CS207 #4, 17 Oct 2014
Gio Wiederhold & Ron Burbank
http://infolab.stanford.edu/people/gio.html
Hewlett 103

Don’t forget to initial the signup sheet. A circle indicates selected topic reported
1. Why should software be valued? Cost versus value.
4. Income from Sales and Service. Alternate Business models.
5. Sales expectations and discounting of future income.
7. Software growth.
8. Legal & forensics
9. The role of patents, copyrights, and trade secrets.
10. Life and lag of software innovation.
11. How to grow a software company: organic or by acquisitions.
12. Open source software; theory and reality. Freemium.
13. Separation of use rights from the property itself.
15. Role of Government
16. Risks when outsourcing and offshoring development.
17. Effects of using taxhavens to house IP. Abolish Corporate taxation?
Various Approaches to assess IP

Rapid summary only – more in readings

1. Income Prediction for other products (similar to SW)
2. R&D roll-over
3. Market capitalization (Market Cap)
4. Comparisons with prior acquisitions with IP
5. Comparisons with existing businesses
1. **Determine life of IP**
   - Diminished by obsolescence, competition, commodization
   - Refreshed by improvements
   - Terminate when insignificant (10%)

2. **Estimate future net income**

3. **Combine**

4. **Discount to NPV**

---

*IP Diminution, Golf*

1992 | 2002 | 2012 | 2022
---|---|---|---
0.00 | 0.20 | 0.40 | 0.60

Years after release of 1st Windows version

Retail transfer IP remaining

1st version IP remaining

(accountants depreciate)
## Combining it all

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<th>today</th>
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Software product

- Sells for $500/copy
- Market size 200,000
- Market penetration 25%
  - Expected sales 50,000 units
  - Expected income $500 \times 50,000 = $25M

after your salary (SE expenses 3.7M) etc ...

Earnings (Profit before taxes) is just $1M

Spend less than $500,000 on initial development
Staff Growth: Linear
Effort total = \( \frac{1}{2} E \times T \)
A simple metric: lag vs completion =
Centroid of prior expenditure
here @ 33% (without discounting)
Erlang sales curves
\( m = \text{mean/variance} \)

\[
fr(t) = \frac{(\lambda m)^{m-1} \cdot e^{-\lambda m t}}{(m-1)!} \quad \text{for } t \geq 0
\]

Erlang \( m \approx \text{infinite} \)

50M when
\( \text{Erlang } m \sim \text{infinite} \)

all for 50,000 units over 9 years

Flash-in-the pan

One-time promotion

Long-lived single product

end of time horizon

9 years

sales
18M
16M
14M
12M
10M
8M
6M
4M
2M
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
years →
Spreadsheet

Allows easy alteration of assumptions but best to keep them simple: `Occam’s razor’

- Updated version every 1.5 years
  - implies modestly sized product
  - responsive to customers
  - finite life – stop when less than 10% of original IP left

- Linear software growth per Roux Rule
  - linear staff growth if perfectly modularized
  - supra-linear staff growth if not, but constrained
  - few deletions (memory is free, not embedded SW)

- Split IGE for R&D and marketing equally
  - Bayes’ base assumption
Guidance obtained

• We applied an overall Erlang sales curve
  ➢ new versions keep market going but customers do not replace earlier versions

• The assumption are sufficiently simple that alternatives can be intelligently discussed
  1. keep development costs low
  2. design so that SW maintenance is low
  3. charge a higher price
  4. minimize sales cost, without reducing market size
  5. broaden the market
  6. or →
Value of product – not of company
• basis for setting a product price
• or license fee

- The value of the company includes future potential
  - Human capital
- The value of its trademark
  - derived from technical qualities
  - strengthened by marketing, including advertising, accounted for in SG&A after product availability
Business models

0. New versions do not replace earlier versions

Alternative business models

1. New versions encourage replacement
2. Provide related services
3. Charge for maintenance
   Lower initial cost, slower income stream
4. Make product Open source to broaden market
   Charge only for services
Alternate business model

Consider maintenance and its income

"Service model"

• More assumptions — now include cost @50% of value

1. Original cost $500 000 (used to estimate 1.a)
   a. Maintenance cost 15%/year of aggregate original cost
   b. Maintenance fee 15%/year of original price, 1 year delay.
   c. 85% annual retention of customers.

2. Maintenance Lag = \( \Delta (t \text{ cost}, t \text{ income}) = 1 \text{ year} \)

3. Stop maintenance when cost > income
### Additional Effect of service model

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<th>y2</th>
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<td>$4.3 million</td>
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Cost of maintenance = 1523/(500+1523) = 75% of total
Service model factors

• Same proportion was used for SW contribution: 25%
  ➢ Maintenance income has lower sales cost, perhaps more should be made available for software improvements

• Discount total only after maintenance cost
  ➢ Income comes at time of spending

• Maintenance fees still generate substantial income
  ➢ Organize business sector to collect those in out years
  ➢ Use excess SW income for replacement or new products

• Continue longer, but stop in time!
  ➢ When maintenance costs more than income
More years of service model?

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Less, out year losses because $5,687M spent on maintenance

Good time to quit
But still have income to v12
Quit: reduce expense & income 1/3 each year

17-Oct-14 Gio CS207 2014
Total income vs technical cost
Discussion

- Ron Burback
- CS PhD and Patent consultant
- His slides follow, and there will be some duplication
IP Protection

• Intellectual Capital
  all intangibles that contribute to non-routine returns
  ➢ People: “Operational capital” hard to protect
  ➢ Intellectual Property
    ▪ Should be protected against misappropriation
      a) Patents
      b) Copyright
      c) Trade Secret
    ▪ All can be
      o Sold gone to someone else
        • if you cannot use them profitably
      o Licensed specified rights to the IP box are rented
        • Sales of a product in Europe, Japan
Overview IP protection

1. Patents
   - Use only if the invention is visible in the product
   - Or use to hinder others .... “blocking patents”

2. Copyright
   - Protects source code and chip masks
   - Not the underlying ideas

3. Trade Secret
   - If it can be kept secret, best choice
   - Must be defended: NDAs, action when violated
1. Patents

1. Device patents
   - Good for visible ideas
   - Headlights built into fender (Pierce Arrow ~1918)

2. Materials patents
   - Analyzable stuff
     - Glue, drugs,

3. Business patents
   - Hard to assure that they represent new findings
     - Grand Fishery of Great Britain (1720): ocean fishing – rejected
     - Wireless Electronic Mail (NTP versus RIM [Blackberry], Nokia, suing Palm)

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Intellectual Property

Patents, copyright, trademarks, and trade secrets
Stanford University
Ron Burbach
November 2013
Outline

• Patents
  ➢ Take a detailed look at the Google (Larry Page) page rank patent to introduce the concepts of a patent
    » [on line- pointer in CS207 web page]
• Gaming the patent system
• Future direction and a proposed redesign
• Trademarks—just a little
• Copyright—just a little
  ➢ doctrine of personal use (aka fair use doctrine)
• Trade secrets—just a little
But first, an observation

• It is much harder to create than to understand.
• You can look really smart when someone else is feeding you all the correct answers.
• Brilliant ideas are simple to understand.

• Consider J.K. *Rowling's Harry Potter*
In the big picture of things

• Given an entity ...
  ➢ Patent: concept of the entity
  ➢ Copyright: the entity itself
  ➢ Trademark: the name or symbol representing the entity
  ➢ Trade secret: may take the form of all of the above
Patents

• Cover page
  ➢ Abstract
• Specification
  ➢ Drawings
  ➢ Description of the concept
• Claims
• More information
  ➢ USPTO.gov
(54) METHOD FOR NODE RANKING IN A LINKED DATABASE

(75) Inventor: Lawrence Page, Stanford, CA (US)

(73) Assignee: The Board of Trustees of the Leland Stanford Junior University, Stanford, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/004,827
(22) Filed: Jan. 9, 1998

Related U.S. Application Data
(60) Provisional application No. 60/035,205, filed on Jan. 10, 1997.

(51) Int. Cl. G06F 17/30
(52) U.S. Cl. 707/513, 707/100, 707/7, 707/501
(58) Field of Search 707/513, 707/100, 707/7, 707/501

References Cited
U.S. PATENT DOCUMENTS
4,953,106 * 8/1990 Gannner et al. \ldots 345/440
4,540,335 * 9/1995 North \ldots \ldots \ldots \ldots \ldots \ldots \ldots 395/440
5,784,054 * 5/1998 Mauldin \ldots \ldots \ldots \ldots \ldots \ldots \ldots 395/610
5,732,241 * 5/1998 Cohen \ldots \ldots \ldots \ldots \ldots \ldots \ldots 707/3
5,832,494 * 11/1998 Figer et al. \ldots \ldots \ldots \ldots \ldots \ldots \ldots 707/102
5,848,407 * 12/1998 Ishikawa et al. \ldots \ldots \ldots \ldots \ldots \ldots \ldots 707/2
6,014,678 * 1/2000 Issre et al. \ldots \ldots \ldots \ldots \ldots \ldots \ldots 707/501

OTHER PUBLICATIONS


Primary Examiner—Thomas Black
Assistant Examiner—Uyen Le
(74) Attorney, Agent, or Firm—Harity & Snyder LLP

ABSTRACT
A method assigns importance ranks to nodes in a linked database, such as any database of documents containing citations, the world wide web or any other hypermedia database. The rank assigned to a document is calculated from the ranks of documents citing it. In addition, the rank of a document is calculated from a constant representing the probability that a browser through the database will randomly jump to the document. The method is particularly useful in enhancing the performance of search engine results for hypermedia databases, such as the world wide web, whose documents have a large variation in quality.

29 Claims, 3 Drawing Sheets
Observations 1

- **US Patent 6,285,999**
  - There are no *international patents*, just an *international application*. All patents are granted by governments (or groups of governments).

- The patent and application have been published.

- Dates are very important!
  - Granted date September 4, 2001
  - Application date January 9, 1998
  - Claiming *priority* is with respect to dates and not work assignment

- Utility patent (must be useful at something)
  - Other patent types include design and plant
Some famous patents

• Utility
  ➢ Bell’s phone patent
  ➢ Edison’s light bulb, phonograph, motion picture, ...
  ➢ http://www.uspat.com/historical/

• Design
  ➢ Apple’s “look and feel” of a computer interface – cropped windows
  ➢ Apple’s ipod
  ➢ Auguste Bartholdi’s “Liberty Enlightening The World” aka the Statue of Liberty

• Plant
  ➢ Hass’s avocado
  ➢ Burbank’s potato
Cover sheet observations 2

- Inventor: Larry Page
- Assignee: Stanford University
  - The assignee has all the rights
  - The patent grants the right to exclude others.
- Title: Method for node ranking in a linked database
- Primary Examiner: Thomas Black
- Abstract: A method assigns importance ranks to nodes in a linked database, such as any database of documents containing citations, the world wide web or any other hypermedia database. The rank assigned to a document is calculated from the ranks of documents citing it. In addition, the rank of a document is calculated from a constant representing the probability that a browser through the database will randomly jump to the document. The method is particularly useful in enhancing the performance of search engine results for hypermedia databases, such as the world wide web, whose documents have a large variation in quality.
Because the work was supported in part by the NSF, the government has certain rights in the invention.

Application: This application claims priority from U.S. provisional patent application Ser. No. 60/035,205 filed Jan. 10, 1997, which is incorporated herein by reference.

- Provisional application (no claims, no examination, defines priority date)
- Non provisional applications
- And many more kinds of applications
Specification

• FIELD OF THE INVENTION
• BACKGROUND OF THE INVENTION
• SUMMARY
• BRIEF DESCRIPTION OF THE DRAWINGS
• DETAILED DESCRIPTION
• Drawings
• The specification is a detailed description of the invention. The invention need not be already built. Enough details that “one skilled in the art” can build the invention. The specification will form the foundation for the claims.
“Although the following detailed description contains many specifics for the purposes of illustration, anyone of ordinary skill in the art will appreciate that many variations and alterations to the following details are within the scope of the invention. Accordingly, the following embodiments of the invention are set forth without any loss of generality to, and without imposing limitations upon, the claimed invention. For support in reducing the present invention to practice, the inventor acknowledges Sergey Brin, Scott Hassan, Rajeev Motwani, Alan Steremberg, and Terry Winograd.”

- A patent is granted for one invention but the specification may describe many inventions.
- You get one shot at the specification. (no new matter)
Drawings

START

SELECT AN INITIAL N-DIMENSIONAL VECTOR $p_0$

COMPUTE AN APPROXIMATION $p_n$ TO A STEADY-STATE PROBABILITY $p_\infty$ IN ACCORDANCE WITH THE EQUATION $p_n = A^n p_0$

DETERMINE A RANK $r[k]$ FOR NODE $k$ FROM A $k^{th}$ COMPONENT OF $p_n$

DONE

FIG. 3
Observations on Drawings

• All drawings are labeled “Fig. N” (as a template)
• Many rules (thickness of lines, size of text, font, ...) but these rules are easy to follow with modern graphic draw tools.
• All (or most) of the elements in the drawing are labeled.
• Since the drawings are part of the specification, you only get one shot at the drawings (except for rule violation edits). **No new matter.**
1. A computer implemented method of scoring a plurality of linked documents, comprising: obtaining a plurality of documents, at least some of the documents being linked documents, at least some of the documents being linking documents, and at least some of the documents being both linked documents and linking documents, each of the linked documents being pointed to by a link in one or more of the linking documents; assigning a score to each of the linked documents based on scores of the one or more linking documents and processing the linked documents according to their scores.
Observations on Claims

• Claim 1 is an independent claim
• Claim 1 is called the planetary claim: the most general.
• Claims define the legal foundation of the patent’s rights
• Claims define one invention: “A computer implemented method of scoring a plurality of linked documents”. This is called the preamble. The specification may define multiple inventions but only one gets to be claimed per patent. There may be many sets of claims, defining many patents, based on the same specification.
• The concepts in the claims need to be grounded in the specification.
• Choice of transitional phrase
  ➢ Comprising – open ended
  ➢ Consisting – closed ended
Antecedent Support in the Claims

- Noun clauses are introduced as indefinite noun clauses and then, when used again, as definite noun clauses.

<table>
<thead>
<tr>
<th>a plurality of documents</th>
<th>the documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>at least some of the documents being linked documents</td>
<td>the linked documents</td>
</tr>
<tr>
<td>at least some of the documents being linking documents</td>
<td>the linking documents</td>
</tr>
<tr>
<td>at least some of the documents being both linked documents and linking documents</td>
<td></td>
</tr>
<tr>
<td>a link</td>
<td></td>
</tr>
<tr>
<td>a score to each of the linked documents</td>
<td>their scores</td>
</tr>
<tr>
<td>scores of the one or more linking documents</td>
<td></td>
</tr>
</tbody>
</table>
Claims
Construction

• Markman hearing
• All noun clauses used in the claim must be grounded, by the specification or by knowledge held by one skilled in the art.
• What is a .... ?
  ➢ Link
  ➢ Score
  ➢ “pointed to”
  ➢ “assigning a score”
  ➢ “processing a document”
Claim 2

2. The method of claim 1, wherein the assigning includes: identifying a weighting factor for each of the linking documents, the weighting factor being dependent on the number of links to the one or more linking documents, and adjusting the score of each of the one or more linking documents based on the identified weighting factor.

Claim 2 is a dependent claim.

29 claims, 4 independent claims, 4 claim clusters

Claims 12 and after, were clearly added after application submission but before patent grant.
Patents concepts

• “first to invent” versus “first to file”
• Utility patent – 20 years
• Design patent – 14 years
• Plant patent – 20 years
• At the very least a utility patent will cost $3,790 (micro entity, less than 3 independent claims, less than 100 sheets of paper, filing, searching, examination, issue, and maintenance).
  ➢ $30,000 typical?
Patent concepts

• Infringement – commission of a prohibited act protected by a patent.

• Validity: A granted patent is assumed to be valid.
  ➢ The five primary requirements for patentability are:
  ➢ (1) patentable subject matter (process, machine, manufacture, or composition of matter); excluded (math, laws of physics, ...)
  ➢ (2) utility – useful. (lack of utility: perpetual motion machine, curing cancer, ...)
  ➢ (3) novelty
  ➢ (4) nonobviousness
  ➢ (5) enablement – one skilled in the art is able to make the patent as described in the specification and claims.

• To show invalidity need to find prior art to the patent.
  ➢ A patent teaches art and if the claims and their construction read on prior art, then the patent is invalid. Need prior art at least 1 year before application filing date. Can get an earlier date by “Swearing Back a Reference”. <<still true>>
Confusion in the patent system

• Bell and Watson vs. Gray and Edison on telephone patent 1870
  ➔ First to file, first to invent, adding new material in specification and then adding a new claim, bribes, alcoholic examiner releasing unpublished application information, after several years of interference the patent was granted to Bell because Bell produced a working prototype.

• Howe & Singer sewing machine controversy 1855
  ➔ “the sewing machine manufacturers got busily down to the job of suing each other out of existence”
Problems with the patent system

• Specification is mostly completed by the inventor. The claims are written by the patent team.
• The patent once granted is assumed valid.
• The grant of the patent is absolute (only one patent).
• Technology is moving faster and faster every day.
• About 576,000 patent applications per year. About 276,000 granted patents. About 6,242 patent examiners. About 2.5 days per application (from USPTO web site). Nearly an impossible task.
• Patent examiners knowledge is not absolute.
How to game a patent

• Keep the application open for a long time, wait and see what happens in technology, and then cut the claims and issue the patent

• Write a specification that is confusing, all encompassing, full of misconceptions, and then use that specification for support in the claims

• Issue multiple patents all with different claims

• Add new material in the abstract

• Broaden the preamble of a claim

• Broaden the claims construction

• Boxing a claim (positive vs negative links)
Patent trolls (aka gnats)

• Obtain a patent and sue for infringement on a large collection of companies (or their customers).
• Prosecute while cost of infringement defense is less than the cost of settlement, then finally settle out of court.
  - start with suing the smallest and the most vulnerable businesses for modest, affordable license fees
  - gain credibility for the patent
  - move on to larger businesses that are now willing to pay more
• The information of each case is then sealed by its settlement agreement.
Pressures on the patent office

- Technology is moving faster and faster
- Impossible to have absolute knowledge
- International patents (who grants patents in a space colony? Oceans?)
- As work loads increase, quality decreases or time delays occur
- Patents on animal life forms (complex life forms). Artificial intelligence?
- The cure (or treatment) of cancer may happen in our life times. DNA based medicine.
- Human Genes (human DNA). What about non-encoding DNA? RNA? The DNA of the mitochondria?
Some suggested changes

- Patents, Copyright, and Trade Marks should be self declared. Get the patent office out of the business of granting validity.
- The patent office becomes a provenance holding site; allowing for publication and time stamps; define spheres of information influence and importance.
- A special court is defined to handle intellectual property issues. Court information is made public.
- A royalty payment system somewhat like radio royalty system is put in place.
- International
- Generous doctrine of personal use for all three.
- Consistent terms (lifetimes)
Thank you

• Recall: It is much harder to create then to understand.
• We need a system in place to fund and support creation of new concepts while at the same time allowing for generous public use.
• Questions?
• Postscript on patented cell lines

1. RB: In 1976 a leukemia patient named John Moore had surgery at the University of California to remove his cancerous spleen. The University was later granted a patent for a cell line called “Mo,” removed from the spleen, which could be used for producing valuable proteins. (USA Patent # 4,438,032)

2. Wikipedia: A HeLa cell is a cell type in an immortal cell line used in scientific research. It is the oldest and most commonly used human cell line. [1] The line was derived from cervical cancer cells taken on February 8, 1951, [2] from Henrietta Lacks, a patient who eventually died of her cancer on October 4, 1951. The cell line was found to be remarkably durable and prolific as illustrated by its contamination of many other cell lines used in research.
• The cells were later commercialized, although never patented in their original form.
Limits to patents

• Genes
  ▪ Recent ruling overturns patentability

• Stemcell: EU Court of Justice, said the use of human embryos ‘for therapeutic or diagnostic purposes which are applied to the human embryo and are useful to it is patentable. But their use for purposes of scientific research is not patentable.’
  

• Business Methods