ON THE MEDIA

HACKING HARDWARE

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By Alex Goldman

A synthesizer powered by an Arduino (Collin Mel)

There's the one aspect of the hacking world that everyone's familiar with - the world of finding software vulnerabilities and breaking into systems via the internet. But there's a whole world of hacking going on out there that shares the same name, but is different in several ways. This is the world of open source hacking.

Open source hackers are people who work, often collaboratively, creating software or hardware that builds on other people's ideas. "Open source" means that their code, their plans, and their processes are freely shared with like-minded hackers who can then use, adapt, or improve upon their ideas. While the Internet is a great way to share this information, many of these hackers coalesce in the real world in what are called "hackerspaces," locations where hackers meet, share, and collaborate.

In the hardware hacking world, the most attention-grabbing example of open source work of late has been the Arduino, a device that allows even the most technically naive to build projects using electronics. I spoke over the phone to Tom Igoe, associate arts professor and head of the physical computing area at the Interactive Telecommunuications Program at NYU, and one of cofounders of Arduino.

Q: Can you explain what hardware hacking is?

Well, I don't use the term, so I guess it can be whatever you want it to be...When I hear the term hardware hacking, I usually think of building new electronic devices, sometimes by modifying existing electronic devices and sometimes by using new hardware that is new electronic components, but hacking usually means not for a particular commercial or hard fast engineering reason, but because you're just kind of exploring an idea.

Q: And what is an Arduino?

Arduino is a microcontroller platform that's designed for non-technical beginners. A microcontroller is just a small computer that has no interface – no keyboard or mouse or screen - but it does have electrical contacts that you can attach electrical sensors or motors to, or lights or things like that. And the whole Arduino platform is designed to be something that you can get up and running on really fast, like in five minutes, and understand the basics of. So then you can start to build projects with it very quickly.

Q: So is the Arduino designed purely for practical use, or is it the kind of thing that can be used to create art projects?

I usually break down the kinds of projects we do into roughly three categories. There are artworks, things that blink or make noise or make flames or whatever, because you've just always wanted this thing to exist. I see people build new assistive technologies for people with physical or cognitive disabilities, like a project called RAMPs, that's a wheelchair DJ. And then on top of those, there's what I call the instructive pieces, the ones that you learn something through that you really can't learn any other way. Sometimes you learn through a particular experience, sometimes you need to build a particular device to make that experience come true. So those are the most common categories of things that I see people do with Arduino.

RAMPs: John Schimmel from MAKE magazine on Vimeo.

Q: For those of us who've never been to one, can you describe a hackerspace?

They're places who are interested in understanding how things work by taking them apart and rebuilding them, or building new things from them, gather informally to make that happen. They're often places people go to after work to hang out with friends in a kind of social setting and to learn things that they've wanted to learn, but they don't have any other formal opportunity to do so. I think they are really kind of the wave of the future, in terms of both informal learning and probably also building businesses.

Q: Are hackerspaces hospitable to people who have very little to no technical knowhow?

I would say they're definitely amenable to people who know nothing. In fact, many hacker spaces actually pay their rent by offering classes to people who know nothing. Keep in mind that a lot of the people who started spaces like this came from knowing nothing themselves, and they didn't respond well to the traditional way of learning things. So they found people around them who they could learn from in non-traditional ways, and once they reached a certain level of understanding they wanted to be able to share that with other people who had the same experience as them.

Q: Has there been a case where something that was created in a hackerspace went on to mass production?

Makerbot. It's a 3D printer. It's a device that lets you design 3D objects and then print them out in plastic on the printer. It's built entirely by a couple of guys designed it in a hackerspace in Brooklyn, New York. They publish all the plans on how to build it as well as selling the kits themselves online. I think there's something like 7500 of them in the wild by now, and the company's been growing quite a bit.

They started just by building a few to see if they could do it, and once they had a working one, they said "Hey, this something we could start to build many of and maybe sell." They built their business up literally printer by printer. They invested just enough of their own money that they could build, say, five of them, and then they sold those five as kits, and they reinvested what they made from that to make the next batch and so forth and so on.

In a way, that model of building business is actually very old fashion, where you spend a little money and do a small run and then a little more and do a slightly larger run. It's not the venture capital model. It's the way business has been built for a long long time, and we're starting to see a return

partially as a result of hackerspaces.

Open Source 3-D Printer Turns Designs Into Objects

Q: I'm wondering if, as someone who's spent a lot of time in a hackerspaces, you see hackerspaces being misunderstood because of the connotation of the word hacker.

Yeah, a little bit, but at the same time, I think that the term "hacker" is losing its pejorative roots. I think a lot folks in the past saw "hacker" as an evil person who broke into something. But Steven Levy's book about it was published 25 years ago, and a lot of people have come to understand that it means more than just evil guy trying to break into your computer. I think with hackerspaces now, a lot of people are really understanding that it's more like a clubhouse for adults. They're the R&D labs of the future, because they're places where people are coming up with really interesting ideas that don't necessarily have a commercial application, yet, but might in the future, and they're incubating them in the hackerspaces.

We might instead think of it as a way for everyday people to understand technology at a hands-on level, rather than just as consumers. Clay Shirky talks about how we're moving from a consumer society to a participant society, well hardware hacking is participating in making electronics rather than just consuming it.

To find all kinds of cool projects made with the Arduino, including a laser controlled cat food dispenser, just do a Google video search for "Arduino." Happy hacking!

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ALEX GOLDMAN

Alex Goldman is a producer for On the Media. One time he got run over by a car.

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