individual risk like you say, but at the same time not one worth taking for vanity baby scans, and at scale of millions of people doing it the risks might play out for some unlucky babies.

Having said that, I think this project is wonderful. There are so many uses for ultrasound.

crispyambulance 88 days ago

Sorry, but imaging a living person with a "hacker" ultrasound scanner is asking for trouble.

How can anyone be assured that this thing isn't transmitting too much energy into the tissue being imaged?

daveguy 87 days ago

This. Ultrasound is a great non-invasive medical imaging technique. The safety of medical imaging is well established: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2390856/> ... PLEASE NOTE THE POWER LEVELS USED IN MEDICAL IMAGING APPLICATIONS: LESS THAN 720 mW/cm² (and possibly less for other types of imaging, this is just one study) that is milliwatts / cubic centimeter.

It is VERY IMPORTANT to consider power delivery. Ultrasonic pulses are also a commonly used for lysing bacterial cells during protein purification -- essentially turning cells to mush. If, in your DIY project, you accidentally "turn it up to 11" (don't know the actual power level threshold and do not want to find out) -- You could also turn your own cells to mush. Here is an example of ultrasonic cell preparation equipment (200 Watt range): <http://www.hielscher.com/ultrasonic-lysis-cell-disruption-ex...>

So. Please pay attention to the safety concerns of ultrasonic imaging, do all of your testing on fruit and use a high quality bench top regulated power supply.

kelu124 88 days ago

Hey Ben, glad to read from you! Let's not worry, this part is only the electronics heart of a probe.. and still, more part of a tech dev kit than of a medical device =) edit: disclaimer included in the homepage, thanks for the idea !

semi-extrinsic 87 days ago

Really cool project! Do you have a total cost estimate somewhere? I toyed with a similar idea a couple of years back, but a friend who was actually working on developing algorithms for medical ultrasound told me I'd be looking at several thousand dollars worth of hardware.

Importantly, how many transducers are you planning on using? I understand typical medical ultrasound uses a phased array with hundreds of transducers. That's what drove up my friend's cost estimate.

What you can do with a single transducer, though, is listen to a baby's heartbeat using the Doppler effect. (You can buy a fetal Doppler device on Amazon for about \$40, that could be a good reference for calibrating your power output to make it reasonably safe.)

bencollier49 88 days ago

It might be worth exercising the precautionary principle in this case. If someone builds your electronics and decides that you didn't warn them before they used it, you could find yourself in a difficult position. A simple disclaimer somewhere visible would do the trick.

CamperBob2 87 days ago

<pet_peeve>

It's never worth exercising the precautionary principle. The precautionary principle is epistemologically invalid: you can never know, much less prove, that something is "safe." The precautionary principle would have confined us to the caves, if not to the trees.

In more modern times, for example, it's been used to fight nuclear power plants that *might* harm some people at some point, in favor of coal-fired plants that definitely do.

There are valid reasons to be concerned about the effects of high-intensity ultrasound and warn potential builders of this gadget about them... but that's not the precautionary principle in action, just common sense.

</pet_peeve>

bencollier49 87 days ago

Hi - thanks for listening. You're doing great stuff.

imagineinore 88 days ago

Your own link says there's no scientific evidence that medical ultrasound does any damage. It just keeps repeating "unconfirmed", as if that has any significance.

deuteronium 88 days ago

This looks very cool!

I've just been looking at your github repository, you mention you use the HV7360 chip to generate the ultrasound pulse.

I'm slightly confused by the datasheet for this chip, am I right in thinking you supply +/- 100V to this chip? If so, what are you using to generate that voltage out of curiosity?

(I have a ~2MHz ultrasound transducer which I keep meaning to play with, to attempt to measure liquid density, so your project is very interesting to me!)

kelu124 88 days ago

Hey there. Indeed, we supply HV to the pulser. Integrated is a recom dc/dc converter. Alternatively, for a DIY approach, you can as well work with something as in http://echopen.org/index.php?title=Analog_Parts_%28Farad%29#... - for HV and pulser.

deuteronium 88 days ago

Thanks a lot for your response, I hadn't seen those recom modules before.

kelu124 88 days ago

Would be glad to get your comments !

tuyguntn 88 days ago

Raspberry PI and Arduiono's changed a lot in embedded space, because of price and flexibility, how this board can change its space? How much does it cost to build complete solution using this project?

However, unlike the technology used in most hospitals across the UK costing anywhere from £20,000-£100,000, the scanner created by Jeff Neasham and Research Associate Dave Graham at Newcastle University can be manufactured for as little as £30-40. [0]

If thats true, it can be game changer in some developing countries.

[0] - <http://echopen.org/index.php?title=Article: Low cost design ...>

kelu124 88 days ago

Depends on the volume of course, and of the quality of image that is expected. This board, plus transducer (necessary to get the image) in small volumes, should be around 200\$. Maybe less in higher quantities, and with streamlined components. Far lower than the usual portable ultrasound scanners (costing ~5k\$). But that's a work in progress so let's see!

We were following the Newcastle project, but I guess the tech was finally bought by NDT -> image quality and framerate were not as good as expected. At least, haven't seen progress on medical imaging use from this end.

raphman_ 88 days ago

From a first glance, it is not yet clear to me how far this project actually is and what its goal is. Could you give a short introduction (or point to an introductory blog post)?

kelu124 88 days ago

Done, tried to write a summary on the home page, thanks for the feedback!

raphman_ 88 days ago

Thanks, that is very helpful.

imagineinore 88 days ago

You need more images. I don't see a single image of it in action.

sangnoir 87 days ago

Apologies for my somewhat off-topic question, which is only tenuously related to the topic: is there an open-source application that is capable of reading or converting .vml ultrasound scan files that are produced by proprietary devices?

kelu124 87 days ago

No idea! Though, if VML is the Vector Markup Language, then "VML is

specified in Part 4 of the Office Open XML standards". Maybe MVL ?

For medical images, ezDICOM may work ?

sangnoir 87 days ago

Sorry - I meant .MVL!

et2o 88 days ago

Everyone is really excited about the future expansion of inky rasping in medicine (even though it's already been in use for decades). Excited to check this out.

kelu124 88 days ago

inky rasping ?

pbhjpbhj 87 days ago

I'd guess it's an autocorrectism for "ultra sound".

et2o 87 days ago

Yeah, you're right. Whoops.

vasili111 88 days ago

That's great! It can help many developing countries.

sitkack 88 days ago

Esp in sexing female fetuses!

<http://www.bc.edu/clubs/mendel/ethos/archives/2008/younger.s...>

> These counterfeit medical professionals lure in clients with advertisements outside their clinics stating, "pay 500 Rupees now and save 50,000 in the future". Parents can spare a lot of time and future hardship by terminating the pregnancy early and trying again for a son in lieu of having to kill a newborn child. The clinics have proven so profitable, that ultrasound machines are even finding their way into rural villages that do not have potable water (Kumar 1998).

kelu124 88 days ago

Answer to that one is easy: with the level of details that this board can provide, one can't find the sex of the fetus - whereas placental location is still possible - and allows the medical staff to inform the mother and prepare the birth =)

Still, an issue.

ausjke 88 days ago

The key question is, how good are the quality for images comparing to others? Did not find info related to that on the site yet.

[Guidelines](#) | [FAQ](#) | [Support](#) | [API](#) | [Security](#) | [Lists](#) | [Bookmarklet](#) | [DMCA](#) | [Apply to YC](#) | [Contact](#)

Search: