Chapter 5

It Just Gets Weirder

Abstract

Chapter 5 is dedicated to general trends that I see coming in technology and computing over the next three to five years, including a ubiquity of cameras, insanely high-density displays, autonomous flying robots, and more. Each trend is driven by a drop in manufacturing cost of specific components, which enables experimental and commoditized production of devices that were priced well out of the range of the average consumer. Once these costs drop just a bit more (as they are destined to), the library world will see the results, including finding ways to deal with massive data sets produced by our communities.

There are a number of really interesting technologies coming in the next couple of years that may not impact libraries directly, but will impact individuals in society—which means that we need to, if nothing else, be aware of them. All of these are trends that I noticed at the 2012 International Consumer Electronics Show, the largest such show in the world. It's where the personal electronics manufacturers come to show off what they are producing for the following year, as well as try to one-up one another with a variety of crazy future tech that may or may not ever see the light of day.

Among the crazy things you see at CES every year are the insane demo televisions that aren't for sale, but just show off the possibilities of the manufacturer. This year, the companies that wowed were LG and Sharp, in two different ways. LG showed off an Organic LED (OLED) television that was 55 inches diagonally, but only 4 millimeters thick—just barely outside the thickness of a pane of glass. To see it in person was like seeing a magic trick. There were moving pictures on the screen, and when you stepped to the side the object appeared to disappear. It looked like an absolutely impossible object, and in ten years it's likely to be the dominant type of display for sale.

Sharp debuted something that wasn't amazing for its physical characteristics, but for its imagery. The company was showing off an 85-inch display that it called the Super Hi-Vision TV due to its packing 33 million pixels into its 8K display. Everyone is probably familiar with HD television, which comes to us in two standard resolutions, 720 and 1080. Both of those numbers count the vertical lines of resolution, so that a standard 720 HD picture has a resolution of 1280×720, while a 1080 HD picture has 1920×1080. A 4K video, the next step up, measures instead horizontal lines of display density, varying in specific resolution by the aspect ratio, but for general use, a resolution of 4096×3072 is a good starting point. YouTube currently allows 4K uploads, and there are a number of commercially available cameras that can take stills and video at that resolution. In very simplified terms, 4K is roughly four times the resolution of what is now the highest end HD format commonly used.

As you can imagine, an 8K display is a different sort of beast. The Sharp Super Hi-Vision has a $7{,}680 \times 4{,}320$ resolution, or roughly sixteen times that of a 1080p Blu-Ray disc. It's hyperreal, unbelievably clear—it's as if you have an 85-inch window into another world. Seeing it felt like a scene out of Harry Potter, where the pictures were alive and might respond if you questioned them. The picture has no discernable pixels at all, no matter how close you might look, and seemingly infinite amounts of detail no matter how closely you might stare at the screen. It was incredible, and Sharp has said it thinks the technology is probably five years or so from being commercially available. Video will be available even before that, as the BBC plans

to shoot some of the 2012 London Olympics in super hi-vision.[1]

So, with that brief journey into televisions of the future, here's a quick look at some trends that I see in personal electronics this year.

Cameras Everywhere

There is an effect in consumer electronics where, as Moore's Law drives the costs of individual components steadily downward,[2] the cost per unit for said component is suddenly so cheap that device manufacturers can just put them in everything. It's no secret that gadget manufacturers look for low-cost options for their devices, but I'm talking about how, once a given chip or interface hits a certain price point, it becomes negligible for the manufacturer to just include it. There was a brief point in the 90s where IR emitters hit this point: every PDA, every phone, every piece of electronics you picked up had an IR port on it and could do stuff with it, from communicating with other devices to controlling your television. It wasn't that the IR was the best interface (it was horrible) but that the component was so cheap that it didn't really cost the manufacturer anything to just throw it in.

I believe we've hit that point with camera sensors.

When you can buy a Barbie doll that doubles as a video camera, I think that it's official that anything can be a camera. There are cameras that are designed to be worn during extreme sports (the GoPro) and my personal favorite, the Looxcie, which is effectively a Bluetooth headset, but complete with an HD video camera that can capture everything you do, all the time.

Barbie Video Girl
www.barbie.com/videogirl

GoPro
http://gopro.com

Looxcie
http://looxcie.com

Even more transformative are the cameras that are connected to the computers in our pockets. The cameras in most smartphones are better than the dedicated point-and-shoot cameras that you could buy just a few years ago, and they have the advantage of being connected to a computer with network access, which means that not only can you upload pictures to the Internet, but in many cases you can also live stream video.

This level of ubiquitous video capture has a lot of interesting potential for libraries, especially as we think about the role of the public library as community memory. Is your library ready to start collecting all of the video being created in your communities? Very shortly we won't be talking about a box of VHS tapes from the 1980s; we'll be talking about local historians bringing you a box full of multi-gigabyte SD cards and more hours of video to deal with than you have hours in a day. How can we handle that sort of content explosion? If you think it's unlikely to happen, consider: at the time I'm writing this, YouTube has 60 hours of video uploaded to it every minute of every day. If we end up being the recipients of even a tiny percentage of that fire hose, it may drown us.

Autonomous Drones

When President Obama signed the FAA Modernization and Reform Act in February, that stroke of a pen opened up the skies of the United States to autonomous drones.[3] There had been limits on uses of drones in US airspace, but the new law first opens the skies to law enforcement drones, and then rolls out other allowable uses (including commercial) over the next several years.

What's a drone, you may ask? Drone is just another term for a form of unmanned aircraft, normally much smaller than anything that could reasonably be manned. We've probably all heard of military drones being used, but the rise of the quadricopter and hexacopter chassis are bringing stable and easily controlled flight to the masses. These devices can be either manually flown or, in some cases, programmed via GPS coordinates, and their price points are coming down to the degree that anyone with $300 in their pocket can pick up a flyable aircraft capable of HD video capture, such as the Parrot AR.Drone (figure 5.1). Kits are available, and an entire open source software project, ArduCopter, is dedicated to these types of aircraft. These devices are on the cusp of complete ubiquity, simply by virtue of affordability and usefulness. For one take on how they may be used, watch the TED video from Vijay Kumar, the researcher from the University of Pennsylvania who is leading one team that is experimenting with small agile drones for a variety of tasks.

Parrot AR.Drone
http://ardrone.parrot.com/parrot-ar-drone/usa

ArduCopter
http://code.google.com/p/arducopter

TED: Vijay Kumar: Robots that fly . . . and cooperate
www.ted.com/talks/vijay_kumar_robots_that_fly_and_cooperate.html

So why should libraries care? Partially because

these devices are going to be an increasingly important technological tool in the next five to ten years, involved in everything from mapping to search and rescue, and there may be library applications that emerge simply from the ubiquity. The second is that these are a subclass of the "cameras everywhere" phenomenon described above, and one of their first uses is in photography and videography. Helping a community capture and archive its memories may come to involve circulating an autonomous photography drone to the public.

The other aspect of this technology that I think is going to be very interesting is the copyright and other intellectual property challenges that arise from their use. Who owns the copyright on a photograph that a robot takes? What sort of privacy issues arise from the ability to have nearly silent autonomous robots flying around with cameras?

Alternative Control Schemas

Many technology vendors at CES were showing off variations on user interfaces for controlling their gadgets, and one of the hot areas this year was the use of motion and voice to control everything from computers to televisions. Everyone is slowly getting used to touch as a user interface for interacting with information, but motion and voice control are still growing as ways to communicate with your devices.

Figure 5.1
The Parrot AR.Drone

Voice control has been improving quickly over the last three years, with Google's Android operating system having speech-to-text ability built in at the operating system level and very good voice recognition as an offshoot. Apple's recently released Siri is yet another example, giving your device the ability to "understand" what do when you talk in natural language to it. With Siri, you can simply speak commands like "Remind me to take out the garbage when I get home," and the system can parse the sentence, create a Reminder with the correct text (Take out the garbage), and then use geolocation to pop up said Reminder when you are physically close to your house.

The other emerging control schema is gesture, driven largely by people's experiences with the Microsoft Kinect platform on the Xbox 360. The Kinect is a sensor/control unit that has multiple cameras, infrared sensors, and a microphone, and it is capable of distinguishing your body from its surroundings to a degree of specificity that allows for controls based on gestures and overall body position. The Kinect has enough resolution that it can resolve individual fingers, easily allowing for control of playback of media in addition to its primary use as a game controller.

Microsoft has released an official software development kit for the Kinect to allow it to control standard Windows workstations and to let people hack control systems for their software.

Gesture, voice, and touch are all powerful new ways to interact with systems. It is no coincidence that they also tend to be the ways that we communicate with other humans. They are powerful precisely because they are natural in a way that tool use isn't, and that power is why touchscreens have taken over where styli, keyboards, mice once dominated. With cheap cameras and fast processors, gesture control becomes far easier to implement, and I think we'll be seeing it in a huge variety of places over the next few years.

Health Monitoring

The last set of upcoming technologies that I think are interesting are what I'm calling personal monitoring devices. These are almost always currently being sold as health assistants, used to track your steps, exercise, and sleep patterns. These are yet another emergent technology based on the plummeting price of the components used to measure these things. There are several of these devices either currently on sale or about to hit the market, and all have similar features, if unique ways of dealing with them.

Each of these devices does one basic task: they contain an accelerometer that measures

Figure 5.2
The Fitbit Ultra wireless tracker on its charger/base station

Figure 5.3
The Fitbit Ultra wireless tracker worn in a pocket

steps or movement (think high-tech pedometer). They store the data and then transfer it to an online tool that tracks your progress over time, compares it to the progress of others, allows you to set and measure goals, and generally lets you game-ify your way into a healthier lifestyle.

The longest standing of these devices is the Fitbit Ultra wireless tracker (figures 5.2 and 5.3), a small device that resembles a digital money clip. The Fitbit tracker measures your steps, elevation, and if you wear it at night, sleeping patterns. It then reports all this information wirelessly to your local computer and then uploads it to the Fitbit servers, giving you the ability to share your activity with friends and compare and compete among a closed set of acquaintances. It's got a robust user community and is by far the most popular of these networked ambient data devices in use.

Fitbit
www.fitbit.com

The most high-tech of these devices, at least in appearance, is the Nike+ FuelBand (figure 5.4), a bracelet with the same sorts of sensors as the Fitbit Ultra. It measures your steps with its accelerometer and gives you feedback as to goals with its embedded LEDs, doubling as a watch. It syncs to your computer using the built-in USB connector or will pair with a mobile phone via Bluetooth and sync with the Nike+ FuelBand app. It is designed for athletes and is water-resistant and purports to last four days on a single charge.

Nike+ FuelBand
www.nike.com/fuelband

The last of these devices that I'd like to talk about is the Goldilocks choice: not too hot and not too cold. It's the Jawbone UP (figure 5.5), another bracelet that measures your steps like the FuelBand, but also measures your sleep patterns like the Fitbit Ultra. It also adds a feedback mechanism for certain activities in the form of a small vibration motor, which can be programmed to do a couple of interesting things. First, it can be set to remind you not to be too sessile, buzzing to alert you that you need to get up, move around, and get away from your desk for a few minutes. The second is potentially more troublesome, in that you can tell the UP to wake you at the "best" time in the morning: that is, when your sleep cycle is at its lightest within thirty minutes of the time you have to be up. In monitoring how you toss and turn, the software can evidently determine the most opportune time to softly buzz you awake. I've not had the opportunity yet to test this, but it's an interesting concept that could be really helpful in practice.

Jawbone UP
http://jawbone.com/up

So why am I pointing these personal health devices in a library-related technology report? Because they are indicative of the sorts of devices that we can expect to see blossom over the next two to three years, and if we aren't paying attention to what our patrons are doing, then we aren't paying attention at all. One of the hallmarks of the next stage in personal electronics is going to be this type of ambient, everywhere data collection as a part of what some call the Internet of Things. These devices are a first step towards massive data collection that we need to be aware of and be considering for future data conservation and collection needs.

Figure 5.4
Nike+ FuelBand

Figure 5.5
The Jawbone UP

Conclusion

In the conclusion of my previous "Gadgets and Gizmos" tech report, I said:

> When I first conceived this issue of Library Technology Reports, my goal was to highlight certain types of personal electronics that I felt were either generally useful for libraries or interesting for libraries to think about.[4]

This is also true for the treatise you are currently reading, but with a twist. This time around I wanted to paint with a broader brush and try to indicate the overall direction that personal electronics are taking. We are seeing a focusing of the market on just a few e-readers, and the tablet market is almost entirely composed of the iPad at this point. The real creativity is coming at the lower level, the $100 devices that do one very specific thing, but do it well. It's not clear to me how these work with libraries or if they are something that will be quickly iterated and overwhelmed by other competitors in the marketplace. But their very existence is proof that we are on the way to using connected objects to understand our world in new ways.

One of my favorite new technology websites is The Wirecutter, which is unlike any other tech coverage site because it tells you explicitly, "You Should Buy This Thing." Looking for a tablet? Buy this one. So in that spirit, here are my explicit recommendations for libraries, ignoring all of the "may be different for your use case" waffling that is true, but sometimes unhelpful. Here's simple list of what device I would buy personally if I were in the market:

- Tablet: the new iPad, 32 GB, Wi-Fi + LTE (AT&T or Verizon, pick for your area)
- E-reader: the bog-standard Amazon Kindle with special offers for $79
- 3D printer: the Makerbot Replicator with dual extruders

The Wirecutter
http://thewirecutter.com

The march of Moore's Law is unavoidable, and these devices will only get cheaper and faster over time. Personal electronics are the only consumer product that I am aware of that gets both less expensive and better over time. Everything else either gets cheaper and worse, or more expensive and better (or, occasionally, more expensive and worse). But the march of faster, better, cheaper is a drumbeat that is regular and predictable. It's up to us to pay attention: we can't afford to be surprised anymore by these things.

Now get out there and play with stuff!

Notes

1. Mark Sweney, "BBC Plans to Use 3D and 'Super Hi-Vision' for London Olympics," The Guardian, August 23, 2011, www.guardian.co.uk/media/2011/aug/28/bbc-3d-vision-london-olympics.
2. "Moore's Law," Wikipedia, last modified March 14, 2012, http://en.wikipedia.org/wiki/Moore's_law.
3. FAA Modernization and Reform Act of 2012, Pub L. No. 112-95, Bill Summary and Status, accessed March 16, 2012, http://thomas.loc.gov/cgi-bin/bdquery/z?d112:HR658; Nick Wingfield and Somini Sengupta, "Drones Set Sights on U.S. Skies," New York Times, February 17, 2012, www.nytimes.com/2012/02/18/technology/drones-with-an-eye-on-the-public-cleared-to-fly.html?_r=1.
4. Jason Griffey, "Gadgets and Gizmos: Personal Electronics and the Library," *Library Technology Reports* 46, no. 3 (April 2010): 33.