CGI Programming

- Perl is used as an example throughout. Most of what is said here applies to any common programming language (ie C, C++, python etc.).
- Perls CGI library provides tools to simplify
  - web page creation

    ```
    header, start_html, h1
    ```

  - form creation

    ```
    start_form,textfield, checkbox_group,
      submit, end_form
    ```

  - parsing QUERY_STRING/stdin

    ```
    param
    ```

  - session maintainence (later)

Examples

A complex example:

http://127.0.0.1/cgi-bin/CGIlibExample.pl

Its source

A simple example:

AddForm.html

Its source

Statelessness

- Browser/webserver interaction is stateless by default
- **Stateless** = no memory of the browsers state (probably determined by previous forms filled in and pages viewed) is kept either at the browser or webserver.
- **Example:** Want to allow access to the addition script only once a user is logged in. Don't want to require a user to login at every page.

Adding State: Cookies

- Store state at the browser: cookies
  - Are name=value pairs (like parameters in a CGI query string)
  - CGI scripts can create cookies and send them to the browser in the HTTP header.
  - The browser maintains a list of cookies that belong to a particular Web server, and returns them to the CGI script during subsequent interactions.
  - Supported by Netscape 1.1 (and later), Internet Explorer
  - perls CGI lib has several methods that support cookies.

Cookies (continued)

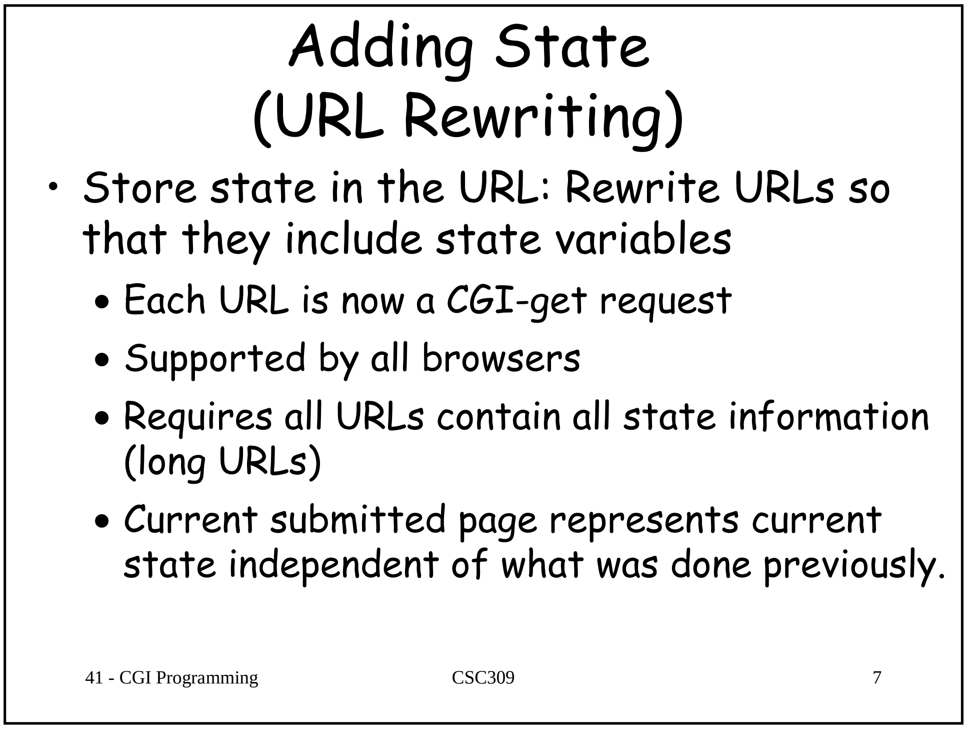
- Example: LoginForm (using cookies)
- Note:
  - Browsers limit the size of cookies.
  - Users can refuse to accept them
- Optional parameters
  - Expiration time - cookie will be stored and returned until expiration time. If not specified, cookie lives until browser is exited.
  - Domain - (ie cs.toronto.edu) return cookie to any server in this domain. If not specified, return cookie only to servers on host sending cookie.
  - Path - cookies sent only to scripts within the path. If not specified, return cookies to any script.
  - Secure flag - return cookies only on a secure (SSL) channel

Adding State (Hidden Variables)

- Store state in web pages: Add hidden variables.
  - Supported by all browsers
  - Requires all hidden variables to appear in all forms.
  - State is sent inside each web page.
  - For form based applications only. Following hyperlinks causes a loss of state (unless you use some javascript tricks).
  - Current submitted page represents current state independent of what was done previously.

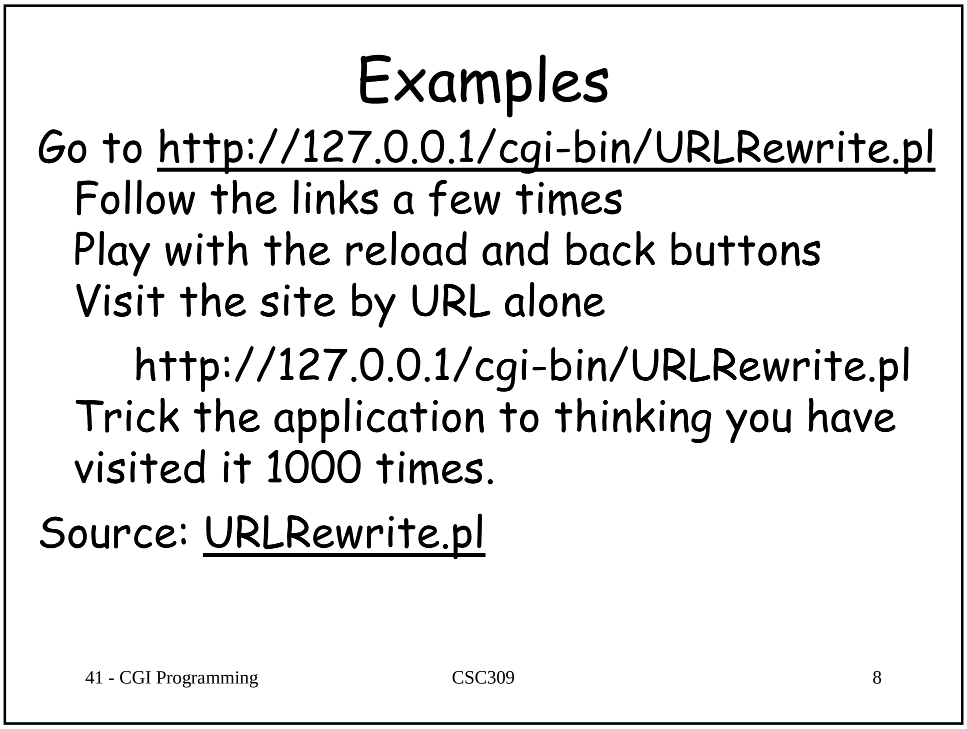
Example: (see AddForm.html (the source))

```
<input type=hidden name=secret value="Don't tell anyone!!">
```



Adding State
(URL Rewriting)

- Store state in the URL: Rewrite URLs so that they include state variables
  - Each URL is now a CGI-get request
  - Supported by all browsers
  - Requires all URLs contain all state information (long URLs)
  - Current submitted page represents current state independent of what was done previously.



Examples

Go to http://127.0.0.1/cgi-bin/URLRewrite.pl

Follow the links a few times

Play with the reload and back buttons

Visit the site by URL alone

http://127.0.0.1/cgi-bin/URLRewrite.pl

Trick the application to thinking you have visited it 1000 times.

Source: URLRewrite.pl

Adding State
(Store State at Server)

- Current state is stored at the server (ie in a file or database)
  - Each request includes a token identifying the browsers session (tokens can be passed via cookies, hidden vars, url rewriting).
  - At each request, the executing CGI script uses the token to fetch session state
  - **Carefull:** Browser back button problem. The page the user is viewing may not reflect state stored at the server.
  - **Solution:** Use `pragma: no-cache` http header to prevent page caching in client and proxies.

Note: Combinations of the above techniques used in practise

Concurrency

- More than one copy of a script may be executing at the same time.
- Manage shared resources (ie files) see flock in perlfunc
- Coordinate processes using system semaphores/mutex
- Carefull: You must understand the system the system the web server is running on. (ie. File locking does not work if the file system is NFS mounted).
- lockExample (not a web based example)

Examples

Go to http://127.0.0.1/cgi-bin/expire1.pl, then follow the links a few times, finally, use the back button a few times.

Sources

expire1.pl (can not be cached)

expire2.pl (can be cached)