



## CENTER FOR TEXTUAL STUDIES AND DIGITAL HUMANITIES

# Introduction to Digital Humanities Research & Computing

Fall Semester 2015

Week 11

## Final Presentation & Report

## Conceptual Design Specification

- use your outline for a conceptual project as the basis
- this project focuses on the conceptual implementation rather than using a proposal model
- think about how to plan the construction of the programming or output of the project
- choose a 'software engineering model' to help plan and outline your project

eg: you might choose to base the process on the waterfall model using the steps for analysis, design, implementation, and testing

- detail each step of your model for your project
- implementation and testing phases can be conceptual
- explain in an introduction or overview why you chose your particular software model
- models can also be used, such as flowcharts or UML

[EXAMPLE](#)

## XML Tests

Think about how you might encode the following information:

- a car
- a sports team / orchestra
- 2 Musical CDs including each song per album per CD (each album has 5 songs)

## Weekly Exercise 1 - Example Solution

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<vehicle>
  <car id="1" type="SUV" manufacturer="Ford">
    <model>Focus</model>
    <variant>Hatchback</variant>
    <doors>5</doors>
    <trim>Sport</trim>
    <colour>Black</colour>
    <year>2014</year>
    <fuel>Unleaded</fuel>
    <transmission>Manual</transmission>
    ...
  </car>
  <boat id="1" type="motor" manufacturer="Princess">
    ...
  </boat>
</vehicle>
```

## XML Viewing

- view without styling in a web browser, editor... - [DEMO](#)
- render with CSS by associating a stylesheet with a given XML file - [DEMO](#)
- transform the document using XSLT
- access, query and manipulate XML using Javascript
- parse XML and render using a language such as PHP
  - PHP & Javascript - [DEMO](#)

# PHP Programming basics

```
<?php
$total = 0;
$booster1 = 50;
$booster2 = 100;

function rocketThrust()
{
    global $total, $booster1, $booster2;
    $total = $booster1 + $booster2;
}

rocketThrust();
echo 'Rocket thrust is currently stable at ' . $total . ' newtons';
?>
```

## Part 1

Make the rocket thrust stable to 350 newtons

```
<?php
$total = 0;
$booster1 = 150;
$booster2 = 200;

function rocketThrust()
{
    global $total, $booster1, $booster2;
    $total = $booster1 + $booster2;
}

rocketThrust();
echo 'Rocket thrust is currently stable at '.$total.' newtons';
?>
```

[Example 1](#)



## Part 2

Add a third rocket booster, and again set thrust stable at 350 newtons

```
<?php
$total = 0;
$booster1 = 50;
$booster2 = 100;
$booster3 = 200;

function rocketThrust()
{
    global $total, $booster1, $booster2, $booster3;
    $total = $booster1 + $booster2 + $booster3;
}

rocketThrust();
echo 'Rocket thrust is currently stable at '.$total.' newtons';
?>
```

[Example 2](#)

## Manipulating Data - intro

- numbers, text, input
- mathematical operations such as addition, subtraction, multiplication...
- string operations such as replace, concatenate, re-order, diff...
- operators such as +, -, and \*
- functions are commands that perform more sophisticated calculations such as calculating the square root of a number

## Manipulating Data - assignment operator ( = )

- nothing more than an equal, =, sign

`$variableName = value;`

- value could be a fixed number, specific string, mathematical equation that calculates a single value...

## Manipulating Data - using arithmetic operators

+	addition	10 + 22.6
-	subtraction	22.6 - 10
*	multiplication	10 * 4
/	division	120 / 4
%	modulus	39 % 7
-	negation	- 2

## Manipulating Data - operator precedence

- normally plays a role in multiple calculations on the same value or variable
- how do we know the order a computer will complete calculations?
- group calculations together to ensure sequence of overall calculation
- bracket calculations to help isolate calculations

100, 75, 25

## Manipulating Data - Mathematics

### A few mathematics functions

- with basic mathematical operators you can create any type of complicated formula (quadratic equation, generating random numbers...)
- most programming languages include built-in mathematical functions
- functions are either built-in or available as separate libraries
- many advantages to the use of built-in mathematical functions
- mathematical functions remove the need to know how to write a function to calculate the square root, for example

## Manipulating Data - Mathematics

### A few PHP Mathematics functions - rocket thrust exercise!

- abs() finds the absolute value of a number
- round() rounds a number to the nearest integer
- ceil() rounds a number upwards to the nearest integer
- floor() rounds a number downwards to the nearest integer
- min() returns the smaller of the two arguments passed
- max () returns the larger of the two arguments passed
- rand(min, max) simply returns a random integer

- [Example](#)

Further information: [PHP Mathematics functions](#)

```
<?php
echo '<p>'.rand().'</p>';

echo '<p>'.rand(1, 49).'</p>';

?>
```

## Manipulating Data - Mathematics

```
<?php
$total = 0;
$booster1 = 50;
$booster2 = 100;
$booster3 = rand();

echo '<p>Original Total = '.$total.'</p>';

function rocketThrust()
{
    global $total, $booster1, $booster2, $booster3;
    $total = $booster1 + $booster2 + $booster3;
}

rocketThrust();
echo '<p>Rocket thrust is currently stable at '.$total.' newtons</p>';
?>
```

[- rocketThrust Random Example](#)



## Manipulating Data - Working with Strings

- many programming languages include built-in string functions such as
  - counting the number of characters in a string
  - removing characters from a string
  - comparing strings
  - splitting strings...

Common functions can include options such as

`length(x)` = counts the number of characters in a string (x) including spaces

`trim(x,y)` = removes characters from a string

`index(x,y)` = returns the position of a string within another string

`compare(x,y)` = compares two strings to see where they differ

`replace(x,y,z)` = replace one string with another string within a main string

## Manipulating Data - Working with Strings

### PHP - some common functions

- strlen() finds the character length of a string  
strlen("DIGH 401");
- strpos() searches for a given character, word, phrase etc within a string  
strpos("Hello World, again!", "World");
- str\_replace() replaces specified characters in a string with new characters, case-sensitive
  - str\_replace('World', 'Jim', 'Hello World, again!');

[Example 1](#)

[Example 2](#)

## XAMPP basics

Overview - after downloading and installation

XAMPP Download - <https://www.apachefriends.org/download.html>

- open XAMPP Control application
  - start required services such as Apache & MySQL
- Apache root directory is 'htdocs'
- create a testing directory
- MySQL admin control panel
  - <http://localhost/phpmyadmin/>

start developing...

## XAMPP- Quick test

- list of instructions that tell the computer what to do, eg: 'Hello World'

```
<?php
```

```
echo "Hello World!";
```

```
?>
```

Example

## Programming basics

### Variables - Quick Recap

- program receives data and stores it in a variable
- a variable can store different types of data, including words and numbers
- variables make programs more flexible
- programs can retrieve, store, and respond to data from outside the program

## Variables in PHP

- used to hold values or expressions

A few simple rules:

- variables start with \$ sign
- must begin with a letter or \_ character
- can only contain alphanumeric or underscore characters
- avoid spaces in the names
- names are case-sensitive

```
$course2="DIGH 401";
```

- PHP is a loosely typed language

# PHP's Scalar Data types

## Integer

Numeric values as a whole number, either positive or negative. Range of numbers varies by OS, but normally -2 billion to +2 billion.

eg: `$value = 401;`

## Character String

Series of single characters, such as 'Hello World'. In theory, there is no limit on the length of a string.

eg: `$value = 'DIGH 401';`

## Floating point number

Numeric values, normally excluding a whole number, that include decimal places. Often known simply as a 'float'.

eg: `$value = 4.01;`

## Boolean

A True or False value. Two possible states represented as either true or false. Mainly used for comparing conditions in conditional statements.

eg: `$value = TRUE;`

# Java's Primitive Data Types

## boolean

true or false - most important operators defined are 'and', 'or' and 'not'

## byte

1 signed byte (two's complement). Covers values from -128 to 127.

## short

2 bytes, signed (two's complement), -32,768 to 32,767

## int

4 bytes, signed (two's complement). -2,147,483,648 to 2,147,483,647. Like all numeric types ints may be cast into other numeric types (byte, short, long, float, double). When *lossy* casts are done (e.g. int to byte) the conversion is done modulo the length of the smaller type.

## long

8 bytes signed (two's complement). Ranges from -9,223,372,036,854,775,808 to +9,223,372,036,854,775,807.

## float

4 bytes, IEEE 754. Covers a range from 1.40129846432481707e-45 to 3.40282346638528860e+38 (positive or negative)

## double

8 bytes IEEE 754. Covers a range from 4.94065645841246544e-324d to 1.79769313486231570e+308d (positive or negative).

## char

2 bytes, unsigned, Unicode, 0 to 65,535

Chars are not the same as bytes, ints, shorts or Strings.



# Programming basics

## Variables - Java

```
int a, b, c;  
a = 1322;  
b = 1673;  
c = a + b;
```

```
String a, b, c;  
a = "Hello, ";  
b = "World";  
c = a + b;
```

## Programming basics

### Variables - Retrieving data

- after data is stored in a variable it can be treated the same as fixed value
- you can also assign the value of one variable to another
- you can also modify a variable by itself

## Programming basics

### Using Constants in programming

- similar to variables that hold a single value that never changes
- eliminate fixed values and replace with a constant
- two advantages to constants, which allow you to
  - replace fixed values with descriptive constant names
  - change the value of a constant once and replicate change throughout

## Programming basics

### Using the 'Constants' concept in PHP programming

- identifier name for a simple value & cannot change during execution of a script
- constants are case-sensitive by default
- constant identifiers, eg; "START", are normally always uppercase
- naming follows standard PHP conventions
  - starts with a letter or underscore
  - followed by any number of letters, numbers, or underscores

```
define("START", "book");
```

```
echo constant("START");
```

## Programming basics

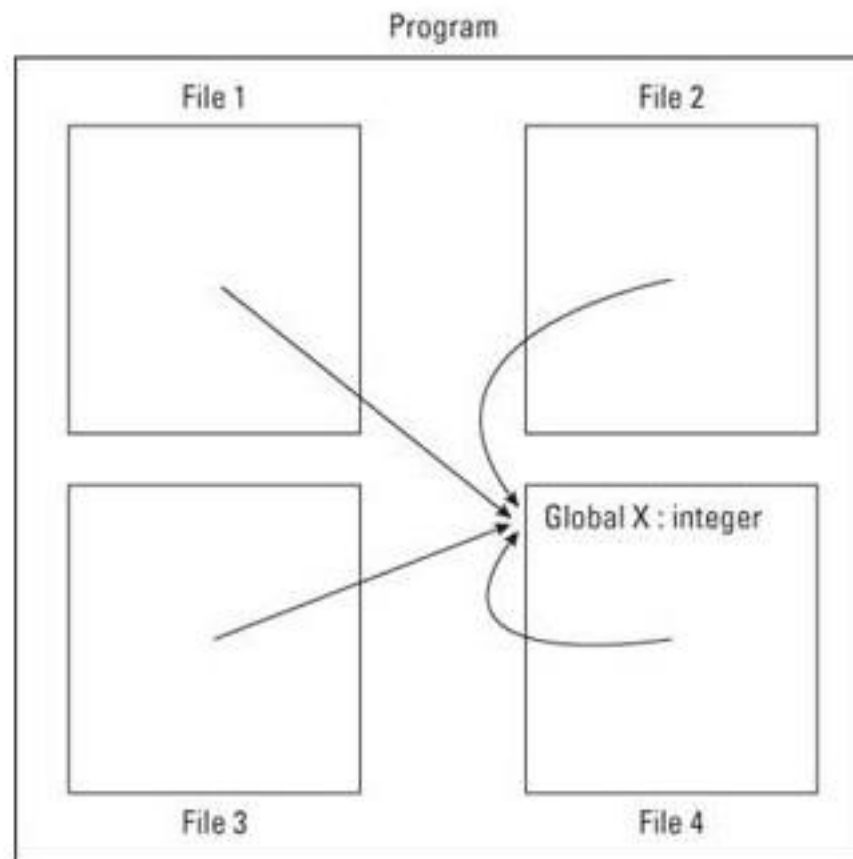
### Scope and Variables - Quick recap

- the scope of a variable defines which part of your program can store and retrieve data in a variable
- the program must ensure that no data is accessed or modified accidentally
- conceptually, three possible scope levels for a declared variable
  - global
  - module
  - subprogram
- PHP has the following scopes
  - local
  - global
  - static
  - parameter

## Programming basics

### Global Variables - Handle with care

- global in name, global in nature
- any part of the program can access the variable including
  - storing new data
  - wiping out existing data
  - changing the data in the variable
  - simply wiping out all data in the variable
- global variables often make error checking and correction harder
- explicit declarations often required in languages to declare global variables



A global variable can be accessed by every part of a program, including subprograms stored in separate files.

# Programming basics

## Global Variables - PHP

- refers to any variable defined outside of a given function
- global variables can be accessed from anywhere outside of a function
- to access a global variable within a function use the 'global' keyword

```
<?php
$total = 0;
$booster1 = 50;
$booster2 = 100;

function rocketThrust()
{
    global $total, $booster1, $booster2;
    $total = $booster1 + $booster2;
}

rocketThrust();
echo 'Rocket thrust is currently stable at '.$total.' newtons';
?>
```



# Week 11 - XML Exercise

## To the Lighthouse

(Here Mr. Carmichael, who was reading Virgil, blew out his candle.)

### 3

But what after all is one night? A short space, especially when the darkness dims so soon, and so soon a bird sings, a cock crows loudly, or a faint green quickens, like a turning leaf, in the hollow of the wave.

It seemed now as if, touched by human penitence and all its tool, divine goodness had parted the curtain and displayed behind it, single, distinct, **the hare erect**; the wave falling; the boat rocking, which, did we deserve them, should be