CENTER FOR TEXTUAL STUDIES AND
DIGITAL HUMANITIES

DIGH 401 - Introduction to Computing

Fall Semester 2014

Week 3

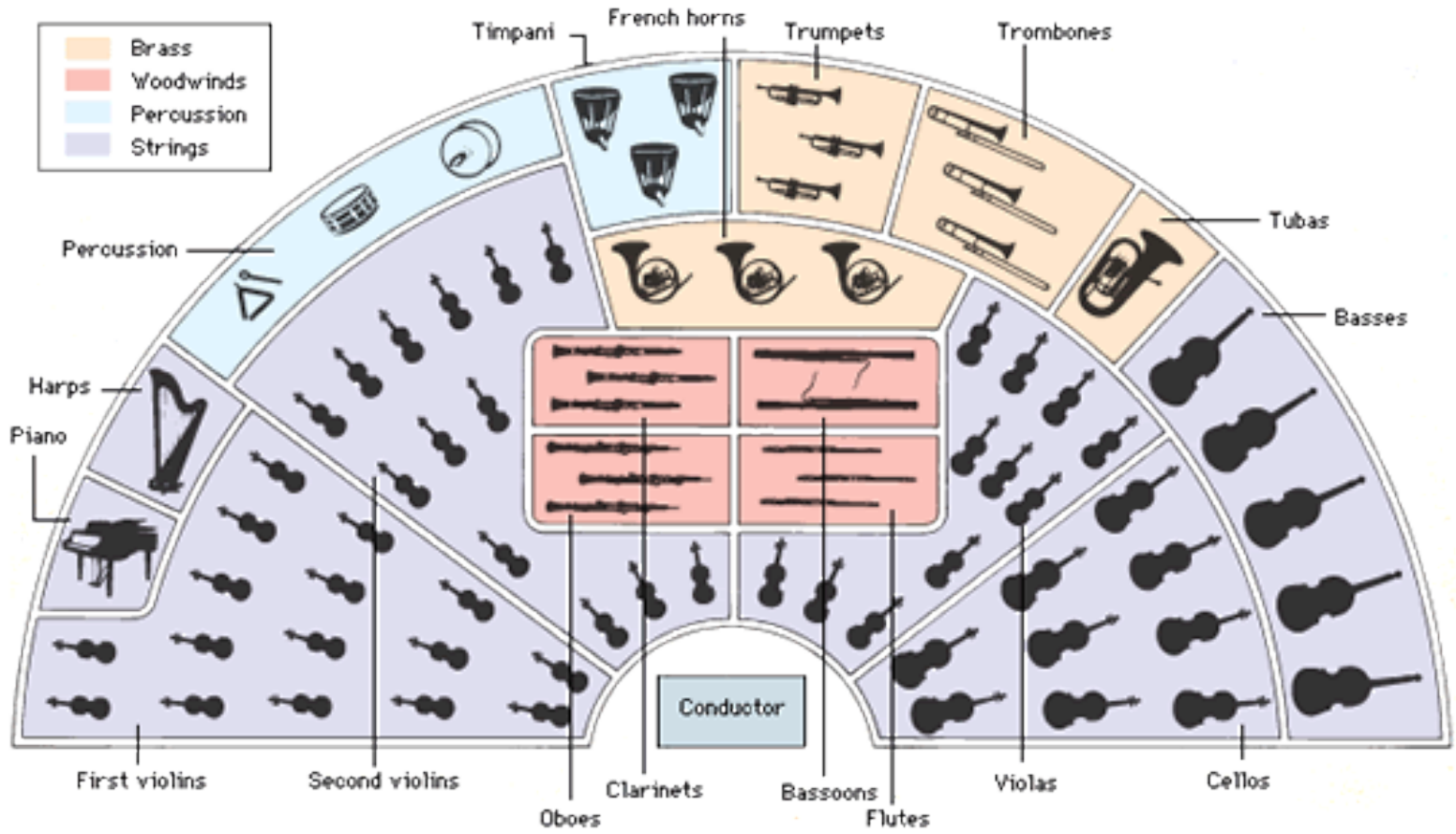
Today's Class

- Last week’s exercise

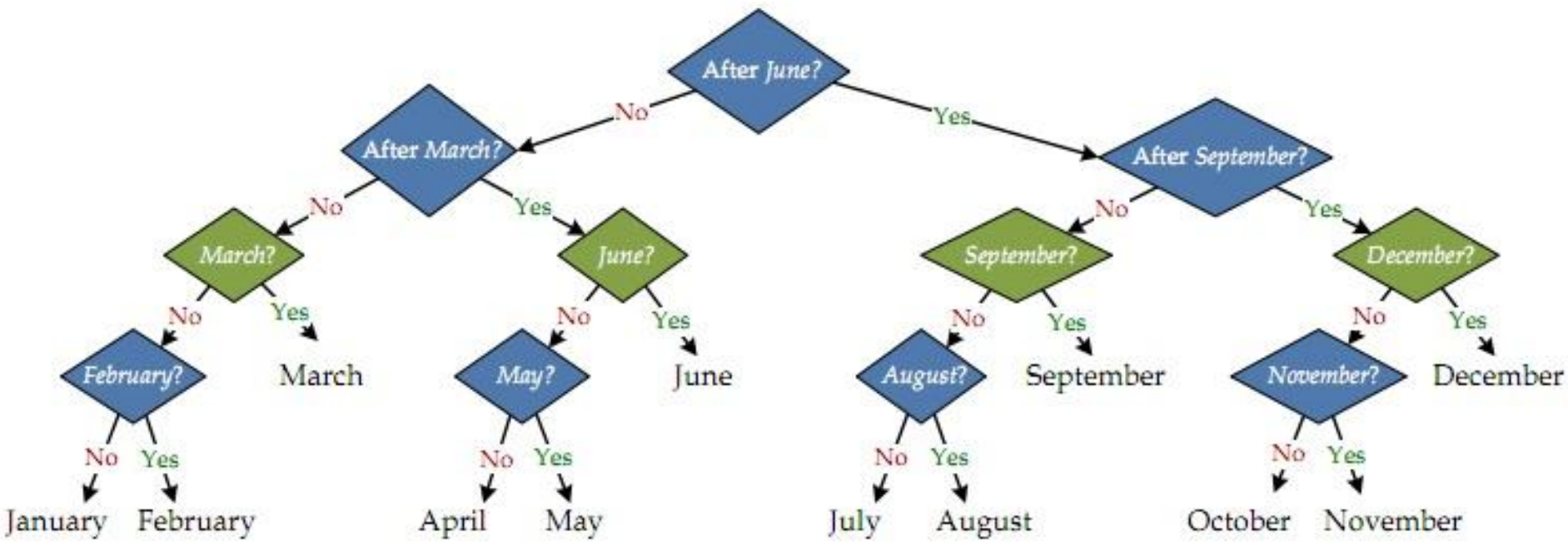
- Alternative methods for writing programs
    - with no discernible plan (spaghetti programming)
    - planning ahead (structured programming)
    - organising a program (Object Oriented programming)

Class Exercise

conceptual algorithm and binary tree to calculate the chosen instrument of a musician in an orchestra



Sections of an orchestra
(shamelessly pilfered from a search of Google Images)


After June?
No
Yes
After March?
After September?
No
Yes
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March?
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December?
No
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February?
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January
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July
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October
November

Alternative methods for writing programs

Spaghetti programming - no real plan

- code first, ask questions later
- modification increases the requirement for ease of understanding
- take care how and where you modify code
- no structure = mess of code
- large number of collaborators compounds this problem

Alternative methods for writing programs

Spaghetti programming - GOTO command

- BASIC programming language most closely associated with Spaghetti programming
- GOTO commands told the computer to 'go to' another part of the program
- the code jumps from one part to another

Alternative methods for writing programs

Spaghetti programming - GOTO command

```
10 GOTO 50
20 PRINT "THIS LINE PRINTS SECOND"
30 END
40 GOTO 20
50 PRINT "THIS LINE PRINTS FIRST"
60 GOTO 40
```

- the code becomes increasingly hard to read, modify, and understand

Alternative methods for writing programs

Structured programming - planning ahead

- keep a program organised from the start

- teaches programmers that a program can be divided into 3 distinct parts

  - SEQUENCES
  - BRANCHES
  - LOOPS

Alternative methods for writing programs

A PHP loop example:

```
for ($x=1; $x<=5; $x++)
{
    echo ‘X = ’.$x.’<br>’;
}
```

DVD playback options for a movie using a

- sequence
- branch
- loop

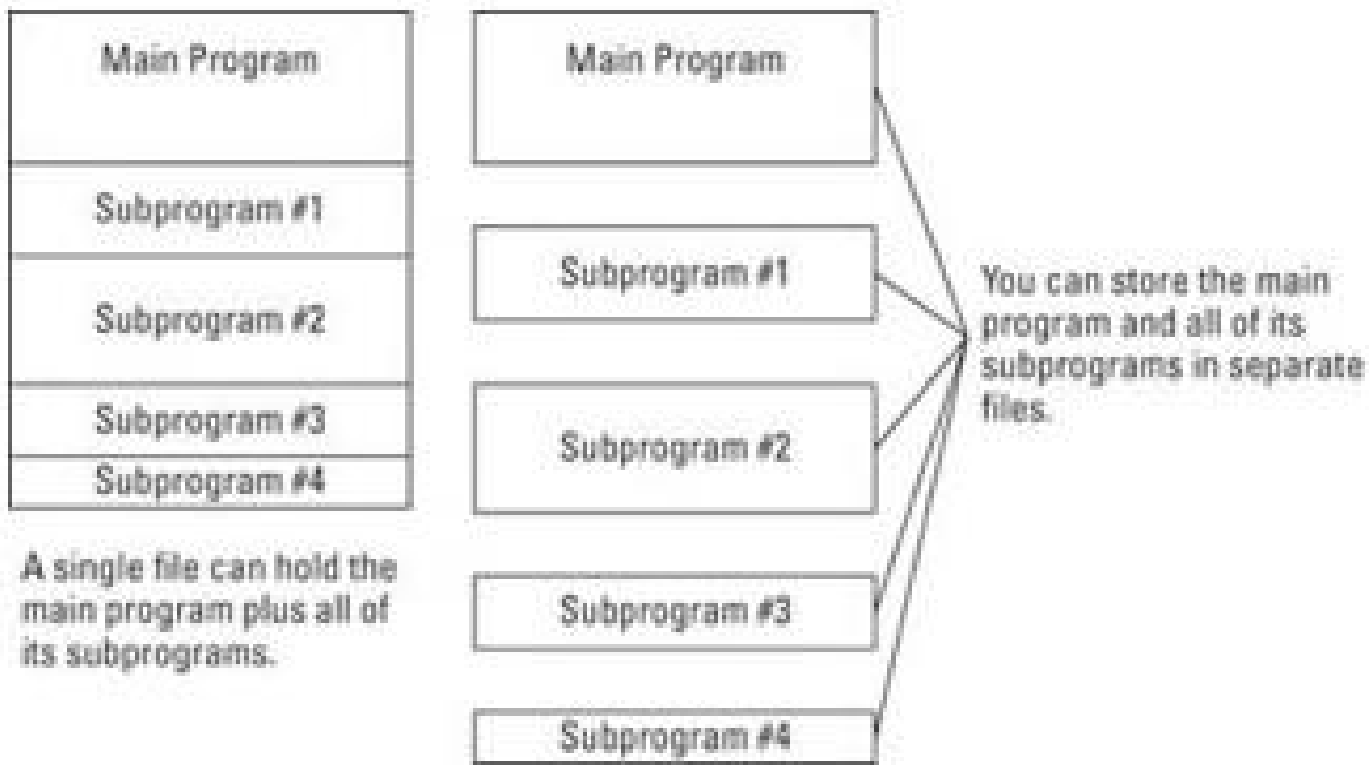
Alternative methods for writing programs

Top-down programming

- dividing a large program into smaller parts
    - easier to manage
    - each part performs a specific task
- identify main (top) task for the program to solve
- identify smaller sub-programs within the larger program
- smaller modules building the larger whole
- larger program consisting of many subprograms
- store subprograms in either
    - one file
    - separate, multiple files (this is often the preferred option)

Alternative methods for writing programs

Top-down programming



Alternative methods for writing programs

Object-Oriented Programming

- Java is an Object-Oriented Programming (OOP) language
- another technique for dividing large programs into manageable parts
- solves two obvious issues with structured programming
    - reusability
    - modelling
- reusability in OOP with objects

Alternative methods for writing programs

The issue of landing a spaceship on the moon!

NASA orbiter error

Alternative methods for writing programs

Object-Oriented Programming - Objects and division

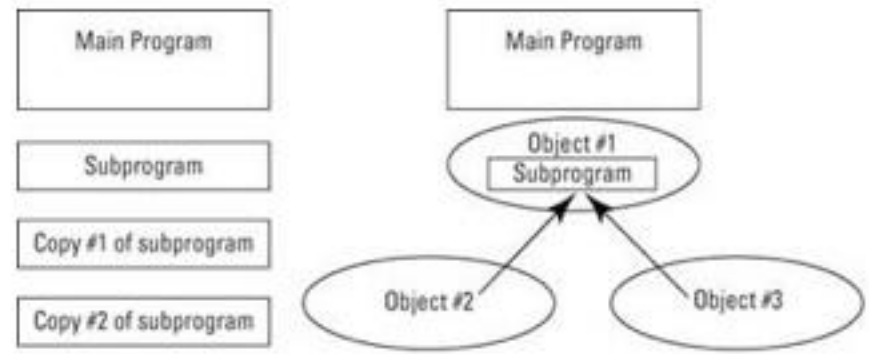
- OOP avoids this issue by issuing objects
- objects combine data and the commands that manipulate them
- OOP divides a large program into real life objects

Think about landing on the moon using an OOP design.

Alternative methods for writing programs

Object-Oriented Programming - Objects and modifications

- objects simplify modification
- objects also permit code reusability
- more efficient and easier than sharing sub-programs
- sub-programs can compound errors
- inheritance in OOP
- OOP never physically copies a sub-program but 'points to' or 'inherits'



Copying a subprogram creates multiple copies of that subprogram.

Instead of making copies of a subprogram, objects "inherit" a subprogram. This leaves a single copy of a subprogram that can be used in multiple objects.

Alternative methods for writing programs

Object-Oriented Programming

- makes programs easier to write
- easier to understand
- easier to modify
- these advantages allow a programmer to focus more on solving problems