



CS1001

Lecture 20

Overview

- Projects
- More on Cantor's Proofs
- Predicate Logic

Goals

- Learn some predicate logic

Assignments

- Brookshear: Chapter 11
 - <http://www.earlham.edu/~peters/writing/infapp.htm>
- Read linked documents on these slides (slides will be posted in courseworks)

Projects

- Technical Project
 - An implementation or investigation into technical subject matter. Expect to spend at least 15 Hours on this.
 - Grade will be based on how thoroughly you combine concepts that have been used throughout this course in selecting and designing your project

Technical Project Examples

- Robocode: A more complex robot. If you choose this, discuss why your implementation is effective. Do some brief reading in the AI section of the book and comment on what type of AI you are using
- Programming: Choose a logic problem (see me if you want examples) and write a program to solve it. Discuss efficiency.
- Web Design/Usability: Design a site and discuss its goals and usability. Why does your design match the application for which it was intended?
- Object Modeling: Model a problem using object oriented design methodologies
- Networks: Examine a problem (or invent one) and discuss various network protocol options
- Architecture: Investigate and compare some modern machine architectures
- Semiconductors: Summarize the newest methods for creating semiconductors

Final Paper

- The final paper is similar in scope to the technical project, but it can be an elaboration on the social consequences of technology. It can also discuss a theoretical concept in additional depth.
- The topic can be tied to your technical project if you like
- Should run 5-7 pages double spaced

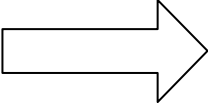
Deadlines

- Email (or submit in class) a brief description of your idea by next Wednesday (April 14th) for *both* your tech project and paper
- Do not worry if it is rough; I will provide comments

Diagonalization

- <http://www.earlham.edu/~peters/writing/infapp.htm>

Propositional Logic

- Information definition: a **proposition** is a statement of **fact**
 - “It is raining” (english)  Raining
- Connectives: operators on propositions
 - And, or, not, implies, if and only if

$\wedge, \vee, \neg, \rightarrow, \leftrightarrow$

Theories

- A **Theory** in propositional logic is a set of constants, functions, relations and axioms.
- Example: (theory of ordered integers)
 - Constants: non-negative integers
 - Function: +, Relation: <
 - Axioms:
 - $\neg(x < x)$
 - $0 < x \rightarrow y < x + y$
 - $(x < y) \rightarrow \neg(y < x)$

Smullyan (Raymond)

On 1 April 1925, I was sick in bed ... In the morning my brother Emile (ten years my senior) came into my bedroom and said: "Well, Raymond, today is April Fool's Day, and I will fool you as you have never been fooled before!" I waited all day for him to fool me, but he didn't.

- Emile had fooled him by not fooling him!
Smullyan writes [1]:-

I recall lying in bed long after the lights were turned out wondering whether or not I had really been fooled.

A Puzzle Introduction (Smullyan)

- There are two casket makers, Bellini and Cellini
 - All Bellini caskets have *true* inscriptions
 - All Cellini caskets have *false* inscriptions

A Puzzle (Smullyan)

A certain Florentine Nobleman gave very lavish entertainments, the high point of which was a game in which the prize was a valuable jewel. This nobleman knew the story of the caskets and designed his game accordingly. He had three caskets, Gold, Silver, and Lead, and inside one of them was the jewel. He explained to his company that each casket was made either by Bellini or Cellini (not any of their sons). The first person who could guess which casket contained the jewel, and who could prove his guess correct, would be awarded the jewel. Here are the inscriptions:

If the jewel is in the silver casket, then the silver casket was fashioned by Bellini

GOLD

If the Jewel is in this casket, then the gold casket was fashioned by Cellini

SILVER

The casket which really contains the jewel was fashioned by Cellini

LEAD

(5 pt.) Which casket contains the jewel? Please explain your answer.

Paradox?

- Can this be solved?
- If so, how?
 - Formulate the problem as a logic problem and evaluate the expressions
 - If you can derive both “truth” and “falsehood” from one single assumption, you’ve found a paradox