Think Like A Programmer

PRINCIPLES AND PROJECTS

Think Like A Programmer

- **Design like a programmer**
  - Problem solving
  - Start with what you have
  - Start with what you need

- **Code like a programmer**
  - Be lazy
  - Be organized
  - Be consistent

Problem Solving

The customer needs something.

How are you going to give them what they need?

How does your knowledge and your skill set translate into a solution to their problem?

Customers

Understand the problem before you try to solve it.

Ask questions.

Get clarification.

Requirements vs. Specification – do they match?

- Requirements = a *document* where the customer indicates what they want.
- Specification = a *document* where you indicate how you will provide it.

Two Kinds of Design

- Top-Down
  - Start with what the customer needs
  - Break it down into manageable chunks
  - Keep breaking it down until the smallest chunks consist of things you can do.
  - This works best for very complicated problems.

- Bottom-Up
  - Start with what you know how to do.
  - Figure out how to leverage that to do bigger things.
  - Think about how your repertoire of knowledge can solve a problem.
  - This works best for simpler projects.

Top-Down Design

The customer needs a search form that lets them find specific items from their database.

PHP

```
$q = $_POST['query'];
$sql = "SELECT * FROM saleitems WHERE (title LIKE '%$q%') OR
   (desc LIKE '%$q%') OR (comments LIKE '%$q%')";
$items = mysql_query ($sql);
```

Top-Down Design

Now, the customer needs a form that lets them enter multiple search terms.

PHP MySQL Nixon

How would you do this?

What does this search query even want?

Attempt #1

You could split the request into tokens. Then you could put together a MySQL query that uses “OR” to combine the tokens.

This might be hard to do if you are searching several fields in the database.

PHP MySQL Nixon

```
$q = split (" ", $_POST['query']);

$sql = "SELECT * FROM saleitems WHERE ((title LIKE
   '%$q[0]%') OR (desc LIKE '%$q[0]%') OR (comments LIKE
   '%$q[0]%')) AND ((title LIKE '%$q[1]%') OR (desc LIKE
   '%$q[1]%') OR (comments LIKE '%$q[1]%')) AND ((title LIKE
   '%$q[2]%') OR (desc LIKE '%$q[2]%') OR (comments LIKE
   '%$q[2]%'))";

$items = mysql_query ($sql);
```

Attempt #2

Use separate MySQL queries to get sets of information, then use logic to get the union and intersection of the sets.

PHP MySQL Nixon

```
$s_1 = "SELECT * FROM saleitems WHERE (title LIKE '%$q[0]%')
   OR (desc LIKE '%$q[0]%') OR (comments LIKE '%$q[0]%')
$s_2 = "SELECT * FROM saleitems WHERE (title LIKE '%$q[1]%')
   OR (desc LIKE '%$q[1]%') OR (comments LIKE '%$q[1]%')
$s_3 = "SELECT * FROM saleitems WHERE (title LIKE '%$q[2]%')
   OR (desc LIKE '%$q[2]%') OR (comments LIKE '%$q[2]%')";
$intersection = myCombineFunction ($s_1, $s_2, $s_3);
```

Attempt #3

Select everything from the database, then use PHP to figure out which items are applicable.

PHP MySQL Nixon

This is probably much slower than using MySQL to get the list of items, but the code might be more straightforward.

Top-Down Design

Now, the customer needs a form that lets them enter multiple search terms, with some items negated, and some items with logic functions.

```
PHP|MySQL –Nixon
```

This search would return all items that have PHP OR MySQL but NOT Nixon.

How would you do this?

And – Or – Not Logic

```
$q = split (" ", $_POST['query']);
return (matches ($q));
function matches ($term) {
  if (strpos ($term, ' ') >= 0) {
    $andTerms = split (' ', $term);
    return (matches ($orTerms[0]) && matches ($orTerms[1]));
  if ($term[0] == '-')
    return (!matches (substr ($term1, 1)));
  if (strpos ($term, '|') >= 0) {
    $orTerms = split ('|', $term);
    return (matches ($orTerms[0]) || matches ($orTerms[1]));
  }
}
```

Top-Down Design

Now, the customer needs a form that lets them enter multiple search terms, with some items negated, and some items with logic functions, and price ranges!

```
PHP|MySQL –Nixon <50
```

This search would return all items that have PHP OR MySQL but NOT Nixon AND have a price less than $50.

ACK! How would you do this?

Bottom-Up Design

What do you know already?

- HTML forms and tables
- Arrays and Loops
- Files
- MySQL
- Cookies? And other state mechanisms

What could you do with these at your disposal?

Could you create Facebook? Twitter? Amazon? Ebay?

Silicon Valley Job Title Generator

http://siliconvalleyjobtitlegenerator.tumblr.com

Could you create a site like this using PHP?

What do you need to create a site like this?

Have you done a project like this before?

How do you think this site works?

What would be the lazy way to make a site like this?

Startup Site Generator

http://tiffzhang.com/startup/

Could you create a site like this using PHP?

What do you need to create a site like this?

Have you done a project like this before?

How do you think this site works?

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Geocoder

A geocoder is a form that lets you enter a location, and it returns the latitude and longitude for that location.

A geocoder is an essential part of any geographical database project:

- Google Maps
- Your auto GPS navigator
- A “nearby” function for your Cheap Gas app, Gluten Free app, or ATM Locator app

Great Smoky Mountains National Park

35.611931,-83.549657

Geocoder

How would you implement a geocoder in PHP?

Where would you get the information from?

How would you extract the information from your source?

How would you use it to automate the task of looking up a whole bunch of locations?

How would you make it usable without a form?

http://www.mixed-up.com/markb/JavaScript/Geo/offline.html

Mashup

Take information from two different sources and merge them together.

- Example: a calendar of events compiled from several different other online sources.
- Example: a database of parks with the parks taken from the National Parks web site and the locations taken from Google Maps
- Example: A shopping web site that shows you the lowest price available by comparing Amazon, Walmart, and Ebay.

https://rcdb.com

Other projects?

What other projects can you think of?

Think of projects that might be useful to you personally.

Think about projects that might be useful to your friends.

Think about projects that might be useful to many people. Those are the kind of projects that might make money.

Code Like a Programmer

Be Lazy

Don't write the same thing twice (DRY = don't repeat yourself)

Use a framework or library if one is available.

Keep code and data separate. Don't put data in your code.

Code Like a Designer

- Be organized.
  - Put comments in your code.
  - Make your code easy to read.

- Be consistent.
  - Be consistent in the way you use white space.
  - Be consistent in the way you indent your code.
  - Be consistent in the way you use curly braces.

Software Engineering

Software Development Tasks

1. Requirements
2. Specification
3. Design
4. Coding
5. **Debugging / Verification**
6. **Maintenance**

Software Engineering

Since debugging and maintenance are the most difficult tasks and will take the most time over the lifespan of the software project, plan with that in mind.

- Make your code easy to read, so you and others can understand it later.
- Make your code easy to follow, by adding comments, so you and others can understand the flow later.
- Test your code thoroughly before releasing it to others.
- Low **Coupling** between modles: Modules are independent if each can function completely without the presence of the other(s).
- High **Cohesion** within modules: Functions that use the same data should be together in the same module.