Robotics & The Law: Liability For Personal Robots

by Ryan Calo, posted on November 25, 2009 - 4:41pm

I’m in the middle of writing a paper on liability for harm caused by (or with) personal robots. The paper grows out of a panel that Dan Siciliano and I organized around the present, near future, and far future of robotics and the law. I’ve recently received some media coverage that, while welcome and accurate, presents a danger of oversimplifying my position. Specifically, a few people have understood my remarks to suggest that manufacturers should enjoy total immunity for the personal robots they build and sell, merely because doing otherwise would chill innovation.

This post develops my position in a little more detail. On my view, robotics manufacturers should be immune from certain theories of civil liability—particularly those premised on the range of a robot’s functionality. I don’t believe that the law should bar accountability for roboticists in all instances. Nor am I by any means certain that my suggestion represents the exact right way to handle liability. But I am convinced that we should talk about the issue. The alternative is to risk missing out on a massive global advance in technology capable of substantially better our world.

The market for personal or service robotics, in the sense of robots for everyday use by consumers, is likely to expand substantially over the next few years. UN statistics, for instance, project that millions of personal or service robots will enter the home this and next year, and one research group predicts personal robotics will be a multi-billion dollar industry by 2015. The applications for these robots are potentially infinite, occurring in such areas as physical or psychological therapy, education, eldercare, exploration, hostage negotiation, rescue, entertainment, and home security. As with personal computers, many applications will arise directly from consumer ingenuity. (This may be why the South Korean government has set a goal of placing a robot in every home by 2015.)

Inevitably, some of these robots will occasion litigation. In speaking with roboticists (Andrew Ng and Oussama Khatib at Stanford University, for instance, and several engineers at the robotics start up Willow Garage), it became clear that building safe robots is an utmost priority. Engineers at Stanford and elsewhere are working on a “human-centric” approach to personal robotics, building special sensors, motors, and materials that decrease the risk of active or passive injury. Nevertheless, I believe that a completely foolproof personal robot is unlikely to be possible. Some person or property will inevitably be harmed, due either to imperfect design, or to the negligence or malice of a person exerting control over a robot.

Liability for harm caused by a personal robot is going to be very difficult to sort out. Robot control runs the gamut from relatively straightforward teleoperation to near complete automation. Robots are made up of frames, sensors, motors, and other hardware, of course, but their behavior is often governed by complex software. Both the hardware and the software can be modified—open source robotic software particularly could have hundreds of authors. It is far from clear how standard tort concepts such as foreseeability, product misuse, design defect, intentionality, and proximate cause
will play out in light. (Sam Lehman-Wilzig made some of these points as far back as 1981 in his wonderful *Frankenstein Unbound*.)

In addition to being singularly difficult, such litigation will be high profile. Robots receive a tremendous amount of media coverage, especially in recent years. Moreover, as Ken Anderson points out, early adopters of robotics are likely to be populations such as the elderly or disabled that need in-home assistance. Other early applications have involved helping autistic children. These populations would make understandably sympathetic plaintiffs in the event of litigation.

Robots already flourish in certain contexts—space exploration, the battlefield, the factory. But note that these are contexts that have built in immunity. Military contractors are largely immune for accidents involving the weapons they build, as Ken also pointed out in our panel. Workplace injuries tend to be compensated through state workers’ compensation schemes. No such blanket protections operate in the home or public street.

Nor can we handle robot liability the way we handle liability for consumer software, another area plagued by complexity and where we place a premium on “generativity” (to use Jonathan Zittrain’s formulation). With software, as Dan recently reminded me in conversation, we allow developers to disclaim responsibility (or “warranty for any particular purpose”). It’s one thing not to be able to sue Microsoft because Word or Windows crashed and lost a document; it’s quite another not to be able to sue a robotics manufacturer because its product crashed into an object or a person.

So what do we do? How do we preserve incentives not just to build robots, but to build them to be as versatile as possible? My view, and the working thesis of my paper, is that we should take a page from the thin book of Internet law. Website services have flourished despite the many ways they can be and are misused. This is due in no small part to the immunity websites enjoy for most of the actions of their users under Section 230 of the Communications Decency Act. Notably, Section 230 also immunizes web services for actions they take in policing the conduct and content of their users. The system is imperfect—it’s hard to tell who the publisher is for some content, for instance, and the availability of anonymity blocks redress in some instances—but it’s still no coincidence that Google, Facebook, MySpace, LinkedIn, and other web giants are all U.S. companies.

I intend to argue that we can and should similarly immunize robotics manufacturers for many of the uses to which their products are put. Robotics manufacturers cannot be named as defendants every time a dinner guest trips over a Roomba or a teenager reprograms the service robot to menace his sister. That a robot can do a particular activity should not open its manufacturer up to liability. Robots should not be treated like guns that, when too easily modified, can subject the manufacturer to liability.

We should take another page from Section 230 and consider immunity for harm attributable to safety features. Cars are relatively well understood, with standardized components and interiors. Thus, it may make sense to hold today’s manufacturers accountable for “aggressive” airbags that cause needless injury. But cars developed as consumer products a hundred years ago, prior to robust product liability laws and industry standards. Personal robots may not survive similar treatment.

It is these sorts of upfront immunities that I believe legislation should address. Clearly tort law has a role to play, just as insurance, industry standards, and other regulatory forces do. As Wendy
Wagner argues, litigation often generates product safety information more efficiently than administrative bodies, and the threat of lawsuit (among many, many other things) helps keep safety in the minds of designers. But we cannot afford existing and prospective robotics manufacturers to be hauled into court for all the ways consumers will use them. Finally, in thinking through liability for autonomous robots, we should keep firmly in mind the harm caused by humans when we undertake the activity in question. Each year, about 40,000 people die from human-operated vehicles. Car crashes are the leading killer of teenagers. We should check our gut reaction to the inevitable first autonomous vehicle death against this backdrop.
Robots Rule

Lawyers ponder liability for actions by ‘thinking’ machines
By Richard Acello

Robots may now be confined to sweeping living rooms and working assembly lines, but futurists and attorneys agree they are destined to take on a much greater role soon. Bill Gates has compared the development of robots to the earliest personal computers in the 1970s.

However, unlike that stationary pile of microchips on your desktop, robots have the potential to act in the real world. Attorneys and legal scholars are now puzzling over how harmful actions of robots will be assigned liability, and particularly how robotic maneuvers will fit into traditional legal concepts of responsibility and agency.

“Robots present a unique situation,” says Ryan Calo, a fellow at the Stanford Law School’s Center for Internet and Society. “Like the computer, it runs on software, but it can touch you. It doesn’t have a particular purpose like a lawn mower or a toaster; it’s more like a platform that you can program to do all kinds of different things. And it can act on the world, so it has legal repercussions. It might be very difficult to ascertain where the liability lies when a robot causes some physical harm.”

One possible avenue would be to view the robot as an agent of its owner, who would be presumed liable for the robot’s actions, but Calo says it’s not so simple. He has blogged about robotics and the law, and led a panel on the subject last year.

“Let’s say you rent a robot from the hospital to take care of Granny, and the neighborhood kids hack into the robot and it menaces Granny and she falls down the stairs. Who’s liable?” he asks. Possibilities include the hospital (which released it), the manufacturer (it’s easy to hack into), the neighborhood kids, or the consumer who failed to do something easy like update the software.

LEVELS OF EXPOSURE

Damages are another puzzler. for defective software, society applies the economic-loss rule so that a consumer could sue Microsoft for the value of the software, but not for any subsequent harm the defective software may have caused.

“Society tolerates Microsoft Word eating your thesis, but it won’t tolerate a robot running into somebody,” Calo says. “If you look at cases where computers have caused physical injury, then you could recover—for example, if the computer gave a cancer patient too much radiation.”

Calo favors limited immunity for the robot industry, similar to section 230 of the federal Communications Decency Act, which gives “interactive computer services” immunity for information put on their sites.
“There is a real danger if there is complete legal uncertainty and you have a couple of bad incidents involving sympathetic plaintiffs,” Calo says. “That could put a chill on robot development.”

 Attempts to get comment for this article from manufacturers of today’s robots were unsuccessful.

 Stephen S. Wu, a partner at Cooke Kobrick & Wu in Los Altos, Calif., and incoming chair of the ABA’s Section of Science & Technology Law, says society is prepared to deal with robots in the next five to 10 years. But cases for product liability involving robots could ramp up with the anticipated increased use of automated machines, Wu says, citing a study that predicts half the highway miles in 2030 will be driven robotically.

 “In the longer run, though, you have to think about robots having intelligence that could surpass our own,” Wu says. “And then we could say if the robots are more intelligent than we are, maybe they should have intellectual property rights.”

 Dan Siciliano, faculty director of the corporate governance center at Stanford University, says robot law will most likely develop as an extension of traditional legal concepts. He expects plaintiffs’ lawyers will “name everybody” in the putative suit for damage caused by robots. “You will see liability work its way up the chain,” he says.

 And don’t be surprised to see some green lizard on your TV one day touting a brand-new form of society’s most traditional risk-spreading tool: robot insurance.
Once just fantasy, robots are increasingly prevalent in the twenty-first century. Ryan Calo, a Senior Research Fellow at the Stanford Center for Internet Society, has been doing fascinating research on the topic. Along with his work at Stanford, Calo serves on the programming group for National Robotics Week and will be co-chairing the Committee on Robotics and Artificial Intelligence for the ABA. (He also tweets about privacy and robotics at twitter.com/rcalo). This month’s ABA Magazine has a terrific article discussing Calo’s work and I wanted to follow up on that piece with an interview of my own. I reproduce my discussion with Calo below.

DC: Tell our readers about your research on robotics.

RC: Thanks very much for your interest. I’m researching essentially two aspects of robotics and the law. First, I’m looking at the potential impact of robots on society—for instance, with respect to privacy—and whether existing laws suffice to address this impact. Second, I’m investigating what the right legal infrastructure might be to promote safety and accountability but also to preserve the conditions for innovation. In each case, my focus has been on “personal” or “service” robots, a rapidly expanding category of consumer technology that encompasses everything from a Roomba to a humanoid Nao. I’m also interested in autonomous vehicles and vehicles features such as lane departure prevention.

DC: What are the most pressing concerns now and what issues do you foresee as pressing in the future?

RC: Today the most pressing concern is the military’s use of robotics. Literally thousands of robots have been deployed in the field, with more on the way. Peter Singer has marshaled extensive evidence that robots may skew individual and military priorities in some instances. On the one hand, I agree that we should be worried about our increased capacity and willingness to kill at a distance. On the other, as Ken Anderson has pointed out, robots may allow for more surgical strikes on enemy targets, reducing so-called “collateral damage” to civilians and infrastructure.

The second pressing concern is the uncertainty around liability for what end-users do with robots. Robots share two key similarities with computers and software: (1) responsibility can be difficult to parse in the event of a malfunction or accident and (2) many of the innovative uses of robotics will be determined by end-users. We’ve managed to domesticate the issue of computer liability with doctrines such as economic loss; you cannot sue Microsoft because Word ate your term paper. But this option is unlikely to be on the table with robots that can cause corporeal harm.

We need to get this issue of liability right. Would you build robots or invest in robotics if you were uncertain of your legal risk? Would you build versatile, “generative” platforms (to borrow a
term from Jonathan Zittrain) if you might be held accountable for whatever users do with those platforms? I wouldn’t.

DC: *What are the broad areas of law most implicated by advances in robotics?*

RC: I believe that robots will eventually have an impact on many, if not all, areas of the law. If we’re talking the next ten years, I would list three in particular: product liability, privacy, and labor law.

Product liability: Classic notions in product liability law will not function well in the context of robotics. Take foreseeability: the possibility of harm is obvious, but its exact mechanism will be extremely difficult to predict and guard or warn against. Or take proximate cause: candidates for why a robot caused a harm include its hardware, its software, its environment, and user input. There could be a different person behind each. The leading “robot operating software” is open source, meaning that there is not even a single author. Meanwhile, robot manufacturers will have relatively deep pockets and, given early use of robotics in areas like eldercare and autism research, plaintiffs will be understandably sympathetic.

Privacy: Robots are essentially a human instrument, and one of the chief uses to which we’ve put that instrument is surveillance. In addition to vastly increasing our power to observe, however, robots have the potential to open new pathways for government and hackers to access the home. Finally, robots have a social meaning that most machines lack. We tend to treat them as though a person were really present, including by experiencing the feeling of being observed and evaluated. It also reveals more about us how we interact with robots in a way it does not with other appliances. For those who are interested, I’ve written a book chapter on this topic, forthcoming from MIT Press and available on SSRN.

Labor law: My colleague Dan Siciliano made an interesting observation to me recently in private conversation. He speculated that were even one job at a fast food chain replaced by a robot—easy enough to imagine—the resulting shift from payroll to capital expenditure could upset an entire state program that depends on payroll tax. For now the model that has emerged out of auto factories, where replacing humans with robots is common, has largely sufficed. But this dynamic may play out differently in new contexts or at larger scales.

DC: *Can law address them adequately?*

RC: In some cases I think the answer is clearly yes. We can pass laws prohibiting certain uses of robots in warfare or immunizing manufacturers for some of the uses to which consumers put their products. In others, I’m skeptical. Take the third way robots implicate privacy, i.e., through their unique social meaning. If it turns out robots exert a subtle chill on expression, interrupt solitude, or persuade especially efficiently, the law will not be well-positioned to react.

DC: *Your remarks to the ABA Magazine suggested that you would like to protect this emerging industry in much the way that law protected industry at the inception of the Industrial Revolution. Do you frame the issue this way or am I reading too much of Mort Horowitz’s Transformation of American Law into your comments?*

RC: The short answer to your excellent question is that I’m not thinking on this grand a scale. I’m looking more toward the success of the reigning transformative technologies—computers and the Internet. (I’m not the only person to make this analogy: the name of the recent report to Congress by leading robotics institutions was titled “Roadmap: From Internet to Robotics.”).
believe we can promote the same success with robotics using a handful of statutory interventions; I don’t mean to endorse a sustained economic instrumentalism.

I believe that robotics holds enormous promise along many lines. There is evidence that programs like FIRST and Robogames are helping to promote interest in science, math, technology, and engineering (STEM), dangerously low among young Americans. As Ki Mae Huessner of ABC.com News points out, robots are capable of doing many of the tasks that humans risk their lives to do today. Her example is the recent mining accident; MIT is building a robot miner that could be operated from a safe position. I would add that robots have been used to address several high profile situations of late—a robot helped disassemble the Times Square bomb; robot submarines are involved in the Gulf Coast oil spill; etc. Remember too that the vast majority of car accidents are caused by human error.

I think that ultimately the most interesting uses of robotics will be determined by end-users—individual and corporate customers that modify robots in interesting ways and put them to novel uses. I worry that before we get there, however, there will be a high profile, high stakes accident involving a robot that—if handled the wrong way—will chill investment in, and diversity of, the American robotics industry. Other countries with higher bars to litigation and a greater acceptance of robots could then leap frog the United States with respect to the transformative technology of our time. We did this ourselves after all in the context of the Internet—as Eric Goldman has pointed out, it is no accident that Google, Yahoo!, Microsoft, etc., etc. all hail from the U.S.