University of Illinois at Chicago
Department of Computer Science

CS 0.5 with Media Computation

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Two different parts

- Splitting incoming majors into different tracks: CS 0.5
- What is taught in one track: mild variation on Guzdial's Media Computation in Python

Problems in Computer Science

- High Attrition Rate at Freshman and Sophomore level
  - 19% National Average
  - As high as 66%
  - 30%-40% at UIC
  - Worse for Female Students

- Not attracting students into the Program

Reasons for High Attrition

- “The traditional approach to CS1 has been found to discourage many prospective computing majors”
- Introductory CS often fail to engage students
- Class are described as
  - too boring
  - overly technical
  - lack creativity

Reasons for High Attrition

- Students have wide variations in background and experiences
  - Slower pace bores those with Greater Experience. Students lose interest!
  - Faster pace loses those with Lesser Experience. Students feel incompetent!

Our Solution

- Divide and Instruct
- Divide Incoming students into two groups
  - Those with greater experience
  - Those with lesser experience
- Use placement exam to determine experience level

Placement Exam

- Focus on Semantics not Syntax
  - Language Independent
- Write code showing some minimal knowledge of:
  - Variables
  - Arrays
  - If Statements
  - Loops
  - Basic Function Calls

Division of Students

- Students not taking or not passing the placement exam follow normal route of CS 0.5 course followed by an aggressive CS 1 course
  - CS 0.5 is not “remedial” but “normal”
- Students passing placement exam are
  - advanced into the aggressive CS 1 course
  - receive credit for our CS 0.5 course
  - “Free” credit motivates the students

Jargon: CS 1, CS 0, etc.

- CS 1: First course for CS majors, programming in Java in >50% of U.S. schools today.
- CS 0: Survey of computer science topics, may or may not include a drop of programming (Javascript, VB); typically for non-majors.
- CS 0.5: My term for home for 1/2 of incoming CS majors

Curriculum of CS 0.5 at UIC

- Based on Mark Guzdial's Media Computation course from GA Tech
- Engage them with Pictures, Sound and Movie manipulation
- Programming in Python with special IDE and add-ons for novice media programmers; programming important but not entire course

Making Emma a redhead

```
def turnRed():
  brown = makeColor(48,20,17)
  file = "/Users/sloan/MediaSources/emma.jpg"
  picture = makePicture(file)
  for px in getPixels(picture):
    color = getColor(px)
    if distance(color,brown) < 25.0:
      redness = getRed(px)*1.5
      setRed(px,redness)
  show(picture)
  return(picture)
```

Original

Posterizing: Reducing range of colors

How do we compare algorithms?

- There's more than one way to sample.
  - How do we compare algorithms to say that one is faster than another?
- Computer scientists use something called *Big-O notation*
  - It's the *order of magnitude* of the algorithm
  - The goal is to describe what happens to the *running time* of the algorithm as the *size of the input grows*
- Big-O notation tries to ignore differences between languages, even between compiled vs. interpreted, and focus on the number of *steps* to be executed.

Advantages of Python

- Fun, relatively easy language
- Not terribly Java-like, so not overlapping with Java students will learn later
- Easy to do Internet things, like downloading web pages, and string things, like writing web pages

Preliminary Results

Our CS 0.5	Enrollment	Success Rate
Old: Fall 02	61	74.8%
Old: Spring 03	38	76.7%
Old: Fall 03	51	68.6%
Old: Spring 04	22	82.9%
Old: Fall 04	15	93.3%
Average “Old”	37	75.9%
New: Spring 05	18	94.4%

Absolute latest results

OLD Average Success Rate (ABC)	76%
NEW Average Success Rate (ABC); 2 semesters of data	**91%**

A bit about the course

- Tweaked version of Guzdial Media Comp course for Georgia Tech non-majors
- Mildly slower pace
- A bit more drill on easiest programming fundamentals
- Our tweaked version is available on our website, of course: http://wiki.cs.uic.edu:8080/CS101