Intellectual Property Protection for Software and Databases

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Outline

- Why? What are the tradeoffs?
- What is current practice? (Iain)
  - US, Europe, Japan
- Towards an optimal policy
- Mitigating market responses

“Pure” Information Goods

- Premise: software and databases are primarily information and therefore have the characteristics of a “pure” public good:
  - Non-rival in use
  - Costly to exclude others from copying and/or using
- Other important characteristics:
  - Production technology is high fixed cost, low marginal cost
  - Standards enhance the value of these goods
  - Development is cumulative; builds on others’ work

Implications

- Insufficient provision in competitive markets
- "Spillovers" - use of the information/product by others - have large social benefits
  - especially salient for basic scientific research
- If IP protection possible, tendency toward (un)natural monopoly because
  - Imitation cost high (invent around; reproduce data *de novo*, etc.)
  - Nature of production technology
  - Nature of consumption technology – standards

Current IP Policy towards Software/Databases

- Software
  - Copyrightable everywhere (coupled with trade secrecy)
  - Patentable in the US, after a series of court decisions in 1980s; less so in Europe, but changing; patentable in Japan
- Databases
  - Copyrightable everywhere, but with variations in coverage
  - EU database directive and the US legislative response

Software (US)

- Diamond v. Diehr (1981) – computer algorithm that controlled a physical process could be patented; Chakrabarty, etc.
- USPTO 1996 Guidelines (incorporates case law)
  - "A computer-related invention is within the technological arts. A practical application of a computer-related invention is statutory subject matter."
- Floodgates opened – wide variety of implementations of trivial programs are now patented (see the examples)

Lucent's Patent on Sine/Cosine Table Lookup

5,937,468 -- Sine/cosine lookup table -- filed June 1997 -- cites 2 prior patents, and nothing else

1. A lookup table, comprising a complementer adapted to selectively complement a subset of bits of a multibit designation of an angle based on a most significant bit of the multibit designation to produce an address signal; a memory addressed by the address signal and adapted to produce two values; and a switching element adapted to receive the two values from the memory and selectively output the values based on the most significant bit.

2. A lookup table as recited in claim 1, wherein the multibit designation contains n bits, and wherein the memory is an array containing 2n-1 rows.

3. A lookup table as recited in claim 2, wherein each of the 2n-1 rows corresponds to an angle between zero degrees and 45 degrees.

4. A lookup table as recited in claim 3, wherein each row contains sine and cosine values associated with the corresponding angle.

5. A lookup table as recited in claim 3, wherein each row contains sine and cosine values associated with an angle between the angle corresponding to the row and an angle corresponding to an adjacent row.

6. A lookup table as recited in claim 5, wherein the sine and cosine values are associated with an angle substantially centered between the angle corresponding to the row and the angle corresponding to the adjacent row.

And 13 more claims of a similar nature…….

Software (Europe)

- EPO Guidelines – "a computer program claimed by itself or as a record on a carrier is not patentable irrespective of its contents."
- Technical Board of Appeals (1997):
  - "a computer program claimed by itself is not excluded from patentability if the program, when running on a computer or loaded into a computer, brings about… a technical effect which goes beyond the "normal" physical interactions between the program and the computer on which it is run."
- Requires that invention be of "technical character" (which has been interpreted to rule out financial and business methods, games)
  - Small sample of 40 US financial patents issued 97-98 shows that approximately half have EPO-issued equivalents

Source: Hart, Holmes, and Reid (2000), IPI, London

Software (Japan)

- Japanese implementing guidelines:
  - Claims may be for a process "where a software related invention is expressed in a sequence of processes or operations connected in time series, or a procedure, the invention can be defined as a process invention by specifying the procedure
  - Claims may be for a product "where a software related invention is expressed as one or more functions performed by the invention, the invention can be defined as a product invention by specifying functions"

Result of Expanding Patentability

- Substantial increases in patenting by software firms since early 1990s, partly fueled by the lack of "prior art" and a weakening of the "nonobviousness" requirement (Graham and Mowery 1999)
- As in the case of semiconductors, appears to be defensively motivated – exclude rather than be excluded
- Corresponding increase in litigation small considering what might be possible given the nature of the patents issued – court decisions not large in number
  - Rent-seeking litigation
  - Defensive litigation

Software: Copyright vs. Patents

- Copyright, the traditional method
  - Protects the precise *expression* of an idea (or algorithm) rather than the idea/algorithm itself
  - Often combined with trade secrecy (implemented via license of machine code only), limiting use for further development
  - Entry (imitation) possible via reverse engineering
  - Maskin & Bessen (1999) – does appear to provide adequate incentives

Software: Copyright vs. Patents

- Patents, expanding in use
  - Enables claim for method, in effect, when reduced to a program in a computer
  - Requires publication of algorithm, which may facilitate spillovers (at a cost)
  - If really enforced, could create chaos in an industry where any software package incorporates many algorithms available in texts such as Knuth, but which have been patented
  - *But,* is the problem patents or the way they have been implemented?

Databases (US)

- Normally copyrightable
- However, data produced by the federal government is in general not copyrightable – an important difference from Europe, since the govt is a major data producer

EU Database Directive (1996)

- response to the perception that database commercialization lagged in Europe; designed to encourage the privatization of government data provision – in effect, government grants a monopoly for distribution of public data
- Creates a comprehensive new *sui generis* IPR free from the traditional exclusions in copyright law (e.g., fair use)
- Requires reciprocal arrangements in countries outside the EU, or retaliatory infringement (departure from "national treatment" principle)
- Cautionary tale from the US: Landsat (NOAA data) granted to Hughes/RCA JV in 1984, price of images increased tenfold; data cannot be regenerated (David 1999)

NRC (1997) Analysis of EU Database Directive

- Removes distinction between protection of expression and protection of ideas
- Database producers can demand payment for use of content that is not otherwise copyright-protected
- Updating the database renews copyright coverage for the whole database (not just the revisions)
- Strict limits on re-use of database without licensing
- Lack of compulsory licensing – problematical for databases that cannot be regenerated
- No “fair use” exception for research purposes
- Independent invention not a defense

Database IP Policy

- A harder problem, because the essence of database usefulness is publication of data that may not be copyrightable by the database producer, and yet there is a substantial cost to production and maintenance
- Some form of copyright seems essential, but
  - Should govts grant monopolies on their own data?
  - Should it be perpetual?
  - How do we ensure access to databases for research?

Mitigating Market Responses

- Non-IPR protection to limit imitation (more later on this)
- Discriminatory pricing increases output beyond the monopoly level in most cases (academic discounts, introductory discounts, etc.)
- Absent IPR, some spillovers easier to achieve; some harder:
  - Easier access to standards
  - Cumulative innovation probably easier
  - But more reliance on secrecy

Protection without IP

- "self-help" strategies – encryption, password protection, shrink-wrap and click-wrap licenses
- Customized products for a small number of customers (limits redistribution possibilities)
- Industry survey finds a large number of database products sold to niche markets at high prices with no protection (Maurer 1999); costly for imitators to reach the same market
- Products sold with specialized software, service, and frequent updating – tends to lock in customers
- Databases – fulltext contents protected even if arrangement is not; sold with software that is copyrighted

Cumulative Innovation

- Problems with market solutions:
  - (Scotchmer 1996): how to reward the creator of a first generation product while leaving enough for second innovator - generally not possible. Complex contracting might work if innovators could be identified ex ante, clearly impossible for scientific research.
  - (Anton and Yao 1998): sale of ideas involves revealing them, which destroys their private value. Solution involves partial disclosure to signal value, and therefore a substantial discount for first inventor.