

What is digital?

What's the difference between

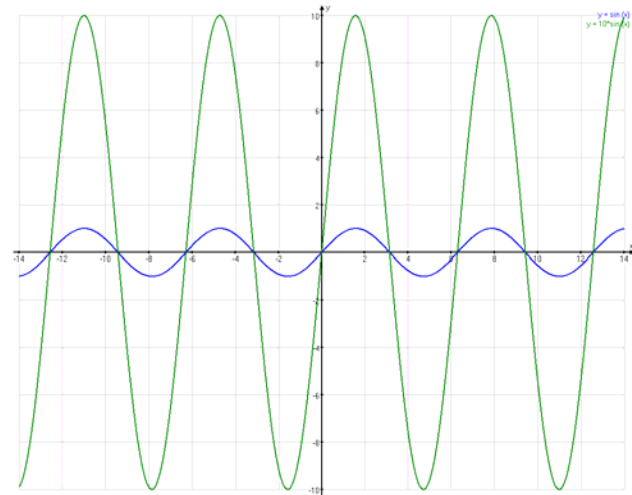
- Rolex and Timex?
- VCR tape and DVD?

Sampling analog music for CD's

- $44,100 \text{ samples/channel/second} * 2 \text{ channels} * 2 \text{ bytes/sample} * 74 \text{ minutes} * 60 \text{ seconds/minute} = 783 \text{ million bytes}$

How does MP3 help?

Why do digital media present new challenges from analog media?



Copyright

US Constitution (Article I, Section 8, Clause 8):

“To promote the Progress of Science and useful Arts”

- **What can you copyright?**
 - **Fixed, tangible medium of expression with a modicum of originality**
- **How do you copyright?**
 - **Don't need anything. Registration necessary for copyright infringement suits**
- **Authors given limited monopoly so they will disclose to public**
- **Concessions**
 1. **Fair use**
 2. **First sale**
 3. **Limited Time**
- **Evolving Bargain: Copyright holder may profit from works and public has access and can build upon them**
- **What would happen if information could only be shared if the owner provided permission?**

Fair use

Use copyrighted works without permission if the use does not unduly interfere with the copyright owner's market for a work

Include personal, noncommercial uses

4 prong test

1. Purpose and character of use (commercial vs. non-profit or educational)
2. Nature of copyrighted work
3. Amount and substantiality of the portion used
4. Effect of the copying upon market

Example: using a VCR to time-shift a broadcast program

Reverse engineering

- OK when extracting unprotected elements
- Connectix Virtual PlayStation

Digital rights management

Idea: copying is hard to control, so make the copying process itself difficult

- Restrict the use of digital files in order to protect interest of copyright holders
- Control file access
- Implemented in operating system, program software, or in the actual hardware of a device

Digital watermarking

- Make information so that unauthorized copying can be detected

Serial Copy Management System (Audio Home Recording Act 92)

Dystopian and utopian results?

Privacy issues?

Important papers

National Information Infrastructure White Paper 1995

1. Copyright owners given exclusive rights over “transmission” of information not just copying
 2. Eliminate first-sale doctrine for digital works
 3. Criminalize tampering with copyright protection or identification mechanisms
- Controversial and bills to implement recommendations were not passed, until...

World Intellectual Property Organization Treaty 1996

Digital Millennium Copyright Act 1998

- Encourages use of technological protections to facilitate a pay-per-view/use system
- Copyright used to regulate multiplication and distribution of works but how about consumption?
- Civil and criminal penalties for circumventing copyright protection systems

Copyrights

Copyright Term Extension Act 1998

- **Free Mickey Mouse! (challenged in Supreme Court 2003)**
- **Retroactive copyright extension of 20 years**
- **Breyer: “effect ... is to make the copyright term not limited, but virtually perpetual”**
 - **Over the last 40 years, Congress has lengthened copyright durations 11 times**
 - **Copyright term length**
 - 95 years for corporations
 - 70 years after death for individuals

Other forms of exclusive rights in information

- **Patents: inventions that others cannot use**
- **Trademark: differentiates between different sources of products**
- **Trade secret: pseudo-property right to penalize those who disclose information to unauthorized persons**

Questions

What are the differences between writing code and writing books in terms of licensing?

Discuss the legality of peer-to-peer sharing with respect to the four prongs of determining fair use

Eben Moglen:

- If you could feed everyone by pressing a button to create lambchops (for free), is there a moral reason to have starving people?
- If everything has zero marginal cost and can be given to everyone everywhere why is it ever moral to exclude anyone from anything?

Consequences

Scientific research

- Secure Digital Music Initiative & Prof. Edward Felton
- Adobe & Dmitry Skylarov

Fair Use

- Copy-protected CDs
- DeCSS and DVD Copy Plus

Innovation and competition

- Sony vs. Connectix and “Mod Chip” makers
- Apple & Other World Computing

Patents

Why patents are powerful?

- Right to exclude others from “practicing the invention”

Currently operating under Patent Act of 1975

- 20 year term

Patent and Trademark Office looks at 4 criteria

1. Is proposed invention patentable?
2. Utility
3. Novelty
4. Non-obviousness

Software patents

- Only recently have patents been granted for software or business methods
- Controversial patent: Amazon.com’s One-Click

Types of software

Software Licenses

- Public domain
- Free
- Open Source
- Copylefted
- Semi-free
- Commercial

Specific licenses

- GNU Public License
- Mozilla Public License
- Lots more...

Proprietary (closed) software

- Freeware
- Shareware
- Adware
- Spyware

Commercial

Academic licenses

Say you buy software using (steep) student discounts that are available at the Duke Computer Store?

Can you use it when you leave Duke and are no longer a student?

What do you buy when you purchase software?

Open source

Commercial software license schemes

- Microsoft's Embrace and Extend
- What's a EULA?

Rights

- Make copies of the program and distribute them
- Access to the software's source code
- Make improvements to the program

Results

- All contributors at same relative level
- Lots of competition in distribution or support
- *Why does it work?*

Free Software Foundation **formed in 1984**

- GNU General Public License (Copyleft)
- Seminal work produced (emacs, gnu compiler)
- Spawned different licenses like the Open Source Definition

Sources of material

Organizations

- The Electronic Frontier Foundation
- Center for Democracy and Technology

Media and discussion

- Wired Magazine
- Slashdot

Databases of information and laws

- Lexis/Nexis
- Thomas

Social issues in Computer Science

- Computer Professionals for Social Responsibility