

Underpinnings of Copyright or, “*Life, Death, and Copyright, Really*”

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Context: My interest in copyright

- Began in “pure” mathematics
 - concerned with social understandings of math
- Switched to law
 - Concerned with social and legal understandings of technical artifacts
 - Practiced commercial law in NY
- Software safety: software personal injury! [Th25]
 - At issue: “control” of rights in safety-critical code
 - *How can industry progress without disclosure?* [Pet]
- Hired to teach CSC “Professional Responsibilities”

Directions for this talk

- What is copyright?
- Broad social understandings of copyright?
 - social purposes and directions for copyright
 - a problem due to copyright of software *object code*
 - Privatization of critical social information
- [conclude]
- Only a little legal analysis
 - no deep discussions of things like the DMCA
- Only a little technical minutiae
 - Useful here only insofar as it illustrates general social understandings
- Preliminary work: I want to get this to a conference and develop it more

My Concern: Privatization of Critical Social Information

- Copyright impedes software accident forensics
 - Therac 25 case illustrates this
 - impedes progress in software “state of the art”
 - Breach of “social bargain” struck by government in giving limited monopoly to authors
 - society does not receive the “ideas” in exchange for the “rights” we grant by copyright
 - there are serious consequences to this trend!

What is “copyright” ?

- Essence: “copy” - “right”
 - common definitions of these words?
- An *abstraction* created by government
 - to what end?
 - utilitarian vs. natural rights theories at play

Humble Beginnings

- 15th century Stationers' Guild
 - guild register for books
 - private enforcement system to regulate book trade
 - agreement to uphold their monopoly
 - involved perpetual rights
- Subsequent Licensing Acts
 - monarchy found stationers' system useful in suppressing dangerous speech
 - promoted dissemination of certain works to certain people
 - but also censorship

A Fresh Start in 1710

- Statute of Anne: parliament made a change!
 - Rights given to *authors*, not publishers
 - Utilitarian focus - to *induce the learned to publish*
 - Social purpose - to *promote learning*
 - Rights established only for *new* books
 - older works fell into the *public domain*
 - Rights had limited duration (14 years!) - *abolished perpetual rights*
 - Rights were limited to printing and reprinting,, not *use* of works
 - Publishers responsible to *deposit copies* in libraries
 - System to redress grievances about *overpricing!*
- For history, see [Rose]

Later: U.S. Constitution

Article I, Sec. 8, Clause 8

- Congress empowered to promote progress of science and useful arts
- by securing to authors and inventors
- exclusive rights
- for limited times
- in their respective writings and discoveries

Contours of the Constitutional View

- Purpose: promote science / useful arts
- Who: authors
- How: exclusive rights
- How long: limited times
- For what: writings

Underlying Economic Model

We grant authors:

- exclusive rights
 - a limited monopoly on *expression* of ideas

Authors grant society:

- publication
 - promotes science and useful arts to freely disseminate new ideas
- ideas and information go to public domain immediately
- limits on duration
 - enrich public domain thereafter

The “Bargain”

- Said to be a “social bargain” where copyright holder gets the limited monopoly and society gets resultant benefits
 - fundamental to the whole scheme: disclosure of the valuable “stuff” from the work
 - see [Lit] and [Sam] for more arguments and explanation
 - not a “natural rights” property model
 - a utilitarian model with a particular underlying rationale for costs, benefits, and who gets what

Some Distinctions in Rights

Patent:

- for “inventions”
 - protect functional aspects
- independent discovery is still a violation of rights
 - “copy” is not essential
- publication of ideas and careful explanation of invention required
 - protection only granted for what is disclosed
- limited to ~17 years

Trade Secret

- common law, not Federal
- does not require any publication
- a contract theory to keep secrets
 - lasts as long as the secret does

Enter Software

- Software basics
 - source code vs. object code (compilation)
 - object code very difficult to read or understand
 - it doesn't reveal its underlying logic and ideas by itself
 - understanding requires experts, expensive tools and time
- Is software subject to copyright?
 - law says software is a “literary work” (1976)
 - Apple v. Franklin says object code is copyrightable (1984)

Uniqueness of Software

- Computer as general purpose machine: inert without software
- Software comprises the *information* to instruct the machine, giving it *function*
 - source code as expression of that function
 - object code as a translation of the *expression* of function into the *function itself*?

New Economic Incentives

- Don't publish source code!
 - publication would reveal innovative designs and ideas to competitors
 - keep it secret (trade secret law)
 - protection lasts as long as the secret does

Copyright Still Useful to “Author”

- Copyright the object code (it gets to the market!)
 - prevent others from copying its exact functionality
 - unless copying technology makes pirating easy :-)
 - little risk of revealing underlying ideas in the code
 - what happened to the social benefits of copyright?
 - can get up to 95 years of protection!
 - for software?!

- Additional efforts on behalf of “authors” to protect these rights:
 - restrict reverse engineering! Don’t let the public see the innovative ideas embodied in the expression!
That is where the value to software is seen.
 - decompiling is already hard and expensive
 - use licensing restrictions (UCITA, formerly UCC Art. 2B)
 - restrict reverse engineering activities by law (DMCA)

An Important Detour

- Safety analysis primer:
 - engineering progress depends on open social discussion of disastrous designs [Pet]
 - software engineering processes focus on communication of underlying design ideas [Par]
 - *Source code* is central, among other components, to effective accident investigation [Lev]

Unintended Consequences of Copyright Incentives?

- Therac-25 medical linac case
 - several injuries and deaths
 - software defects implicated
- Hospitals had “killed” patients due to the machine
 - wanted to do some analysis for its safety
 - the manufacturer refused to release source code to hospital experts for internal analysis
 - claimed they needed to keep control for safety reasons!
 - not an irrational argument!
 - claimed trade secrecy on the underlying source code

A Fortuitous Event (for the state of the art in software)

- Consultation with hospital in case
 - I had the materials relevant to an analysis
 - this information considered proprietary after settlement
 - court records to be sealed after settlement (\$\$)
 - I was a graduate student wanting to publish :-)
 - discussion with manufacturer's attorney revealed opposition to use of materials AND a special Texas rule!
 - not common attorney behavior
 - not a common rule among other Courts (unfortunately)

Progress through Publication of Therac Proprietary Information

- Software systems analysis
- Software source code forensics
- Software engineering process
 - testing and analysis methods

A Related Phenomena

- Consider “Open Source” software movement
 - Linux network servers
 - insurance rates lower when compared to Microsoft (proprietary, closed source) network servers
 - wow, something is going on when the source is disclosed to the public

Final Thoughts

- Public safety is in jeopardy due to natural rights view of software source code!
 - US Constitution envisions a different incentive structure for copyrights
- Should safety-critical software be subject to an “open source” law?
 - add patent protection for valuable algorithmic details
- Open records Court rules in cases affecting public health and safety
- Contact me with questions or thoughts:
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Selected Sources

[Lev] Leveson, Safeware, Addison-Wesley

[Lit] Littman, Digital Copyright, Prometheus

[Par] Parnas, “Evaluation of Safety-Critical Software,” CACM June, 1990.

[Pet] Petroski, “To Engineer is Human,” Vintage, 1992.

[Rose] Rose, “Authors and Owners: The invention of Copyright.” (general history of copyright)

Samuelson at www.sims.berkeley.edu/~pam/papers.html

[Th25] Leveson, Turner, “An Investigation of the Therac-25 Accidents,” IEEE Computer, July 1993.

*Some of my own software safety / legal research can be found on my webpage: www.csc.calpoly.edu/~csturner