CS1001

Lecture 27

Overview

- Summary
- Final Exam Review

Reading

- Read thoroughly:
  - Chapters 10, 11 (esp 11.2/11.3, 10.3)
  - All Logic Handouts
  - 5.1 – 5.5 (on programming)
  - Chapter 3 (networking
  - Chapter 6 (less thoroughly)
- Be familiar with
  - Chapter 2, Chapter 9, Semantic Web, Web Design

Other Material

- Slides: History, links
- Concentrate on second half of the course
- There will be one algorithm described using Java. You will need to read the algorithm and determine what it is doing. This will be much less technical than the Java questions in the past exam

Review

- These slides are your guide
- The TAs will review further (as of now, during office hours)
- Possibly an additional session next week

Evaluations

- Fill out your course evaluations online!
- Very different curriculum than past years – it needs refinement
- This course should give you some basics of Computer Science on the non-technical front while giving you enough programming to take 1003 or 1007
- http://oracle.seas.columbia.edu

The Overview

- Try to pay particular attention to how the ideas in the course all influence each other
  - Example: Usability influences how we design software (user-centered design) which in turn influences programming languages we use

Core Areas

- Math/Theory/Logic
- Artificial Intelligence
- Database Systems
- Networks
- Design, Modeling
- Computer Architecture, Transistors
- History

Questions

- History
  - Know the contributions of the historical characters in the slides. You may be asked to compare the work of two of them. Stick to Babbage and later
- Architecture
  - Concentrate on how modern electronics might limit progress in terms of speed

Questions

- Networking
  - Be familiar with protocols and be prepared to evaluate a communication method between two parties
  - For example "Say Alice and Bob want to communicate yes/no responses…" be prepared to evaluate a sample communication protocol

Questions

- Design/Modeling
  - Be prepared to evaluate a sample interface. Think critically about the potential users
  - Be prepared to critique a model or flowchart of a given problem
  - Be prepared to think about how a study might be flawed due to human psychological factors

Questions

- Java
  - Describe what a program does given a Java code sample
- Theory
  - Natural deduction: like Homework (rules will be provided)
  - Halting problem: try to understand this proof!
  - Non-deterministic (uncomputable or paradoxical) versus non-deterministic in polynomial time

Questions

- Artificial Intelligence
  - Describe and algorithm to accomplish an AI task (similar to midterm, but your instruction set will be more flexible and "high-level")
  - Semantic networks (as in the homework)
- Databases
  - Centralization/Decentralization
  - Data mining, statistical trend finding

A Timeline

- (500 BCE – 500AD) Math is a branch of philosophy; Logic is philosophy. Paradox is identified, but math (geometry) is considered perfect and rational. Pi, irrational numbers are troubling but not seen as serious problems
- (500AD – 1600's) Philosophy and Mathematical logic mingle to form theories of rhetoric. Theories of structured discourse developed

A Timeline

- (Renaissance, Baroque… until 1600's) Geometry (Math), Logic, Public Speaking, Poetry, Painting, Sculpture, Music all unified under the guise of creating perfect and rational forms of human expression. This ordered expression is seen as a divine gift (the unordered is seen as undesirable)

A Timeline

- Formal study of rhetoric incorporated into many theories of art. J.S. Bach, likens non-perfect intervals (those with irrational ratios) to “devilish hubub”
- Newtonian Mechanics allows precise prediction of the physical world
- Overarching Theme: Divine influence creates order. Creativity is divine influence using a human being as a vessel

A Timeline

- The classical period (1700's) starts to shift the creative drive away from divine influence and instead to enlightened individuals
- A time of empowerment for humans – more control over their own destines (Protestantism, etc)
- Math forks from philosophy to become a tool for human advancement

A Timeline

- The romantic period (late 1700's early 1800's) forks creativity (and along with it art, music, etc) from philosophy and mathematics. Raw, uncontrollable emotion becomes the focus of creativity
- Mathematics becomes increasingly complex as physical discoveries call for increased use
- Philosophy and Rhetoric fall back to more academic interests

A Timeline

- Romantic/Victorian periods see the rise of mechanics into the 1900's. Industry/production champions human innovation
- Art switches from the emotional to the fantastic – new sounds, visions, etc are created to celebrate human innovation

A Timeline

- 1920's, 30's, 40's – Turmoil
- Schrodinger, Einstein, Heisenberg discover serious problems our reasoning of the physical world
- Goedel discovers serious problems in mathematical reasoning
- World wars fueled by (among many things) religious conflict and technological uncertainty

A Timeline

- We are now just recovering from enormous scientific uncertainty in the early/mid 20th century. Electronics has fueled enormous progress in conquering practical problems, but theory has moved more slowly
- Digital computers have allowed us to *optimize* and solve problems very quickly, but they are just fast versions of the mechanical devices a century ago

A Timeline

- This weakness was brought out by the hunt for Artificial Intelligence. As should be expected, this is still a formidable problem
- AI is being solved by statistical methods
- Problems in computability now being addressed by *the very same* physical phenomena that caused the breakdown in physics – Quantum Mechanics. Quantum computing holds promise in efficiently solving some of the most complex problems known

Thank You