

Utils Lecture

17-313, Foundations of Software Engineering, Spring 2023



Administrivia

- Final group presentations
 - Monday, May 8, 2023 05:30pm 08:30pm In Person GHC 4401
 - Snack Survey on Slack
 - Final Class: AMA with the professors. We will post a survey for questions.





Software Patents: The Good, The Bad, and The Ugly



Disclaimer: l'm not a lawyer!



Venice, 1474



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England, 1566









Today: USA





https://www.popularmechanics.com/technology/design/g20051677/patents-changed-the-world

What is a patent? New. Useful. Non-obvious.

"A patent is an exclusive right granted for an invention, which is a product or a process that provides, in general, **a new way of doing something**, or offers a **new technical solution to a problem**. To get a patent, technical information about the invention must be disclosed to the public in a patent application."



https://www.wipo.int/patents/en



What rights do patents grant?

- Patents **don't** give you the right to make, use, or sell an invention.
- Patents **do** give you the right to **exclude others** from making, using, and selling an invention for the term of a patent (20 years)
 - stop or sue others
 - licensing and royalties







What's the difference? Patents vs. Copyright

- Copyrights cover the details of expression of a work
- Copyrights don't cover any ideas Patents only cover ideas and the use of ideas
- Copyrights happen automatically.

Patents are issued by a patent office in response to an application.





Why do patents exist?

- Encourage disclosure of inventions
- Reward invention and creativity
- Protect investment of capital into R&D
- Encourage the market to "design around"
- Protect small companies from large ones





Software Patents





Patent or not?



Patent or not?

- 1. Running bingo on a computer
- 2. Using a computer to help users plan meals while achieving diet goals
- 3. Using a computer to order a pizza with customized toppings
- 4. Prompting a user before establishing a new network connection
- 5. Automatically notifying users when an item is picked up or delivered
- 6. Using a computer network to ask people to complete tasks and then wait for them to do them
- 7. Using SMS to perform tasks (e.g., checking bank balance)
- 8. Selecting ALL images in a CAPTCHA that match a given text



The software patent system is broken!



Alice vs. CLS Bank (2014)

Case	Claimed Invention	Result		
Alice Corp. v. CLS Bonk (June 19, 2014)	Method of computerized risk mitigation in financial settlements	X Step 1 X Step 2 fu an co	IOT Patent Eligible /hy? Risk mitigation is a long-standing fundamental economic practice" (step 1) nd the claims merely required generic emputer implementation (step 2)	Supreme Court smashes "do it on a computer" patents in 9-0 opinion Court dedices to rop activity patents altogether.
Digitech (July 11, 2014)	Method of digital image processing: used "device profiles" to organize devices' spatial and color properties	X Step 1 X Step 2 int og sp	IOT Patent Eligible Iby? Claimed "device profile" was stangible: method claims covered regarization of information untethered to pecific structure.	Guestion 1: In the patter: clineted to a pattertialightic compati- log. status: kina?
buySAFE и. Google (Sep. 3, 2014)	Online transaction performance guarantee	X Step 1 X Step 2 by	IOT Patent Eligible My? The claims are about creating a antractual relationship that is performed y any general purpose computer.	Abate: With software petershi, the answer in uccurity "His." De the idlalmed elements, Individually and / or es
Oltramerical v. Hulu (Nov. 14, 2014)	Internet-distribution of copyright material	X Step 1 X Step 2 /// /// /// /// ///	IOT Patent Eligible Iby? Offering media in exchange for lewing an advertisement is an abstract lea. Implementing it on the internet does ot transform it into patent eligible.	combined, transform the dialines invention into something pateno eligible?



Problem: Inventive step and non-obviousness



https://www.statista.com/statistics/256554/number-of-patent-application-filings-in-the-us

🔄 S3D

Problem: Long patent pendencies and terms

TABLE 4: PATENT PENDENCY STATISTICS (FY 2021)

Utility, Plant, Reissue Pendency Statistics by Technology Center (in months)	Average First Action Pendency	Total Average Pendency
Total Utility, Plant, and Reissue Pendency	16.9	23.3
Tech Center 1600—Biotechnology and Organic Chemistry	17.0	24.0
Tech Center 1700—Chemical and Materials Engineering	18.8	26.7
Tech Center 2100—Computer Architecture, Software, and Information Security	17.5	25.6
Tech Center 2400—Networks, Multiplexing, Cable, and Security	15.7	22.9
Tech Center 2600—Communications	13.5	19.9
Tech Center 2800—Semiconductor, Electrical, Optical Systems, and Components	15.7	22.3
Tech Center 3600—Transportation, Construction, Agriculture, and Electronic Commerce	18.1	25.9
Tech Center 3700 — Mechanical Engineering, Manufacturing, and Products	18.6	26.7



https://www.uspto.gov/sites/default/files/documents/USPTOFY21PAR.pdf

Problem: Incompatibility

- PNG was invented to avoid GIF patent issues
- Opus is a patent-free MP3 alternative
- AV1 vs H265

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Codecs allow the app to read and p from the Microsoft Store. HEVC Video Exter £0.79	olay different files. Download this codec	opus
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Problem: Independent discovery doesn't matter!

"The idea that I can be presented with a problem, set out to logically solve it with the tools at hand, and wind up with a program that could not be legally used because someone else followed the same logical steps some years ago and filed for a patent on it is horrifying."



John Carmack



Problem: Only large organizations benefit

- The patent system relies on people to challenge bad patents
 - requires considerable time, money, and legal expertise
 - the US legal system requires both parties to pay legal fees (c.f., losers pay costs in Europe) *
- US software patents cost between **\$15,000 to \$45,000!**
 - that's before you even apply for international patents!



https://www.patenttrademarkblog.com/how-much-patent-costs https://www.eff.org/issues/patent-busting-project



Problem: Non-Practicing Entities (Patent Trolls)



Patent trolls hijzok ideas and extort money from those who do the real work.

Today the Administration is taking action to protect innovators and ensure the highest-quality patents in our system.

WH.GOV/PATENTTROLLS

JUNE 4, 2018



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'Patent trolls' cost other US bodies \$29bn last year, says study
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Problem: Innovation is Stifled

"As a developer for a small startup, absurd software patents are a constant worry. Stories abound of people like us getting pressured out of existence over the use of incredibly vague, basic interface elements and system components."

"Software patents are generally written in vague and nontechnical legal language, which obfuscates the patent in question . . . and also makes it easy to dramatically extend the patent to elements not considered at all when the patent was originally filed."



This American Life: When Patents Attack!

- Innovatio sued libraries and coffee shops for providing WiFi in a public space
- Boadin has sued various media outlets, claiming that its patents are infringed whenever a word or phrase on your computer autocompletes
- NPHJ claims they hold a patent on "scanning and emailing documents". They tried to sued non-profits for \$1000 per employee in damages.







- Zoosk has a website that mobile devices can connect to
- Zoosk's server collects information from the mobile devices, including location and unique device identifiers
- Zoosk users can send and accept invitations to connect with and send messages to each other.
- Zoosk shares profile information of connected users, who are "members of a same social network" (i.e., they're on Zoosk)
- Zoosk can connect users who are in the immediate vicinity of each other, or a particular distance away



Problem: Open Source is under attack, too!



Ensuring Patents Foster Innovation in Open Source

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at this week's Open Source Summit Yorth America, we heard inom Gevin Jakehwith Unified Patents, Kevin is a patent attorney with saw Showage heating done to innovation by patent horis - more kindly binness to any sociation autoin definition



""" Bata collected through June 5, 2022"""





What next?

- Alternative licensing models
 - The Defensive Patent License (DPL)
 - The Open Invention Network (OIN)
 - License on Transfer (LOT) Monday, May 8, 2023 05:30pm - 08:30pm In Person GHC 4401
- Bogus patent bounties
- <u>Unified Patents</u>
- Commonsense reform
- Abolish software patents?







Considering Tradeoffs



Life is all about tradeoffs

In this course, we have talked a lot about tradeoffs.

Some tradeoffs we have discussed:

Writing Tests vs writing more features

Choosing a familiar tech stack vs a "trendy one"

Other tradeoffs...?



Think about structured ways to make decisions

Do what is ethical, legal, moral, obvious

Sometimes, there are multiple (legitimate) options, that all seem to have positives and negatives.

What to do?



People have studied this before...

Economics Ethics Biology + Microbiology Medicine Sociology **Politics** Engineering **Computer Science Strategy Games**



Architecture Tradeoff Analysis Method

- 1. Present the ATAM.
- 2. Present business drivers.
- 3. Present architecture.
- 4. Identify architectural approaches.
- 5. Generate quality attribute utility tree.
- 6. Analyze architectural approaches.
- 7. Brainstorm and prioritize scenarios.
- 8. Analyze architectural approaches.
- 9. Present results.







Pros and cons

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Moral or Prudential Algebra

1. Make a list of Pros and Cons

2. Take a few days to think, forcing your brain to come up with all of the positive and negative aspects of taking the measure you're considering.

3. Assign weights to each item on your list depending on its importance.

4. When the weight of a item on your "pro" list is equal to the weight of an item on your "con" list, strike both of them out.5. What is left in the balance is the choice you need to make. Wait a few more days and, if nothing new occurs to you, act on the decision you've made.





Even Swaps

Premise:

It is easy to make decisions when there is only one objective.

But having only one objective, as any decision maker knows, is a rare luxury.

Even swaps provides a practical way of making trade-offs among any set of objectives across a range of alternatives.

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Overview - 3 step process

1. Create a Consequences Table

2. Eliminate "Dominated" Alternatives

3. Make Even Swaps



Running Example from research paper

Example: Alan Miller is a computer scientist who started a technical consulting practice three years ago.

For the first year, he worked out of his home, but as his business grew he decided to sign a two-year lease on some space in the Pierpoint office park.

Now that lease is about to expire. He needs to decide whether to renew it or move to a new location.



Define the objectives

Alan defines five overriding objectives that he needs his office to fulfill:

- 1. a short commute from home
- 2. good access to his clients
- 3. good office services (clerical assistance, copiers and fax machines, and mail service)
- 4. sufficient space
- 5. low costs

He finds five viable alternatives: Parkway, Lombard, Baranov, Montana, and his current building, the Pierpoint.



Create Consequences Table

Objectives	Parkway	Lombard	Baranov	Montana	Pierpoint
Commute in Minutes	45	25	20	25	30
Customer Access (%)	50	80	70	85	75
Office Services	А	В	С	А	С
Office Size (Square Feet)	800	700	500	950	700
Monthly Cost (\$)	1850	1700	1500	1900	1750

https://hbr.org/1998/03/even-swaps-a-rational-method-for-making-trade-offs



Create Ranking Table

Objectives	Parkway	Lombard	Baranov	Montana	Pierpoint
Commute in Minutes	45 (5th)	25 (2nd tie)	20 (1st)	25 (2nd tie)	30 (4th)
Customer Access (%)	50 (5th)	80 (2nd)	70 (4th)	85 (1st)	75 (3rd)
Office Services	A (1st tie)	B (3rd)	C (4th tie)	A (1st tie)	C (4th tie)
Office Size (Square Feet)	800 (2nd)	700 (3rd tie)	500 (5th)	950 (1st)	700 (3rd tie)
Monthly Cost (\$)	1850 (4th)	1700 (2nd)	1500 (1st)	1900 (5th)	1750 (3rd)

https://hbr.org/1998/03/even-swaps-a-rational-method-for-making-trade-offs



Eliminate "Dominated" Alternatives



https://hbr.org/1998/03/even-swaps-a-rational-method-for-making-trade-offs



Make Even Swaps

- 1. Determine the change necessary to cancel out an objective.
- 2. Assess what change in another objective would compensate for the needed change.
- 3. Make the even swap.
- 4. Cancel out the now-irrelevant objective.
- 5. Select the dominant alternative.



First Even Swaps

• For Baranov, swap 5 commute minutes, for 8% customer access.

Objectives	Lombard	Baranov	Montana
Commute in Minutes	-25 (1st tie)	20 25 (1st tie)	25 (1st tie)
Customer Access (%)	80	70 78	85
Office Services	В	С	A
Office Size (Square Feet)	700	500	950
Monthly Cost (\$)	1700	1500	1900



Second Even Swaps

• For Baranov, swap C->B, add \$200, for Montana, swap A->B, reduce \$100





Second Even Swaps

• For Lombard, swap 250 sq ft for \$250

Objectives	Lombard	Montana
Commute in Minutes	25	25
Customer Access (%)	80	85
Office Services		В
Office Size (Square Feet)	700 950	950
Monthly Cost (\$)	1700 1950	1800

53D

Advice for swaps

- Make the easier swaps first
- Concentrate on the amount of the swap, not on the apparent importance of the overall objective.
- Remember that the value of an incremental change depends on what you start with.
- Make consistent swaps.
- Seek out solid information.

