APCS Principles

www.csprinciples.org

What?

What?

A new first course in computer science

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Alternative to CS1, not replacement

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Designed to be
an AP course:
credit/placement

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A new first course in computer science

Designed to be an AP course: credit/placement

Collaborative: CollegeBoard, NSF, Academia (6-12/University)

Alternative to CS1, not replacement

Process and Content

- How are we designing and building this course?
  - Who is behind the development
  - What is the process used
- What will be in this course?
  - Content
  - Skills
  - Pedagogy

Toward another first course

- Harvard CS50, CS1
- Stanford CS 106A, CS 105
- Princeton COS 126, 116/109
- Berkeley CS61A, CS10
- Texas, CS 305J, CS 302
- Wisconsin, CS 302, CS 250/202
- Colorado CSCI 1300, 1220/1000

Toward another first course

- Tufts, Comp 11, Comp 9,7
- Clemson CPSC 101, CPSC 120
- USC, CS 101L, Nothing
- Virginia Tech, CS 1054, CS 1614
- U. Kansas, EECS 168, EECS 128
- Brown, CSCI 150, CSCI 20
- U. Mass, CMPSCI 121, CMPSCI 120

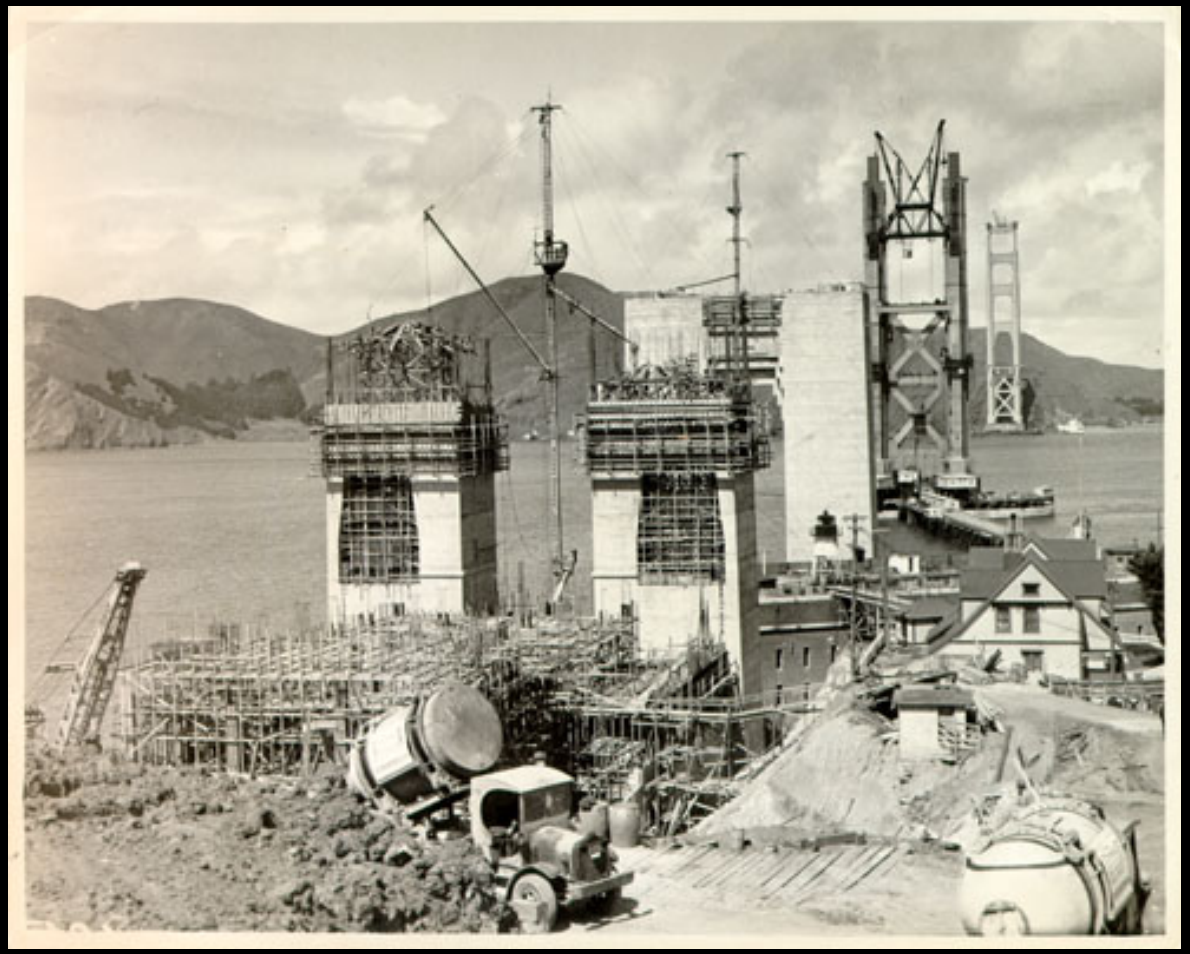
Who?

Who?

- Don Allen
- Christine Alvarado
- Owen Astrachan
- Stacey Armstrong
- Tiffany Barnes
- Amy Briggs
- Charmaine Bentley
- Mark Guzdial
- Rich Kick
- Jody Paul
- Chris Stephenson
- Duane Bailey
- Dan Garcia
- Joanna Goode
- Susanne Hambrusch
- Michelle Hutton
- Deepak Kumar
- Jim Kurose
- Andrea Lawrence
- Richard Pattis
- Katie Siek
- Beth Simon
- Larry Snyder
- Lynn Stein
- Fran Trees
- Lien Diaz
- Cameron Wilson
- Jan Cuny
- Kathy Haynie

Engineering a Course and Exam

Engineering a Course and Exam



Engineering a Course and Exam

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Foundation of Course/Exam

- Commission convened to use College Board framework and methodology to build course/exam
  - Evidence-centered design
  - Claim: student has knowledge or skill
  - Evidence: behavior/performance that the skill/knowledge has been achieved
- Drafted Seven Big Ideas

Commission and Advisory Board

- Commission has task of delivering framework for course/exam using evidence centered design
- Advisory board provides feedback, guidelines, advice to commission
  - Advisory board actually advises

Timeline

- 2009-2010
  - Big Ideas, Practices, Claims/Evidence
- 2010-11
  - Pilot I: Five colleges
  - Draft College Survey
  - Test item prototype
- 2011-12
  - Pilot II: 10+ colleges, 10+ high schools

Possible Next Timeline

- Necessary and sufficient conditions to continue
  - How do we ensure "substantial" buy-in?
- 2012-2013
  - Curricular framework finalized?
  - Exam format identified
- Deploy exam and course
  - 201?

From Process to Product

- What will be in this course?
  - Pilot courses are exemplars
  - Seven big ideas
  - Six computational thinking practices
  - 200 claims and evidence statements
- From bits to NP to modeling to …

Where's the Programming?

- To that end [solving computational problems and exploring creative endeavors], the course highlights programming as one of the seven big ideas of computer science, because programming is among the creative processes that help transform ideas into reality.

Big Ideas

1. **Computing is a creative human activity that engenders innovation and promotes exploration.**
2. **Abstraction reduces information and detail to focus on concepts relevant to understanding and solving problems.**

Big Ideas Continued

3. **Data and information facilitate the creation of knowledge.**

4. **Algorithms are tools for developing and expressing solutions to computational problems.**

Big Ideas Continued

5. **Programming is a creative process that produces computational artifacts.**

6. **Digital devices, systems, and the networks that interconnect them enable and foster computational approaches to solving problems.**

Big Ideas

7. **Computing enables innovation in other fields including science, social science, humanities, arts, medicine, engineering, and business.**

Computational Thinking Practices(Draft)

1. Analyzing problems, artifacts, and effects of computation
2. Creating and using computational artifacts, computational models
3. Communicating processes and results
4. Connecting computation with mathematics, science, engineering
5. Work effectively in teams

What will students do? What problems will they solve?

Stories motivate computational examples

Undecidable, P/NP, heuristics

JULY 1, 2010, 5:26 P.M. ET

UPDATE: Google To Acquire ITA Software For $700 Million >GOOG

Article

We're Hiring Hackers.

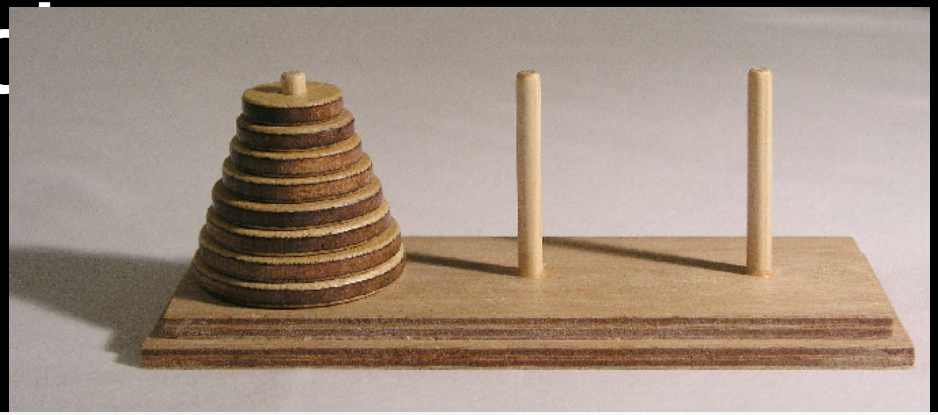
SIAM/Journal for Society for Industrial and Applied Mathematics
July/August 2000

Computer Scientists Find Unexpected Depths In Airfare Search Problem

17 U.S.C. § 512 DMCA

- Limitations on liability for service providers
  - YouTube /Google v Viacom, June 23, 2010
- 24 hours video/minute
  - Youtube: 3/17/2010
  - How many Gbytes?
- How does Youtube analyze audio tracks?

TinEye searc



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Upload new image Browse... or enter new URL paste URL here (page or image) Search

JPEG, 677x298, 123.2 KB

3 Results

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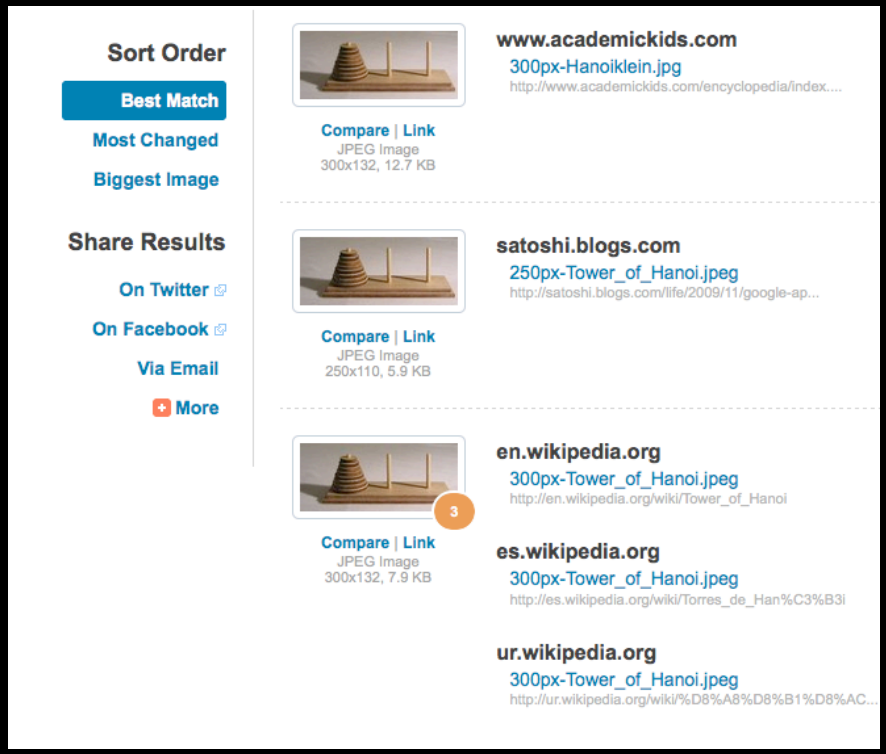
for file: **http://brynnevans.com/blog/wp-content/uploads/2009/03/tower_of_hano...**

These results expire in **72 hours**. **Why?**

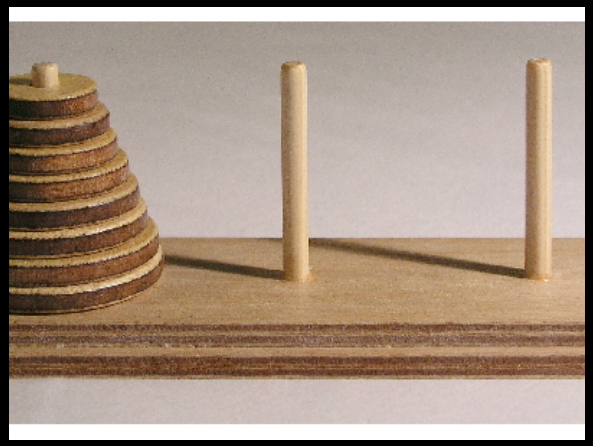
Post a success story!

Thinking about TinEye and Testing



- Different images
  - Size and format
- Clip image search
  - Search? Success!
- Hide image search?
  - Steganography

Steganography with 2 bits/pixel



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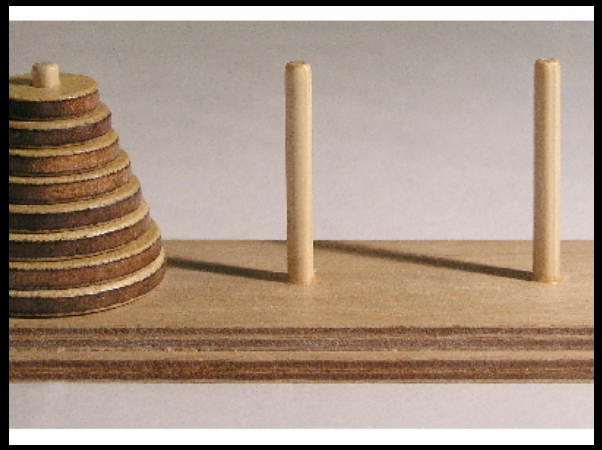
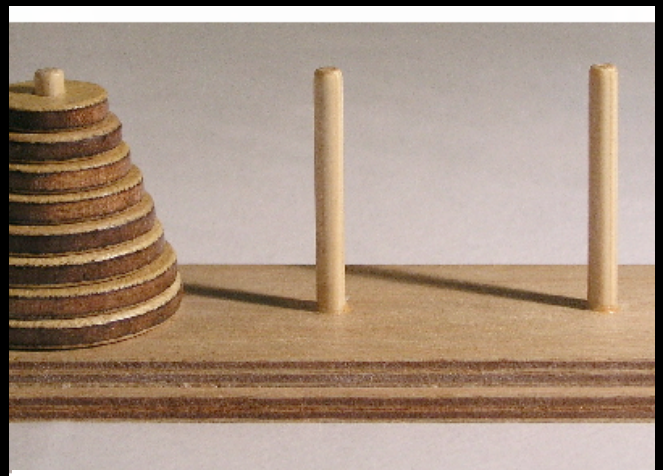
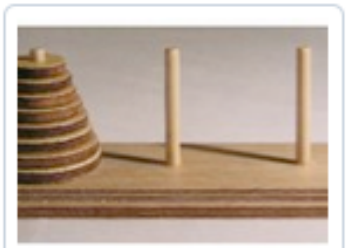


Extract image from Hanoi: 2 bits





PNG, 400x300, 177.9 KB

3 Results

Searched over **1.5728 billion** images in 4.960 sec

for file: **http://www.cs.duke.edu/~ola/images/hanoi-hidden.png**

These results expire in **72 hours**. **Why?**

Post a success story!

Extracting image: 2-bits

```
def extractImage(im):
  newImage = im.convert("RGB")
  data = newImage.getdata()
  pic = Image.new(im.mode,im.size,None)

  ndata = [(r%4*64, g%4*64, b%4*64)
           for (r,g,b) in data]

  pic.putdata(ndata)
  return pic
```

Future work

- Oversee pilot courses, analyze the outcomes of the pilots, prepare for next, larger pilot
- Gain consensus on claims and evidence (from 500+ to ~128)
- Develop prototype exam questions
- Gather support for next phase of project