Section 1:
CLIPS CGI

This section describes the setup and installation of examples demonstrating how a front end web page can be integrated with a CLIPS expert system through the Common Gateway Interface (CGI) in conjunction with Perl. The examples have been tested using Perl version 5.18.2 running on Mac OS X 10.10.2 with Apache and Strawberry Perl version 5.20.2.1 running on Windows 7 with Internet Information Services.

1.1 CLIPS CGI Directory Structure

In order to use CLIPS CGI, you must obtain the source code by downloading the CLIPSCGI zip file from the Files page on the CLIPS SourceForge web page. Once downloaded, you must then extract the contents of the file.

When unzipped the CLIPSCGI project file contains the following directory structure:

```
CLIPSCGI
    examples
        animal
        auto
        wine
    executables
        windows32
        windows64
        macosx
```

Executables are provided for 32 and 64-bit versions of Windows and a fat binary (containing both 32-bit and 64-bit versions) is provided for Mac OS X. These are the same executables that come with the standard distribution of CLIPS, so they are provided merely for convenience. Input to CLIPS from the CGI application is passed through temporary files and output from CLIPS is captured by the CGI application through standard output, so you can replace the provided clips executable with a custom or older version of CLIPS.

Although tested only on Windows and Mac OS X, the example code should be portable to other systems and web servers. On other systems, you'll need to configure a web server to run Perl CGI applications and compile the core CLIPS source code to create a console executable that will be invoked by the example CGI code. See section 2 of the Advanced Programming Guide for information on compiling CLIPS.

1.2 Installation For Microsoft Windows

1.2.1 Starting Internet Information Services

From the Start menu, select “Control Panel.” Double click “Programs and Features.” In the left pane, click on “Turn Windows features on or off.” Locate “Internet Information Services” and expand the tree view of its features. Expand “Web Management Tools” and select the check box for “IIS Management Console.” Expand “Application Development Features” and select the check box for “CGI.” Expand “Common HTTP Features” and select the check box for “Static Content.” Finally, click the OK button to apply the configuration changes.

Next, create a simple web page. Using a text editor, create a plain text file called hello.html and place it in the folder C:/inetpub/wwwroot. The contents of the file should be:

```
<!DOCTYPE html PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML>
   <HEAD>
      <TITLE>Hello World</TITLE>
   </HEAD>
   <BODY>
      <H1>Hello World!</H1>
   </BODY>
</HTML>
```

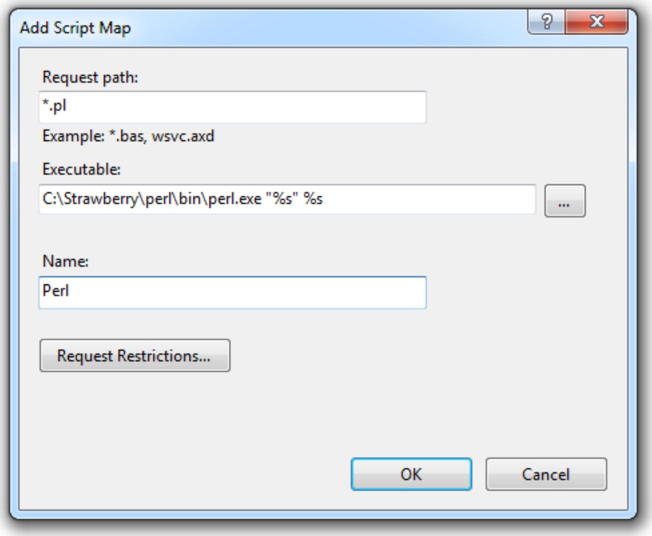
In your web browser, enter http://localhost/hello.html in the address bar. You should see “Hello World!” displayed in the browser content pane.

1.2.2 Installing Perl

Open a web browser and enter http://www.perl.org/get.html in the address bar. In the Windows section under Binaries, click “DOWNLOAD STRAWBERRY PERL” and you’ll be directed to the http://strawberryperl.com/ web site. Click on “Strawberry Perl 5.20.2.1 (32bit)” if you are running a 32-bit version of Windows or “Strawberry Perl 5.20.2.1 (64bit)” if you running a 64-bit version of Windows. Once the installer is downloaded, run it and follow the instructions for installation.

Once installation is complete, select “Control Panel” from the Start menu. Click on “Administrative Tools” and then double click on “Internet Information Services (IIS) Manager.” In the left pane, click on the topmost entry in the tree view, then double click on “Handler Mappings” in the middle pane. Click “Add Script Map...” under Actions in the right pane. For

“Request path”, enter “*.pl”. For “Executable”, enter “C:\Strawberry\perl\bin\perl.exe "%s" %s”. For “Name”, enter “Perl”.



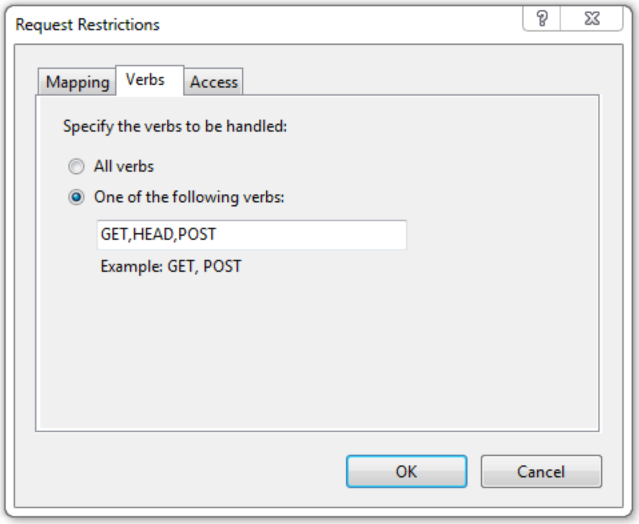
Add Script Map

Request path:
*.pl
Example: *.bas, wsvc.axd

Executable:
C:\Strawberry\perl\bin\perl.exe "%s" %s

Name:
Perl

Click on “Request Restrictions…” and set the Verbs tab to allow the following entries: GET,HEAD,POST.



Request Restrictions

Specify the verbs to be handled:

○ All verbs
● One of the following verbs:
GET,HEAD,POST
Example: GET, POST

Click the OK button to close the “Request Restrictions” dialog box, then click the OK button to close the “Add Script Map” dialog box. Click the Yes button when asked “Do you want to allow this ISAPI extension?”.

From the Start Menu, select “All Programs”, then “Accessories”, and then “Command Prompt”. At the command prompt, enter the following command:

```
Iisrestart
```

1.2.3 Testing Perl

To test perl/CGI configuration, create a file named hello.pl in the c:\inetpub\wwwroot directory. Its contents should be:

```
#!C:\Strawberry\perl\bin\perl
print "Content-type: text/html\n\n";
print "<H1>Hello World!</H1>\n";
```

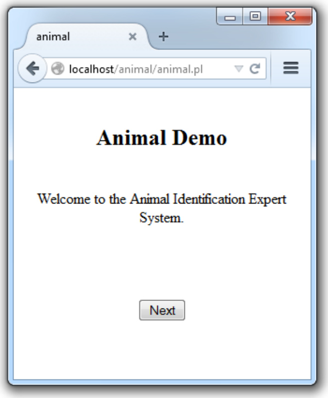
Open your web browser and enter http://localhost/hello.pl in the address bar. You should see “Hello World!” displayed in the browser content pane.

1.2.4 CGI Example Programs

From the CLIPSCGI project directory, copy the appropriate clips 32-bit or 64-bit Windows executable file (from either executables\windows32 or executables\windows64) and the animal, auto, and wine folders (from examples) to the c:\inetpub\wwwroot directory. The contents of this directory should be:

```
 clips.exe
 animal
 auto
 wine
```

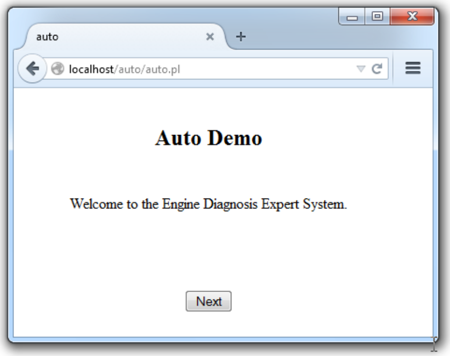
Enter http://localhost/animal/animal.pl in your web browser address bar to run the Animal Demo. It should appear in the browser content pane:



Animal Demo

Welcome to the Animal Identification Expert System.

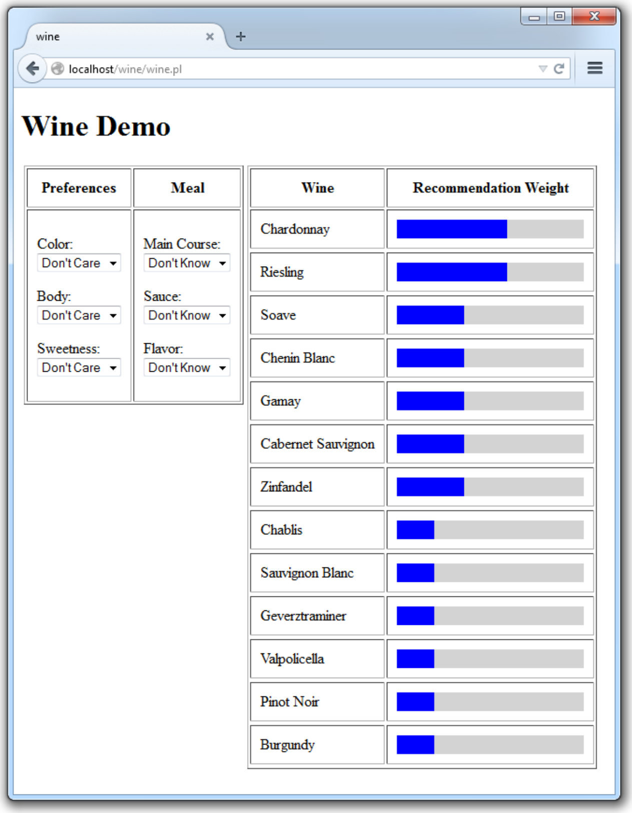
Enter http://localhost/auto/auto.pl in your web browser address bar to run the Auto Demo. It should appear in the browser content pane:



Auto Demo

Welcome to the Engine Diagnosis Expert System.

Enter http://localhost/wine/wine.pl in your web browser address bar to run the Wine Demo. It should appear in the browser content pane:



Wine Demo

Preferences	Meal
Color: Don't Care Body: Don't Care Sweetness: Don't Care	Main Course: Don't Know Sauce: Don't Know Flavor: Don't Know

Wine	Recommendation Weight
Chardonnay	
Riesling	
Soave	
Chenin Blanc	
Gamay	
Cabernet Sauvignon	
Zinfandel	
Chablis	
Sauvignon Blanc	
Geverztraminer	
Valpolicella	
Pinot Noir	
Burgundy	

1.3 Installation For Mac OS X

1.3.1 Starting Apache

Launch the Terminal application (located in the Applications/Utilities directory).

Start the Apache web server with the following command:

```
sudo apachectl start
```

This apachectl command requires root access, so you'll be prompted for your administrator password. After the command completes, launch Safari (or other web browser) and enter http://localhost in the address bar. If Apache is running, you'll see the text "It works!" in the browser content pane.

Next, create a simple web page. Using a text editor, create a plain text file called hello.html and place it in the folder /Library/Webserver/Documents. You'll need to enter an administrator password to modify the contents of this folder (either when you drag the file into the folder or use the sudo command to invoke an editor in the terminal app). The contents of the file should be:

```
<!DOCTYPE html PUBLIC "-//IETF//DTD HTML 2.0//EN">
<HTML>
   <HEAD>
      <TITLE>Hello World</TITLE>
   </HEAD>
   <BODY>
      <H1>Hello World!</H1>
   </BODY>
</HTML>
```

In your web browser, enter http://localhost/hello.html in the address bar. You should see "Hello World!" displayed in the browser content pane.

1.3.2 Apache Configuration

1.3.2.1 User Localhost Configuration

It's useful during development to be able to host web pages in your user directory; entering your administrator password each time you make changes to files in the system localhost folder can be inconvenient. In order to do so, you need to create a "Sites" folder at the root level of your account if one does not already exist. Your root level directory will be contained in the /Users folder. For example, if your user account name is johnsmith you'll need to add a Sites folder to

/Users/johnsmith. You can either create the folder using the Finder or from the Terminal application using the mkdir command.

Next, create a file in /etc/apache2/users named <username>.conf where <username> is the name of your account (for example, johnsmith.conf). If should have the following content (again where <username> is the name of your user account):

```
<Directory "/Users/<username>/Sites/">
AllowOverride All
Options Indexes MultiViews FollowSymLinks SymLinksIfOwnerMatch Includes ExecCGI
DirectoryIndex index.html index.cgi
Require all granted
</Directory>
```

In the Terminal application, navigate to the /etc/apache2/users folder and issue the following command:

```
ls –al
```

The permissons for the <username>.conf file should be:

```
-rw-r--r--
```

If the permissions are not set correctly, you can change them with the following command:

```
sudo chmod 644 <username>.conf
```

1.3.2.2 HTTP and User Directories Configuration

Edit the file httpd.conf in /etc/apache2. Under Dynamic Shared Object (DSO) Support, uncomment the following lines by removing the # character:

```
#LoadModule cgi_module libexec/apache2/mod_cgi.so
#LoadModule userdir_module libexec/apache2/mod_userdir.so
#LoadModule rewrite_module libexec/apache2/mod_rewrite.so
#LoadModule php5_module libexec/apache2/libphp5.so
```

Under DocumentRoot, change Options to:

```
Options FollowSymLinks Multiviews ExecCGI
```

Under DocumentRoot, change the AllowOverride to

```
AllowOverride All
```

Under /Library/WebServer/CGI-Executables, uncomment and modify the AddHandler cgi-script to the following:

```
AddHandler cgi-script .cgi .pl
```

Under /Library/WebServer/CGI-Executables, uncomment the following lines

```
#AddType text/html .shtml
#AddOutputFilter INCLUDES .shtml
```

Under Supplemental configuration, uncomment the following line:

```
#Include /private/etc/apache2/extra/httpd-userdir.conf
```

Edit the file httpd-userdir.conf in /etc/apache2.extra and uncomment the following line:

```
#Include /private/etc/apache2/users/*.conf
```

Using the Terminal app, restart apache using the following command:

```
sudo apachectl restart
```

1.3.2.3 Configuration Testing

Copy the hello.html file from /Library/Webserver/Documents to your user Sites directory. For example, if your user name is johnsmith, you'd copy the file to /Users/johnsmith/Sites. In your web browser, enter http://localhost/~<username>/hello.html in the address bar. For example, if your user name is johnsmith, you'd enter http://localhost/~johnsmith/hello.html. If user configuration is working properly, you should see "Hello World!" displayed in the browser content pane.

To test perl/CGI configuration, create a file named hello.pl with the following contents:

```
#!/usr/bin/perl
print "Content-type: text/html\n\n";
print "<H1>Hello World!</H1>\n";
```

Place this file in the /Library/Webserver/Documents and /Users/<username>/Sites directories. The permissions for these file should be:

```
-rwxr-xr-x
```

If the permissions are not set correctly, you can change them with the following command:

```
sudo chmod 755 hello.pl
```

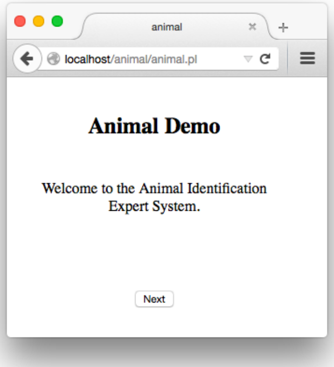
Open your web browser and enter http://localhost/hello.pl in the address bar. Next enter http://localhost/~<username>/hello.pl in the address bar. In both cases, you should see "Hello World!" displayed in the browser content pane.

1.3.3 CGI Example Programs

From the CLIPSCGI project directory, copy the clips Mac OS X executable file (from executables/macosx) and the animal, auto, and wine folders (from examples) to the /Library/Webserver/Documents and /Users/<username>/Sites directories. The contents of these two directories should be:

```
clips.exe
animal
auto
wine
```

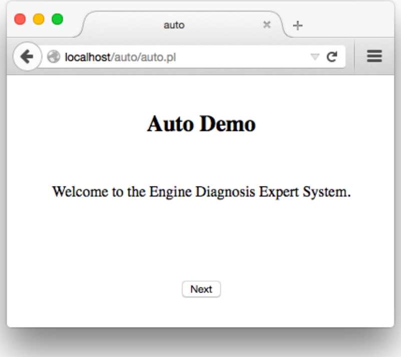
Enter http://localhost/~<username>/animal/animal.pl in your web browser address bar to run the animal demo from your user localhost directory. Enter http://localhost/animal/animal.pl in your web browser address bar to run the animal demo from your system localhost directory. The Animal Demo should appear in the browser content pane:



Animal Demo

Welcome to the Animal Identification Expert System.

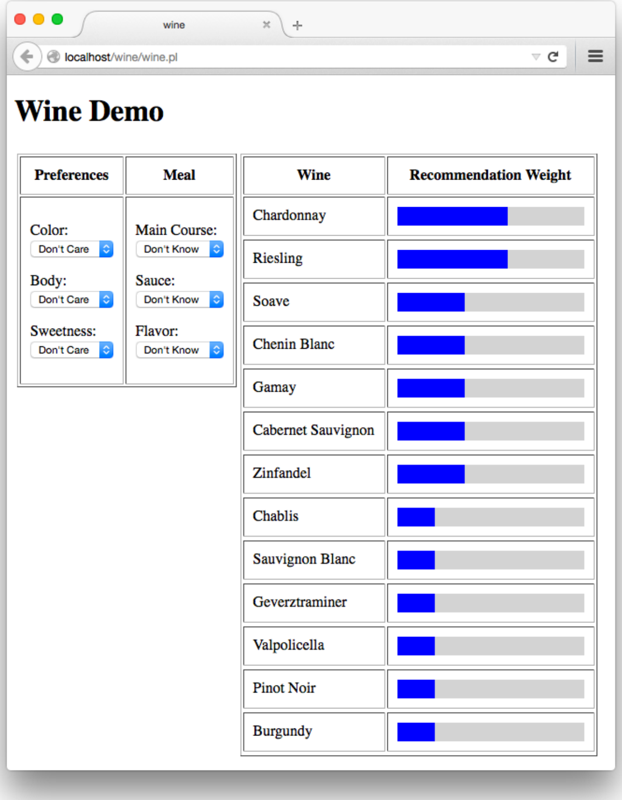
Enter http://localhost/~<username>/auto/auto.pl in your web browser address bar to run the auto demo from your user localhost directory. Enter http://localhost/auto/auto.pl in your web browser address bar to run the auto demo from your system localhost directory. The Auto Demo should appear in the browser content pane:



Auto Demo

Welcome to the Engine Diagnosis Expert System.

Enter http://localhost/~<username>/wine/wine.pl in your web browser address bar to run the wine demo from your user localhost directory. Enter http://localhost/wine/wine.pl in your web browser address bar to run the wine demo from your system localhost directory. The Wine Demo should appear in the browser content pane:



Wine Demo

Preferences	Meal
Color: Don't Care Body: Don't Care Sweetness: Don't Care	Main Course: Don't Know Sauce: Don't Know Flavor: Don't Know

Wine	Recommendation Weight
Chardonnay	██████
Riesling	██████
Soave	████
Chenin Blanc	████
Gamay	████
Cabernet Sauvignon	████
Zinfandel	████
Chablis	██
Sauvignon Blanc	██
Geverztraminer	██
Valpolicella	██
Pinot Noir	██
Burgundy	██