Coding Guidelines

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http://research.tamhsc.edu/pinformatics/

http://pinformatics.web.unc.edu/

Course URL:

http://pinformatics.tamhsc.edu/phpm672

Assignment 1

- No data
- Yes readme.txt

What we are going to learn

- Big Picture
- How to avoid code confusion and associated programming errors.
- Common pitfalls.
- Programming Style Guidelines.
- Basic ideas behind good programming methodologies and good programming etiquette.

Why are your programming habits SO IMPORTANT?

- We'll talk about this over and over, so this is just a first assault!
- Programming done poorly is almost worthless:
  - You won't be able to understand what you programmed just last week,
  - Others won't be able to understand what you tried to accomplish,
  - And neither you nor anyone else can FIX your bad code. So ……
  - The time to develop good habits is NOW!

Outlining and Sentence Diagrams

- Remember when your English teacher…(Here it comes- this is one of those “when I was younger lectures…!”)
- So, here are my notes for what I want to tell you:
  - Planning is important…to?
    - You and the people you interact with!
  - Planning saves time…why?
    - Outcomes trump effort
  - Planning is not easy…why?
    - Requires crystal clear thinking (computers only know 0/1)
    - Requires re-thinking
    - Sometimes requires throwing stuff away!
  - Planning can be irritating
    - Not making progress!

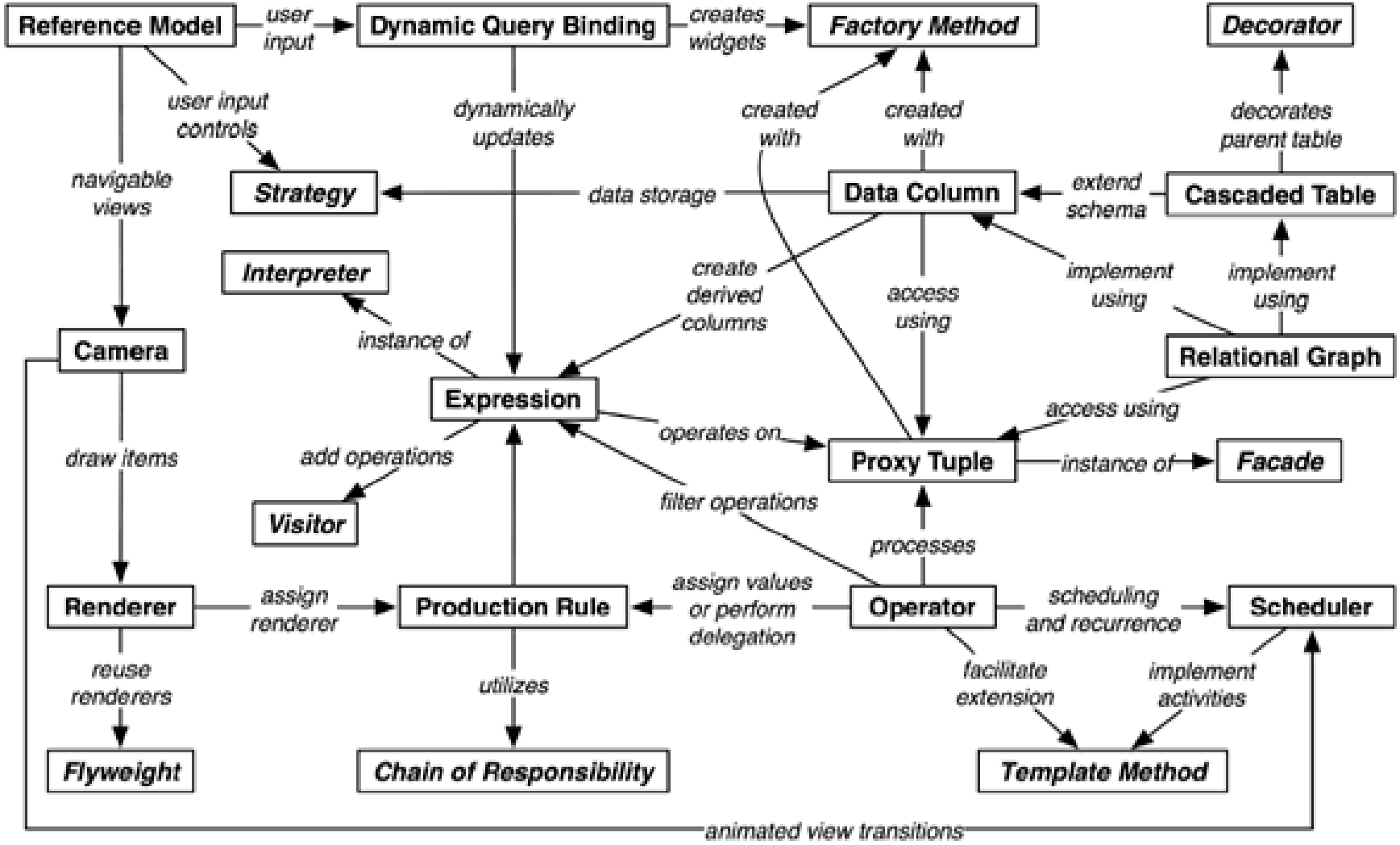
What does this (planning) mean vis a vis programming?

- Think “top-down”
  - Design the program before you code.
  - Break the problem down into small steps
  1. State the problem clearly.
  2. Define the inputs and outputs
  3. Describe the algorithm:
     - Psuedocode, flow charts, or even **comments**!
  4. Translate the steps to SAS code
  5. TEST EACH STEP on a small version

Cool web sites

- Many
  - Wikipedia
  - Google or Bing:
    - Programming practices
    - Software design
    - Software design tutorials
- Also see: "*Design Patterns: Elements of Reusable Object-Oriented Software*" by Gamma, Helm, Johnson, and Vlissides.
- If you are really interested, I recommend taking programming 101 in computer science
  - undergraduate class
  - many online courses
  - Sometimes class for non-majors

Software Design Techniques



Software Design Patterns for Information Visualization
Jeffrey Heer, Maneesh Agrawala
IEEE Transactions on Visualization and Computer Graphics (TVCG), 12(5). Sep/Oct 2006.
PDF (2.0M)

Now, let's discuss some of the more mundane, but essential, aspects of good programming

Pitfalls, variable names

- Properly formed variable names are
  - Easy to read and meaningful
    - xyr versus dblXYCoordinateRatio
  - Adhere to a naming convention
    - For example ‘int’ prefix for integer variables.
  - Begin with a letter and can contain letters, numbers and ‘_’. In particular, no spaces are allowed.

Pitfalls, operator precedence rules

- Make sure you know what has precedence

```
>> 1/2+3          >> 1/(2+3)
=    3.5000       =    0.2000
```

```
>> 2^2^3
   = 64
```

```
>> (2^2)^3
 = 64
```

```
>> 2^(2^3)
 = 256
```

>> x & y | z == (x & y) | z ? x & (y | z)

  - same sometimes not all the times
  - try x=F, y=F, z=T
  - Build a truth table

- When in doubt, use parentheses.
- TEST it out

Pitfalls, ordering of arguments

- Functions (see later lectures) may have many input arguments. Their order will matter, just as

a/b ~= b/a

Programming Etiquette

POPULATION
INFORMATICS
RESEARCH GROUP

Readable Programs

- **Whitespace**
  - Grouping
  - Indentation
    - to show control flow
- **Documentation**
  - Naming
  - Comments
- **Modular Code**
  - Break large blocks into smaller pieces
  - Use sub-routines or functions (more later)

Write programs for people first, computers second.
-- Steve McConnell

Will you be able to read and understand your own code six months from now?

Whitespace

Use **indentation** to show logical structure

Which script is more readable?

```
x = 3; if x < 3 then y = 3; else y = 5;
```

or

```
x = 3;
if x < 3 then y = 3;
else y = 5;
```

Documentation

Use meaningful names

Which is more readable?

```
xx = yyy( x );
xxx = PinkFlamingo( xx );
x4 = max(find(xxx)~=0);
floyd = x4.balance;
```

or

```
currID = CustomerID( custName );
currAccounts = BankAcct( currID );
mainAcct = max(find(currAccounts)~=0);
currBalance = mainAcct.balance;
```

Documentation

use **comments** to clarify meaning

- The first comment at the beginning of the script or function should describe what the script or function does.
- Approximately one comment per group of commands is about right.
- Avoid comments which just repeats what the associated code does.
- Use comments to document tricky code
- Use comments to give credits
- Did you see what google did on the csv file?

Google Flu

http://www.google.org/flutrends/us/data.txt

Google Flu Trends - United States
Copyright 2015 Google Inc.

Exported data may be used for any purpose, subject to the Google Terms of Service (http://www.google.com/accounts/TOS?hl=en_US). If you choose to use the data, please attribute it to Google as follows: "Data Source: Google Flu Trends (http://www.google.org/flutrends)".

Each week begins on the Sunday (Pacific Time) indicated for the row. Data for the current week will be updated each day until Saturday (Pacific Time). Note: To open these files in a spreadsheet application, we recommend you save each text file as a CSV spreadsheet. For more information, please visit http://www.google.org/flutrends

CSV FILE

Basics of Programming: SAS

- data step
  - Row at a time
- proc step
  - Full table
- Libname: directory location (folder)
- run; (missing last results)
- ; (I am done. Can be more than one line)
- log & lst (html): computer communicating back with you what happened
- http://support.sas.com/onlinedoc/913/docMainpage.jsp

Programming basics

Move to lab2 if 11:30

if earlier, go over assignment 1 (or next week)