The Beauty and Joy of Computing

UC Berkeley: VIS 50 Lecture 50
San Diego
CODRE ORG HOPES TO GROW CS EDUCATION
A new non-profit foundation is dedicated to growing computer programming education. Their goals are to spread the word that there's a worldwide shortage of talent, and list all available courses!

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Programming Paradigms Lecture

- What are they?
  - Most are Hybrids!
- The Four Primary ones
  - Functional
  - Imperative
  - Object-Oriented
  - OOP Example: SketchPad
- Declarative
- Turing Completeness
- Summary

Of 4 paradigms, how many can BYOB be?

- 1 (functional)
- 1 (not functional)
- 2
- 3
- 4

Most Languages Are Hybrids!

- This makes it hard to teach to students, because most languages have facets of several paradigms!
  - Called "Ninho-paradigm" languages
  - Scratch too!
- It's like giving someone a juice drink with many fruit in it and asking to taste just one fruit!

Object-Oriented Programming (OOP)

- Objects are data structures
  - With methods, you ask of them. 
  - Class is an object.
  - Inheritance saves code
- Hierarchical Classes
  - E.g., parent special case of musician, a special case of performer
- Examples (the not pure)
  - Java, C++

OOP Example: SketchPad

- Dr. Ivan Sutherland
  - "Father of Computer Graphics"
  - 1968 Turing Award (Thaddeus Price) for CS
  - Wrote Sketchpad for his foundational work in UI/UX design
  - The most impressive software ever written
  - Fast
    - Object-oriented system
    - Graphical user interface
    - Non-procedural language

functional programming

- Computation is the evaluation of functions
  - Plugging pipes together
  - Each pipe, or function, has exactly 1 output
  - Functions can be input!
- Features
  - No state
  - E.g., variable assignments
  - No-mutation
  - E.g., changing variable values
  - No side effects
  - Examples (the not pure)
    - Scheme, Scratch BYOB

en.wikipedia.org/wiki/Imperative_programming

en.wikipedia.org/wiki/Object-oriented_programming

en.wikipedia.org/wiki/Functional_programming

en.wikipedia.org/wiki/Programming_paradigm

en.wikipedia.org/wiki/Sketchpad

en.wikipedia.org/wiki/Object-oriented_programming

en.wikipedia.org/wiki/Imperative_programming

Of 4 paradigms, what's the most powerful?

- Functional
- Imperative
- OOP
- Declarative

- All equally powerful