CS 246 - Logic and Computation **Fall 2016**

Lecture 1: September 1, 2016

Lecturer: Kevin Lanctot *Notes By: Harsh Mistry*

1.1 Administrative Information

Lecturer : **Kevin Lanctot**
Office : **DC 2131**
Office Hours : **Monday 1:00pm - 2:00pm**
Assignments : **Due on Wednesdays**

1.2 Discussion Topics

1.2.1 What are we doing?

Humans vs Computers

- What areas do computers out perform humans?
  - Repeated, Complicated tasks
  - Precision Tasks
  - Predictability
  - Speed of completion
  - Making Unbiased decisions
  - Retaining accurate memory.
  - Concentrating
- What areas do humans out perform computers?
  - Problem Solving
  - Learning New Concepts
  - Extrapolation
  - Creating unique creations
  - Judgement
  - Pattern Recognition
  - Emotions
  - Vague instructions

1.2.2 Computer Programming and Mathematics

How is computer programming related to mathematics?

- Both have logical sequence of steps
- Both consist of multiple different solutions
- Both consist of elegant solutions
- Given a input, both return an output.
- Both can be robust and limited

1.2.3 Problem Solving

- Breakdown problem into smaller pieces
- Read the problem carefully
- Focus
- Relate to known problems
- Brainstorm
- Try a different approach
- Try simpler versions of the problem
- Take a break
- Solve special cases

1.3 Course Description

As noted on Kevin's Slides

Propositional and predicate logic. Soundness and completeness and their implications. Unprovability of formulae in certain systems. Undecidability of problems in computation, including the halting problem. Reasoning about programs. Correctness proofs for both recursive and iterative program constructions

Consider the C co de for selection sort on the next slide. C has

- Logic Operators : & & , || , !
- Control Structures: if, else, for, while, do ... while

Typically functions would have preconditions and postconditions (or a contract) to specify behaviour

1.4 Chapter 1 : Proportional Logic

1.4.1 Logic: What and Why

As noted on Kevin's Slides

Logic is the systematic study of the principles of reasoning and inference. We use logic throughout computer science,

- To model the computer hardware, software and embedded systems we create or encounter, in order to reason about those objects in a mathematically precise and rigorous manner.
- To understand how to develop systems that can themselves apply reason and make inferences ("artificial intelligence").

Historically, logic and CS are closely linked.

- To define and build a "computer" required deep ideas from logic.
- Computer science gave the first real defnition of "rigorous argument" : an argument that may be checked by a machine.

1.4.2 The Essential Argument

- If p and not q, then r. Not r. p. Therefore q.

1.4.3 What is Logic?

In the essential argument

- The factual content of the statements doesn't matter.
- The relationships among the statements govern the argument.

Logic concerns careful reasoning about the process of reasoning.

So we need to know

- What, exactly, constitutes a "statement"?
- What, precisely, do the logical relationships mean?

End of Lecture Notes
Notes by : Harsh Mistry