CS 312
Internet Concepts

Developing Web Content:
CGI Forms

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HTML Forms

- Form elements are elements that allow the user to enter information
  - » text fields
  - » radio buttons
  - » checkboxes
  - » buttons
  - » drop-down menus
  - » textareas

- The definition and layout of a form is HTML, but CGI is needed to process the data provided to the forms.

What is CGI?

- Common Gateway Interface
- It's not a language, but a protocol
  - » common to refer to a program that uses CGI as "a CGI program"
- CGI program can be written in almost any programming language
  - » C, C++, Perl (most popular for CGI), Visual Basic
- Most typically used for processing form data and returning results in HTML format

Forms

- Defined with the <form> tag:

<form action="">
<label> <input /> </label>
…
<label> <input /> </label>
</form>

- action attribute is required by XHTML.
- User input fields are defined by the <input> tag
  - » attributes: type (type of input), name (used for referencing)
- Text label associated with an input field is defined with the <label> tag

Form Example


```
<form action="../cgi-bin/maillist.pl" method="post">

<h2>Join our mailing list</h2>

<label>Name: <input type="text" name="realname" /> </label>

<br /><label>E-mail: <input type="text" name="email" /></label>

<p><input type="submit" value="Submit" /></p>

</form>
```


Forms and Actions

- The main attribute of a form tag is *action*
  - » ex: <form action="/cgi-bin/maillist.pl">
  - » action is required by XHTML
    - ❖ if no action to be taken, then action="" will validate
- *action* tells the browser where to send the data for processing
- input type="submit" creates the submit button
  - » when pressed, the data is sent to the action defined

Forms and Methods

- If the method is *get*
  - » query string of the arguments is tacked onto the end of the URL (of action attribute)
    - *name=value*
    - "?" is separator between data-value pairs
  - » URL is sent to the web server
  - » should only be used when doing a search or requesting data
- If the method is *post*
  - » client sends the query string directly to the server, separately from the URL
  - » should be used when updating data on the server, for example, in a database

Form Processing

What Happens When Submit is Pressed?

- User presses "Submit" button
- Browser sends form data to web server
  - » specifically to CGI program defined in <form action>
- Web server launches the CGI program
- CGI program executes taking the data from the form as input
- CGI program typically will generate a web page using HTML
- CGI program passes the HTML page back to the web server
- Web server passes the HTML page back to the browser

Forms and CGI

- For now, we'll use the HTML Code Tutorial's (http://www.htmlcodetutorial.com) mycgi.pl script
- Displays name=value pairs that are sent to it
- We'll look at writing our own CGI programs later

Form Input Types

- Text
- Submit Button
- Reset Button
- Password
- Radio Button
- Checkbox
- File Upload
- Non-Input Types
  - » select (scrolling or drop-down list)
  - » textarea

Text Type

- A one-line text entry field

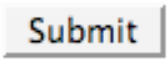
  <input type="text" name="user" value="Donald Smith" size="30" />

- Attributes:
  - » type
  - » name of this parameter
  - » value (optional) – default input value
  - » size (optional) – field width
  - » maxlength (optional) – limit the number of characters the user can enter

- When form is submitted, the information will be passed as
  - » user=Donald+Smith

Submit Type

- A submit button
  - » <input type="submit" value="Submit" />



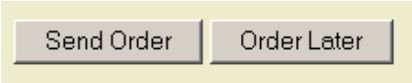
- Value indicates the text that will be placed on the button
  - » if nothing given, default is "Submit Query"

- When pressed, the form data is submitted to the script specified the form's *action* attribute

Submit Button

- Can have multiple submit buttons in the same form
- We can have multiple submit buttons, e.g., two labeled Send Order and Order Later, respectively.

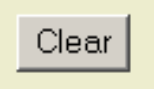
```
<input type="submit" name="action" value="Send Order" />
<input type="submit" name="action" value="Order Later" />
```



Reset Type

- A reset button

```
<input type="reset" value="Clear" />
```



- Value indicates the text that will be placed on the button
  - » if nothing given, default is "Reset"
- When pressed, the all field data and selections in the form are reset back to their original, default values

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Multiple Submit Buttons

- When multiple submit buttons are used in a single form, they should have the *same name* but *different values*

- Only one submit button can be clicked/effective.
  - » If the user clicked on the button labeled Send Order, then the corresponding part of the query string will be action=Send+Order

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Image as Submit Button

- An image can also be used as a submit button, typically the image is some icon.

```
<input type="image" name="lion" src="../odulion.gif" />
```

- The type is *image*, not submit
- Must specify the source URL for src
- When the image is clicked, the corresponding part of the query string will be:
  - » lion.x=*xvalue*&lion.y=*yvalue*
- *xvalue*, *yvalue* are location in pixels where the mouse was clicked on the image
  - » a bit like image map

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Hidden Field

- Used to pass some value, not given in any current input fields, to the called procedure.

  <input type="hidden" name="to" value="weigle" />

- In the query string, this field and value pair are passed as
  - » to=weigle
- But, nothing is shown in the document text or form

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Password Type

- A one-line password entry field

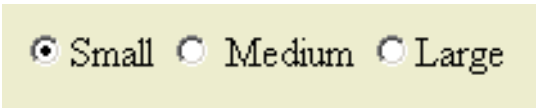
  <input type="password" name="passwd" value="xyzzy" size="10" />

- All characters, default or user input, in the password field are shown as asterisks or dots.
- When form is submitted, the information will be passed as
  - » passwd=xyzzy
  - » no encryption is performed (plain-text)

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Radio Button Type

- A group of radio buttons
  - » Similar to checkboxes, but the user can select only one out of a group

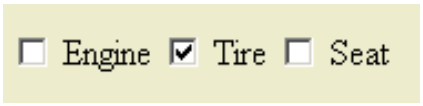



```
<input type="radio" name="size" value="small" checked="checked" />Small
<input type="radio" name="size" value="medium" /> Medium
<input type="radio" name="size" value="large" />Large
```

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Checkbox Type

- A group of checkboxes
  - » Used to select multiple items.




```
<input type="checkbox" name="items" value="engine" />Engine
<input type="checkbox" name="items" value="tire" checked="checked" /> Tire
<input type="checkbox" name="items" value="seat" /> Seat
```

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

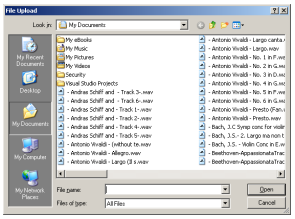
File Upload Type

- A file upload field

  <input type="file" name="upload" size="40" />

- An input field and a Browse button will appear

- When the Browse button is clicked, a File Upload window will show up for selecting a file



http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

File Upload

- Additional requirement for file upload:
  - » The form must specify an enclosure type of multipart/form-data, and use POST submission method.

Example:

```
<form action="URL" method="post"
    enctype="multipart/form-data">
    <input type="file" name="upload" size="40" />
    …
</form>
```

The actual processing of the file upload is a little complicated.

Button Type

- A push button

  <input type="button" value="Press Me!" />

- Used to implement *client-side* scripts
  - » e.g., Javscript
  - » nothing is sent to the server

- Example with simple Javascript

  <input type="button" value="Click!"
  onclick="javascript:alert('Clicked!');" />

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Select Tag

- A drop-down or scrolling list

  <select name="cars"> *drop-down*

  <select name="favorites" size="4" multiple="multiple"> *scrolling*

- Each option in the list is surrounded by <option>...</option> tags
  - » ex: <option>jogging</option>
  - » for default selection, use selected attribute on option tag
    - ❖ ex: <option selected="selected">swimming</option>

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Textarea Tag

- textarea tag, not an input tag
  - » For defining a large input text area, not just a field of a single line, use **textarea** tag.

```
<textarea name="longtext" rows="5" cols="60">
</textarea>
```

http://www.cs.odu.edu/~mweigle/cs312/forms/form.html

Server-Side Actions

When a web server receives a CGI request:

- It creates a set of environment variables containing information about
  - » the server itself
  - » the remote browser
  - » the current request, including QUERY_STRING
- It calls the corresponding script with any arguments in the environment variable QUERY_STRING.

Server-Side Actions

- The script picks up any information it wants from the environment variables, particularly the arguments from QUERY_STRING,
  - » i.e. the parameters with corresponding values,
- The script then executes its own instructions
- Many programming languages provide tools for easy picking of parameter values by procedures
- The output by the script, typically a HTML page, is sent back to the client by the server

Communicating with Scripts Via URLs

- Scripts may or may not require arguments from users.
- The arguments are called a query string and may be appended at the end of a URL with the question mark "?" leading it.
- If argument has blank space
  - » use "+" or "%20"
- If there are two or more name/value pairs
  - » use "&" to delimit

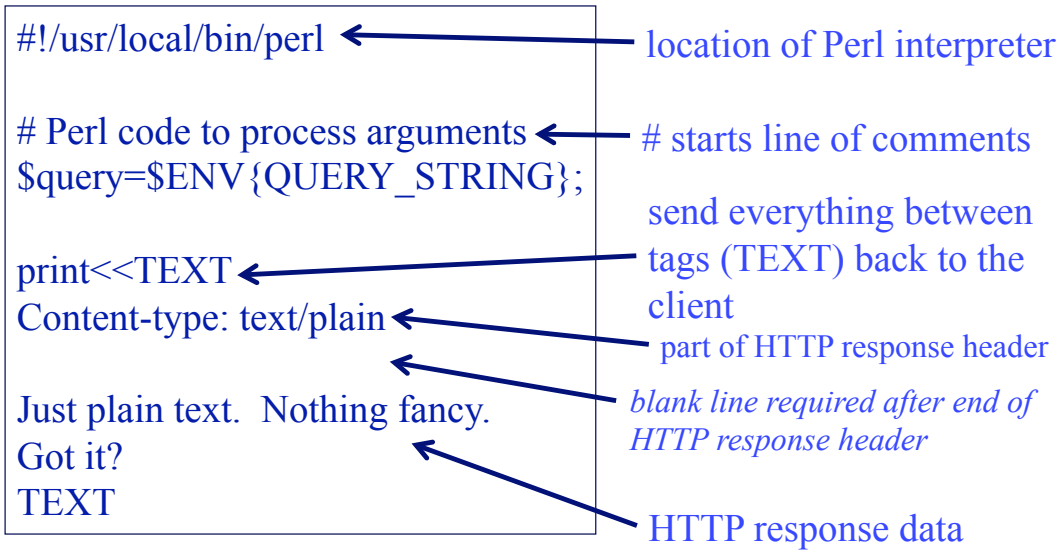
Examples

- One argument with parameter and value
  - » http://www.google.com/search?q=titanic
- Argument value has blank space
  - » http://www.google.com/search?q=john+smith
- Two or more parameters, using '&' to link pairs
  - » http://finance.yahoo.com/q/bc?s=AAPL&t=2y

ODU-CS CGI Implementation

- CGI scripts must be stored under ~/public_html
- CGI scripts are best, but not required, stored under ~/public_html/cgi-bin/
- The cgi-bin directory and all programs in the directory should have access mode 755 so that it can be executed by the web server.

Layout of Perl CGI Script



Simple Examples of Perl CGI Scripts

- Generating a plain text page, in perl on Unix

```
#!/usr/local/bin/perl

print<<PLAIN
Content-type: text/plain

Just plain text.  Nothing fancy.
Got it?
PLAIN
```

You must have the blank line in between the Content-type:text/plain (end of HTTP header) and the data part.

http://www.cs.odu.edu/~mweigle/cgi-bin/plainText.cgi

Simple Examples of Perl CGI Scripts

- The perl script mapCoord.cgi

```
#!/usr/local/bin/perl

$queryString = $ENV{QUERY_STRING};
print <<END;
Content-type: text/html

<html>
<p><b>The coordinates where the mouse was clicked were:</b></p>
<p>$queryString</p>
</html>
END
```

How can we use this to get coordinates clicked in an image map?

http://www.cs.odu.edu/~mweigle/cgi-bin/mapCoord.cgi

Determining Image Map Coordinates

- Use a form with image submit button

```
<form action="../cgi-bin/mapCoord.cgi" method="get">
<input type="image" name="coordinate" src="shapes.jpg" />
</form>
```

http://www.cs.odu.edu/~mweigle/cs312/forms/finding-coord.html

Improving CGI efficiency

- CGI technology generally requires a fresh copy of the program to be executed for every CGI request
  - » The interpreter and the script may need to be reloaded each time
  - » The workload may overwhelm the web server when interpreting scripts is needed
- Integrating script interpreters directly into web servers
  - » mod_perl embeds Perl interpreter into the Apache server
- Caching compiled versions of the scripts in system location so that further requests for the file are automatically directed to the compiled code

Other Efficient Approaches

- Active Server Pages, ASP
  - » A programming language, Microsoft's server-side technology for Internet Information Service, IIS
  - » An add-on to Internet Information Services (IIS)
  - » Using various built-in objects, each of which corresponds to a group of frequently-used functionality useful for creating dynamic web pages
  - » Can be mixed with HTML

ASP Example

```
<html>
   Today's date is: <%response.write(date())%>.
   <br>
   The server's local time is: <%response.write(time())%>.
</html>
```

*Would produce something like (**does not** work on our Apache):*

Today's date is: 15.03.2006.
The server's local time is: 10:17:18.

The syntax is simply <% XXXXX %> where XXXXX is just the script language function calls.

Apache::ASP

- An Active Server Pages port to the Apache Web Server with Perl scripting only
- Apache::ASP syntax:
  <%*xxx*%>
  where *xxx* is any valid perl code.

Reference, Apache::ASP: http://www.apache-asp.org/

PHP (Hypertext Preprocessor)

- An open-source, scripted programming language
- Allows interaction with a large number of relational databases
- Interacts with many major Web servers
- Can be embedded into HTML

Reference, a PHP tutorial:
http://www.w3schools.com/php/default.asp

Simple PHP Example

- A HTML document calling a php script

```
<html>
<form action="1action.php" method="post">

<p>Give your name please: <input type="text" name="name" /> </p>

<p>Give your age please: <input type="text" name="age" /></p>

<p><input type="submit" /></p>
</form>
</html>
```

ASP and PHP scripts all can be called in forms.

PHP Script

We'll do more PHP later

- The php script called in the previous form,
  - » file name 1action.php:

```
Hi <?php echo $_POST['name']; ?> ! <p>
You are <?php echo $_POST['age']; ?> years old.
```

PHP can be mixed with HTML, just use: <?php XXXX ?>

http://www.cs.odu.edu/~mweigle/cs312/forms/php.html

Comparisons of ASP & PHP

- Both are languages used to build Dynamic Web sites that can interact with Databases and exchange information
- ASP programs require IIS on Windows, DB connection is to MS-SQL, both not free
- PHP programs run on Linux with Apache server, DB connection to MySQL, all free
- PHP also runs on many other platforms and can connect to many other databases, is faster than ASP, and has many free, open source software