Foundations of Software Engineering

Part 26: Software Engineering Ethics
Michael Hilton
Administrivia

• Grades will be curved (Do NOT assume 90 = A/B boundary)
• Review session for final
• Presentations next week
Learning goals

• Awareness of ethical issues in software engineering
• Reflection on decision making
• Knowledge of professional codes
• Starting points to dig deeper
Legal vs Moral vs Ethical

• Morality governs private, personal interactions
• Ethics governs professional interactions
• Law governs society as a whole, enforced by powers that be
Cases
“Update Jun 17: Wow—in just 48 hours in the U.S., you recorded 5.1 years worth of music—40 million songs—using our doodle guitar. And those songs were played back 870,000 times!”
Les Paul Doodle

• Likely designed in days, side project
• Used by users for 5.3 million hours (8 lifetimes)
• Questions: Time sink, lost productivity? Negative or positive net contributions to the world? Who should consider cost/benefits? Based on what principles?
Welcome to Universal Paperclips
> AutoClippers available for purchase!

**Paperclips: 307**

**Business**
Available Funds: $ 1.90
Unsold Inventory: 212
Price per Clip: $ 0.12
Public Demand: 66%

**Marketing**
Level: 1
Cost: $ 100.00

**Manufacturing**
Clips per Second: 34

Wire 693 inches
Cost: $ 15

AutoClippers 2
Cost: $ 6.21
There is a huge difference between not maintaining a repo/package, vs giving it away to a hacker (which actually takes more effort than doing nothing), then denying all responsibility to fix it when it affects millions of innocent people.
Airlines

Some airlines may be using algorithms to split up families during flights

Your random airplane seat assignment might not be random at all.

By Aditi Shrikant | aditi@vox.com | Nov 27, 2018, 6:10pm EST
A/B Testing

The Morality Of A/B Testing

Josh Constine  @joshconstine  /  4 years ago

Comment
Bias in Big Data and Machine Learning

https://www.propublica.org/article/how-we-analyzed-the-compas-recidivism-algorithm
Global Lawful Interception Market

Size and Forecast (2013 - 2020)

Market is forecast to reach $2,100 million by 2020

Growing at a CAGR of 20.8% (2014-2020)

Global Lawful Interception Market by Components, ($million), 2013-2020

- Mediation Devices
- Routers
- Intercept Access Point
- Gateways
- Switch
- Handover Interface
- Management Server

The comprehensive view on the % share of Components (2013)

Global Lawful Interception Market by Network Technology, ($million), 2013-2020

- VoIP
- Wlan
- Wimax
- DSL
- PSTN
- ISDN
- Mobile Voice Telephony
- Mobile data

The comprehensive view on the % share of Market Technology (2013)

Global Lawful Interception Market by Geography

Asia-Pacific
Fastest Growing Segment at a CAGR 15.3% (2014-2020)

Europe, North America, LAMEA

Global Lawful Interception Market by Dynamics

Drivers
- Rising criminal activities
- Dramatic increase in interception warrants
- Rising volume of data traffic and security

Threats
- Growing popularity of social media communications

Restraints
- Regulation enforcements
- Advancements in network technologies
Dual use
MICROSOFT SOFTWARE LICENSE TERMS: 
WINDOWS OPERATING SYSTEM

THE SOFTWARE ON YOUR DEVICE (INCLUDING THE APPS) IS LICENSED “AS IS.” TO THE MAXIMUM EXTENT PERMITTED BY YOUR LOCAL LAWS, YOU BEAR THE ENTIRE RISK AS TO THE SOFTWARE’S QUALITY AND PERFORMANCE. SHOULD IT PROVE DEFECTIVE, YOU ASSUME THE ENTIRE COST OF ALL SERVICING OR REPAIR. NEITHER THE DEVICE MANUFACTURER NOR MICROSOFT GIVES ANY EXPRESS WARRANTIES, GUARANTEES, OR CONDITIONS FOR THE SOFTWARE. TO THE EXTENT PERMITTED UNDER YOUR LOCAL LAWS, THE MANUFACTURER AND MICROSOFT EXCLUDE ALL IMPLIED WARRANTIES AND CONDITIONS, INCLUDING THOSE OF MERCHANTABILITY, QUALITY, FITNESS FOR A PARTICULAR PURPOSE, AND NONINFRINGEMENT.

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WHAT'S IN THE BOX? —

Meet the legislator trying to do something about video game loot boxes

Hawaii’s Chris Lee wants to protect minors from “psychological manipulation”

KYLE ORLAND - 12/16/2017, 9:00 AM
One Bitcoin Transaction Now Uses as Much Energy as Your House in a Week

Bitcoin’s surge in price has sent its electricity consumption soaring.
Robots, Automation and the Future of Work
Should software developers have a code of ethics?

With the power to change the way the world works comes the responsibility to address ethical dilemmas.

Professional Ethics in Software Development

by The RIQ News Desk Feb 08, 2017
Medical, Legal, Business, Engineering Ethics
Medical, Legal, Business, Engineering Ethics

• Many fields have well-developed professional ethics

• Basic ethical duty to “hold paramount the safety, health and welfare of the public”

http://ethics.wikia.com/wiki/Citicorp_Fiasco
Professional Engineer
Professional codes

• Codes for ethical practice
• Identify problems, guide solutions
• Judgement still necessary
Malpractice vs. Negligence

Negligence is a failure to exercise the care that a reasonably prudent person would exercise in like circumstances.

Malpractice is a type of negligence; it is often called "professional negligence." It occurs when a licensed professional (like a doctor, lawyer or accountant) fails to provide services as per the standards set by the governing body ("standard of care"), subsequently causing harm to the plaintiff.

YOU CAN'T HAVE MALPRACTICE

IF YOU DON'T HAVE ANY PROFESSIONAL STANDARDS
IEEE CS/ACM Software Engineering Code of Ethics (short version)

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

- **Public**: Software engineers shall act consistently with the public interest.
- **Client and Employer**: Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest.
- **Product**: Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
- **Judgement**: Software engineers shall maintain integrity and independence in their professional judgment.
- **Management**: Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
- **Profession**: Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
- **Colleagues**: Software engineers shall be fair to and supportive of their colleagues.
- **Self**: Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

https://www.computer.org/17-313/education/code-of-ethics
Code of Ethics

research shows that the code of ethics does not appear to affect the decisions made by software developers.

Does ACM’s Code of Ethics Change Ethical Decision Making in Software Development?

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ABSTRACT

Ethical decisions in software development can substantially impact end-users, organizations, and our environment, as is evidenced by recent ethics scandals in the news. Organizations, like the ACM, publish codes of ethics to guide software-related ethical decisions. Indeed, ACM has recently been a target of such activities.

The first example is the Uber versus Waymo dispute [26], in which a software engineer at Waymo took self-driving car code to his home. Shortly thereafter, the engineer left Waymo to work for a competing company with a self-driving car business, Uber. When Waymo realized that their own code had been taken by their former employee, Waymo sued Uber. Even though the code was not actually used by Uber, the case illustrates the potential for ethical dilemmas in software development.
Ethics for Software Engineers?

- Software engineers often have large autonomy (e.g. push to production)
- Fast release cycles
- Time and budget pressures
Ethics vs Best Practices?
Ethics framework
Professional vs Personal Ethics

• “I was just following orders”

• Professionals serving the public, impact public welfare

• Ethical values/standards
Harms Software Engineers can cause?

• Is there any software engineering that’s safe?
Hippocratic Oath

• I will not be ashamed to say "I know not," nor will I fail to call in my colleagues when the skills...

• I will respect the privacy of my patients...

• I will prevent disease whenever I can, for prevention is preferable to cure.
Obligations to whom?

• Public welfare

• Some cases more obvious: QA for pacemaker

• Analyze stakeholders, including fringes
Ethics frameworks

• Character-based/virtue ethics:
  – qualities of morally excellent persons
  – aim to develop, amend faults

• Consequentialist/utilitarian ethics:
  – derived from likely consequence of actions
  – maximizing welfare

• Deontological/rule-based/duty-based ethics
  – derived from universal rights/rules
  – human lives as source of all moral value
Summary

• Software engineers face ethical questions regularly
• Most software can potentially cause harm
• Fast decision making under constraints
• Professional codes can guide
Further Reading

• ACM/IEEE-CS: Software Engineering Code of Ethics
  https://www.computer.org/web/education/code-of-ethics

• Vallor and Narayanan. An Introduction to Software Engineering Ethics
  https://www.scu.edu/media/ethics-center/technology-ethics/Students.pdf

• CMU 08-200 Ethics and Policy Issues in Computing

More cases

• Offshore development
• Experimentation and IRB
• Privacy, Data economy
• Copyright
• Streetview
• Self-driving cars
• Artificial intelligence – super intelligence
• 3d printing