Chapter 7

Web Interfaces and CGI Programming

The present chapter explains how to build graphical user interfaces as Web pages. For example, we shall create an interactive Web interface to a computational service and display the results graphically. Interactive or dynamic Web pages can be realized in different ways:

- by Java applets that are downloaded and executed on the client’s computer system,
- by JavaScript code as part of the HTML code in the Web page,
- by programs on the Web server communicating with the Web page through a Common Gateway Interface (CGI).

The latter technique has two attractive features: The Web page interaction is fast (no need to download applets), and a full-fledged programming language of almost any choice can be used in creating the interactivity. Scripting languages, in particular Perl, have traditionally been popular for CGI programming, basically because CGI programming involves lots of text processing.

Only some basic knowledge of Python from Chapter 2 is required to understand the present chapter. Since we deal with Web-based graphical user interfaces and the same examples as in Chapters 6.1 and 6.2, it might be an advantage to have browsed those examples.

You can learn the simplest type of CGI programming from the Chapter 7.1 in a few minutes. CGI programming becomes somewhat more complicated as the applications get more advanced. Creating a Web interface to the simulation and visualization script simviz1.py from Chapter 2.3 touches many useful topics in CGI programming and is dealt with in Chapter 7.2.

CGI scripts performing calculations with scientific data are conveniently coded in Python. However, if you do not need Python’s scientific computing capabilities, it might be worthwhile to consider other dynamically typed languages for creating CGI scripts. Perl is particularly popular for writing CGI applications and offers packages that makes CGI script development quicker and/or more sophisticated than in Python. The companion note [15] demonstrates the simple transition from Python to Perl syntax in the forthcoming Python examples. PHP is also a very popular language for CGI scripting. Perl and PHP have quite similar syntax, but the PHP code is inserted as a part of the HTML code in a Web page. For the examples in the present chapter the differences between Python, Perl, and PHP are very small.

For large sophisticated Web applications, Plone is an easy-to-use and powerful tool. Plone is built on Zope, a Python-based open source application.
server for building intranets, portals, and custom applications. The SciPy site is implemented with Plone so you can go there to see an example of what Plone can do (appropriate links are provided in doc.html).

7.1 Introductory CGI Scripts

We shall introduce the basics of CGI programming through Scientific Hello World programs like the ones used for introducing GUI programming in Chapter 6.1, but the user interface is now an interactive Web page instead of a traditional GUI. Figure 7.1 displays the layout of the page. In a field we can fill in the argument to the sine function, and by clicking the equals button, a new page appears with the result of the computation, see Figure 7.2. After having shown two versions of this simple Web application, we discuss two very important topics of CGI programming: debugging and security.

Fig. 7.1. Web page with interactive sine computations.

Fig. 7.2. The result after clicking on the equals button in Figure 7.1.