CPSC 121: Models of Computation

Unit 0
Introduction

George Tsiknis
Based on slides by Patrice Belleville and Steve Wolfman

Introductions

- Instructor: George Tsiknis

  Office: ICICS 307
  Email: tsiknis@cs.ubc.ca
  Office Hours: TBA on course web site

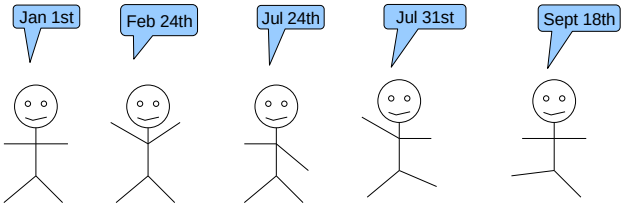
- TAs : See course site.

Learning Goals

- By the end of this unit, you should be able to:
  - Give an example of how we can apply formal reasoning to a simple, real-world task.
  - Give an example of how a computational solution to this simple task might go wrong.
  - Describe the four “big questions” which we will address in CPSC 121.

Activity

- Find an algorithm to order students by birthday.



Problem

- How many swaps did you need to make?

Question

What is the maximum number of swaps we may make to order 4 people by their birthday?

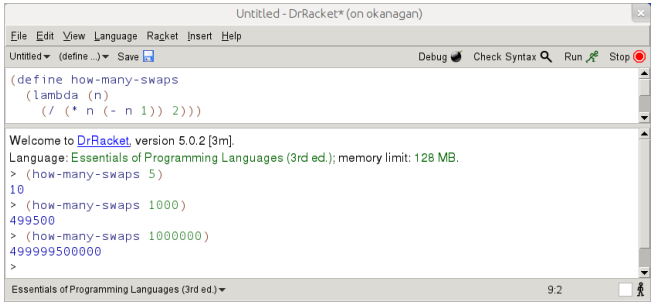
a. 3
b. 4
c. 6
d. 12
e. None of these

How many swaps?

- For 1 person?
- For 2 people?
- For 3 people?
- For 4 people?
- For 5 people?
- …
- For **n** people?

Computing Swaps with DrRacket

- Computing n(n-1)/2 using DrRacket:



Computing Swaps in Java

- Computing n(n-1)/2 using Java:

```
import java.io.*;

public class Compute
{
    public static void main(String[] args)
    {
        int n = Integer.parseInt(args[0]);
        System.out.println(n * (n-1) / 2);
    }
}
```

```
poirot> java Compute 5
10

poirot> java Compute 1000
499500

poirot> java Compute 1000000
-364189984
```


Questions Answered in CPSC 121:

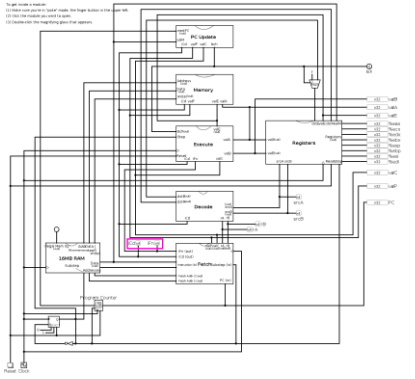
- How can we prove that n(n-1)/2 is the largest number of swaps needed for n birthdays?
  - Can use the method of *Mathematical Induction*
- Why did our Java implementation print a negative value, but not the Racket implementation?
  - Use different *Number Representation*

? CPSC 121: The BIG questions: ?

1. How can we convince ourselves that an algorithm does what it's supposed to do?
2. How do we determine whether or not one algorithm is better than another one?
3. How does the computer (e.g. Dr. Racket) decide if the characters of your program represent a name, a number, or something else? How does it figure out if you have mismatched " " or ( )?
4. How can we build a computer that is able to execute a user-defined program?

Our Working Computer

- A working computer you will learn about in the labs:



Course Learning Outcomes

- After you complete the course, you will be able to:
  - model important problems so that it is easier to discuss, reason about, solve, and test them.
  - learn new modeling formalisms more easily.
  - communicate clearly and unambiguously with other CS experts on complex topics.
  - characterize algorithms (CS problem solutions), by proving their correctness or efficiency.
  - critically read proofs: justifying why each step is correct and judging what the proof means.
  - explain how computers work.

Course Administration

- Explore the CPSC 121 website: http://www.ugrad.cs.ubc.ca/~cs121/current/
  - You are ***required*** to be familiar with the course website.
- Read carefully the ***Course Info*** section on the course web site.
- Check the Connect site for the course for Pre-class Quizzes & Marks:
  - http://www.connect.ubc.ca
- Check the Piazza site for the course discussion board https://piazza.com/ubc.ca/winterterm12014/cpsc121/home
  - **Check announcements very often**

Course Activities and Grading

- Your final grade will be computed as following:
  - Assignments (5) 14%
  - Labs (9) 14%
  - Pre-class Quizzes (~12) 5%
  - Clicker Questions 3%
  - Midterm #1 12%
  - Midterm #2 12%
  - Final Exam 40%
- To pass the course, you must obtain at least 50% on the final exam, and at least 50% on your combined lab and assignment marks.

Labs and Tutorials

- Labs
  - Start on Monday September 8th.
  - Usually have a pre-lab and in-lab work
    - Pre-lab work must be done **before** you get to the lab.
    - In-lab work must be completed during the lab time, so the TAs will be able to mark it.
  - You **must** attend the lab you are registered for.
- Tutorials
  - Start on Monday September 8th.
  - You will work in small groups on problems suggested by the TA.
  - Try to attend the tutorial you are registered for.
  - In first tutorial you may take the *concept inventory pre-test* for participation credit (0.5 % ; you'll get another 0.5% when you complete a similar test at the end of the course).

Assignments, Quizzes and Exams

- Assignments
  - Problems that exercise the material discussed in the lectures.
  - We encourage you to do them in groups of two.
- Pre-Class Reading and Quizzes
  - To facilitate your learning we assign reading from the text followed by a related quiz before certain lectures.
  - Usually one quiz every week, due at 7:00pm before the lecture day.
- There will be 2 midterms:
  - Tuesday **October 14th**, 2014, from 17:30 to 19:00, and
  - Monday **November 10th**, 2014, from 17:30 to 19:00.
- The final exam will be scheduled by UBC in December.

Pre-Class Learning Goals for Next Lecture

By the start of next class, you should be able to:

- Translate back and forth between simple natural language statements and propositional logic.
- Evaluate the truth of propositional logic statements using truth tables.
- Translate back and forth between propositional logic statements and circuits that assess the truth of those statements.

First Quiz

- The first online quiz is due**: Monday, Sept 8, at 7:00pm.**
- Sections to read for the quiz:
  - Epp, 4th edition: 2.1 and 2.4.
  - Epp, 3rd edition: 1.1 and 1.4
  - Rosen, 6th edition: 1.1 up to the top of page 6, and 11.3.

Second Quiz

- Second online quiz is due on **WEDNESDAY, SEPT 10, 7:00pm**.
- Assigned reading for the quiz:
  - Epp, 4th edition: 2.2
  - Epp, 3rd edition: 1.2
  - Rosen, 6th edition: 1.1 from page 6 onwards.