UIPLANTS: A Software Program for the Landscape Industry and Horticulture Education

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SUMMARY. UIPLANTS is a computer-based reference to help identify, culture, and use woody landscape plants for the northern and central United States. The program provides a comprehensive reference to serve the educational and professional communities with more than 8000 high-quality color images and textual descriptions of more than 900 species and cultivars. Special features include a highly flexible slide show and the ability to compare any two images side by side. Student activity can be tracked, creating detailed logs of student use patterns and times.

ADDITIONAL INDEX WORDS. computer, computer-aided instruction, MS Windows, trees, shrubs, vines, plants

Students, educators and landscape professionals require visual materials to help learn, teach, and sell plant materials. In an ideal situation, live plant specimens would always be available, but there are many situations when this is not feasible. For example, it would not be convenient to bring live plant material to a potential customer's home. Even if live materials were available, the many seasonal features of the plant could not be seen at one time. Horticulture students often find the need to study plant materials at every stage of development at any time of the year and at all times of the day or night.

Printed landscape plant references offer only a limited number of line drawings (Dirr, 1990), black and white photos (Flint, 1983; Wyman, 1990) or color images for a portion of the plants they cover due to the high costs of printing. Publications that do feature color images often are limited to presenting only one or two plant features (Phillips, 1978; Phillips and Rix, 1989) or may have only limited text to accompany the images. Even with an extensive set of reference books, students and professionals find that much of the visual plant information they need is unavailable.

Computer-based systems offer the ability to store large quantities of visual images in a compact and affordable format. This is especially true with compact disc (CD-ROM) technology, which can store up to 700 megabytes of data per disc.

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These discs can be produced at costs ranging from about \$75 each to less than \$1, depending on the quantity produced.

There are several other multimedia plant material products on the market. Southern Trees, an expert system for selecting trees (second edition), and Florida Plant Selector, from the Univ. of Florida, serve as a comprehensive guide to the ornamental features and selection of trees and shrubs from the southern United States. Plantit CD!, also from the Univ. of Florida, features 1000 photographs of U.S. plants, with one picture per plant. Horticipia, Desops LTD, Purcellville Va., is a two-CD set, with one CD featuring perennials and annuals and another covering trees, shrubs and groundcovers. In general, each of the Horticipia disks has two or three images per plant. The Pro Series Plant Database for CDROM, Green Thumb Software, Boulder Colo., has 2300 U.S. plants, with color photos and the ability to interact with landscape design software or print color photos. It has audio scientific name pronunciation.

Although the above products present images of major ornamental features nicely, and in some cases offer plant selection utilities, the current products on the market do not have an extensive photographic library for any single species and do not allow side-by-side comparisons of their images. These products usually do not show leaf, bud, stem, and bark features or other plant features such as flower, fruit, or fall color unless they are particularly showy. UIPLANTS displays text and images simultaneously to provide a greater understanding of plant features. Other CD-ROM-based products that we have seen present either images or text on the screen, but not both, for most portions of their program.

The Dept. of Horticulture at the Univ. of Illinois has produced a software program called UIPLANTS to provide descriptive information and images for woody landscape plant identification, ornamental features, and culture for the northern and central United States. Designed to serve college students and industry professionals, UIPLANTS takes advantage of computer and CD-ROM technology to store and display color images in a coordinated format with text by using the interactivity that this equipment makes possible.

Educational objectives for this program include

- serving as a comprehensive reference to help identify, culture, and use woody landscape plants,
- enhancing retention of course material through increased use of visual study techniques,
- facilitating individualized instruction, and
- increasing student access to information that is not available in the classroom or not

readily available from standard references.

Objectives for professionals include

- serving as an informational display tool for clientele of botanic gardens, arboreta, and retail sales establishments,
- serving as a sales tool by facilitating customized sales presentations,
- creating a program that is capable of updating by the user, and
- providing a framework program that can be used for other commodity areas.

As teachers of plant materials courses, we found that our campus grounds lacked a sufficient diversity of plant material specimens and students lacked quality visual references when studying for examinations. UIPLANTS is designed to supplement other methods of information delivery for plant materials students but not replace laboratories where students still need to see, touch, and smell plants. Although this program could replace traditional slide-lecture information delivery, it is intended to be a study tool for students preparing for laboratory or lecture examinations. The program is particularly useful when plants are not easily available or when the weather or light conditions do not permit outdoor viewing. UIPLANTS also provides individualized instruction at a pace appropriate to each student or client, allowing the user to choose the path and order of the subject matter. Optimally, the program should be available to students at any time of the day or night and in a location convenient for their study.

Garden centers, retail nurseries, landscape designers, botanic gardens, and arboreta all have clientele who want plant material information. This program can serve as a reference in support of salespeople and also be used by knowledgeable consumers. New employees working sales lots often do not have the necessary knowledge to answer many of the questions posed by potential customers, such as "How big will it get? What do its flowers and fruit look like? How is it different from other species? What major problems can I expect?" Many years of experience usually are required to develop the competency to answer some of these questions. The encyclopedic portion of UIPLANTS allows for easy access to answers for many of these questions.

Sales of landscape designs hinge on the ability of the designer to impress the customer with the beauty and functionality of the plants that have been selected for them. Because consumers usually want to see what they are getting before they agree to spend their money, designers often find themselves having to work with a number of pictorial references to illustrate plant features. In many cases, the images are not available in reference books. UIPLANTS provides many images in one easily accessible source. A customized list

feature allows users to put together a completely customized presentation. The program shows images of plants in the landscape and has text concerning landscape use, but it does not offer an extensive series of images showing functionality, massing, or other design characteristics.

Because it is easy to upgrade, owners of this software also can add their own text and images to the program to keep up to date with new cultivars or inventory.

System requirements

UIPLANTS can be run on nearly every new computer with either a DOS-Windows or OS/2 operating system.

Minimum requirements are (with preferred configurations in parentheses)

- A 25 MHz 486 or 33 MHz 386SX (33 MHz 486DX or better)
- 4 megabytes RAM (8 megabytes RAM)
- SVGA video card or equivalent with 1 megabyte VRAM (must support 1024x768 with 256 colors)
- Mouse or other pointing device
- About 5 megabytes of hard drive space for the program
- a CD-ROM drive or about 700 megabytes of disk space for the images
- Microsoft Windows 3.1 with the Arial font installed.

The program can run under several different hardware configurations. On our development machine we store the program, images, and text on a 1-gigabyte hard drive. Most individual users with less hard drive space will operate from a CD-ROM reader and 5 megabytes of hard drive space. In this configuration, the images would be stored on the CD, and the program, including text, would be on the hard drive. Because the software is set up to look for images on multiple drives, user-supplied images on a hard drive can be accessed easily by the program.

The program also can be run from a central server over a local area network. Our program currently runs on an OS/2 server at the Univ. of Illinois in the College of Agriculture's microcomputer Laboratory. In this configuration, one copy of the program ran from a server that could be accessed from any of 50 individual machines. The speed of the server and the network-linked machines was sufficient to produce no noticeable delay with 10 to 15 students working on the program simultaneously.

Images and text

UIPLANTS is written in a completely modular format and contains detailed images and text for more than 900 species and cultivars of woody landscape plants spanning more than 150 genera. All data from the program

are kept in plain text files, making plant additions and deletions as simple as editing one of these text files or copying a new image to the hard drive.

Images come from the slide collections of the authors, with additional images from Floyd Giles and Dave Williams at the Univ. of Illinois and Paul Cappiello at the Univ. of Maine. Slide images were scanned with a Kodak RFS 2035 film scanner, which converts the images into 480x320 Windows device-independent bitmap files (.DIB/.BMP) with a unique palette of 256 colors. Images are assigned DOS file names using the first three letters of the genus, the first two of the specific epithet and one letter for the cultivar, if applicable, along with a two-digit number designating the plant feature and image number. With this file-naming scheme, up to 10 characteristics can be displayed per plant with up to 10 images within each of those characteristics. This makes it possible for a plant to have 100 images associated with it, and another 100 for each of its cultivars.

Textual information and images are available on plant habit, leaves, buds, stems, flowers, fruit, fall color, cultural requirements, diseases and insects, and landscape use. In addition, information is also available on plant size, color, texture, winter hardiness, and native range. The text was composed initially by the individual authors and then reviewed by the other authors. Additional reviewers and text contributors include D.J. Williams and F.A. Giles. Univ. of Illinois. and P. Cappiello, Univ. of Maine. The authors also anticipate an external review of the program and text before release.

An important feature of UIPLANTS is its ease of upgrading. The program allows for the addition of images and text for a genus, species, or cultivar by copying a properly named file to the appropriate subdirectory or by editing existing files. As a standardizing mechanism, a simple text-formatting language similar to the HyperText Markup Language (HTML) and Rich Text Format (RTF) was developed. New images can be added to the program by users, if they have access to a film scanner, by applying the naming convention described above and placing the file in the appropriate sub-directory, making them immediately available to the program without any further work. The program also has a simple utility to add text and images for new species or cultivars.

Program features

OPENING SCREEN. The opening screen of UIPLANTS allows the user to obtain information about the program, authors, and version update notes or to enter the main body of the program. Optionally, it can serve as a place for

Fig. 1. Sample screen displaying information provided when a species is selected.

students to log into the program so that their efforts can be monitored. The login system prompts users for an identification code that is used by the computer to log the user's activities. When a proper code is entered, the program can be accessed. We currently are using the login system to evaluate the educational benefits of the program and the stu-

dent use patterns of various program features. UIPLANTS has extensive logging capabilities that list every activity performed by each user, the amount of time spent to do the activity, and the order in which activities were performed. Because these files are long and difficult to read, several programs have been developed in Perl, a language suited for parsing text files, to summarize user activities into a more readable form. Login security can be toggled either on or off, with different degrees of activity-logging.

MAIN PROGRAM BODY.

The main portion of UIPLANTS is encyclopedic in nature, displaying the full-color images and text side by side for each plant characteristic. The graphical nature of the program makes it simple to switch between characteristics, and it does not overwhelm the user with too many options. Genera, species, and cultivars can be selected by a click of the mouse on scrollable lists of choices. The only computer background required for users is the ability to use a mouse to point and click on items.

When a species or cultivar is selected with the mouse, an image of the plant

Fig. 2. Sample screen displaying information on a cultivar.

Fig. 3. Sample slideshow screen displaying user selectable options.

habit appears, accompanied by text describing the habit, size, color, texture, hardness, and native habitat (Fig. 1). In most cases, multiple images are available for each selected feature, allowing users to see diversity in each plant feature. For example, a user often would be able to see young and more mature plant specimens when looking at a plant's habit. The inclusion of multiple images for each feature also provides an opportunity for the authors to show a range of characteristics, such as the variation that commonly occurs in habit or leaf shape or an average flowering display versus an extraordinary one. It also helps to avoid problems with students' associating an identification with some extraneous background image, such as "Oh! That's the viburnum with the red car in the background!"

The program revolves around the species page, from which all other features are available as button choices. Users can go to any feature such as leaves, buds, stems, flowers, fruit, fall color, bark, and culture in a nonlinear fashion. The compare/mark page, slideshow, and cultivar fea-

tures are also available from the species screen.

When the cultivar button is chosen, a list of cultivars appears for the species the user is currently viewing. Cultivars are selected in a manner similar to species and presentations begin with a habit or other image of the main distinguishing feature (Fig. 2). At the touch of the next feature button, the viewer is presented with other features of the cultivar.

SLIDESHOW. The slideshow portion of this program displays a sequence of plant

Fig. 4. Sample screen displaying the side-by-side format of the compare feature.

images without the accompanying text. Great user flexibility in choice of options makes this a powerful addition to the program. Users choose the images they see, the order in which they are presented, and the duration of each image on the screen. All species images in the database are available in the slideshow and can be presented in either a sequential or random fashion. Users can pause the show at any time or change the display options, even while the slideshow is in progress. The slideshow also contains a routine that randomly selects from among the available images for each chosen plant feature, resulting in a different selection of images each time the slideshow is run.

When the slideshow button is pressed, a menu appears prompting the user to determine which single genus or multiple genera are to be displayed. In addition, the program allows for the selection of custom user-defined lists that an instructor, landscape designer, or other professional might set up in advance. By adding the names of desired species to a text file, lists of plants can be created for viewing in the slideshow. Instructors can group plants by week, semester, genus, flowering time, or any characteristic that aids in presenting the material to students. Trades people can make lists of plants for designs to show potential clients or simply to show customers plants that they sell.

Landscape contractors and designers may make customized lists to show potential clients plant materials they have selected for their landscape design. They can choose which images they wish to show and in what order. If you were displaying *Aronia arbutifolia*, red chokeberry, to a client, you might want the fruit displayed first, followed by the flowers and fall color. And if one fruit image were better than another, you would want to have the program to use the superior image every time. This is achieved by cycling through the images in a preprogrammed browser and selecting the images you want displayed. Student users often choose to select plant groups corresponding to the lists covered in laboratories. These lists allow the viewer to concentrate on species that are of immediate concern. At the Univ. of Illinois, the customized lists include plants grouped by lab dates and semester. Custom lists used at the College of Lake County allow the instructor to select a different list of plants.

Once the genera or species have been chosen, the user is asked if he wants to see the plant names with each image in a time-delayed fashion or if he wants to take an interactive quiz (Fig. 3). The second option allows students a short time to identify the species before seeing the name. In the quiz format, the screen displays the first image of the

randomly chosen species and asks the user to correctly spell the scientific name of the plant. The student can respond by typing in the answer or looking at additional features to provide more clues. Visuals from all of the prechosen categories are available to help identify the plant. If the response is not correct, the software tells the user to try again, but gives the answer after three wrong responses. The program does not score or log data on student results.

After selecting the name display options, the user can then choose the display order of the habit, leaves, buds, stems, flowers, fruit, fall color, and bark for the genera they have picked (Fig. 3). Students studying for an outdoor identification test might decide to view only the habits, leaves, buds, stems, and bark, whereas habit, flowers, fruits, fall color, and bark might be used to prepare for a lecture examination.

The length of the display time for each feature can be set within a range of 2 to 60 seconds. The pause button can be pressed at any time to allow additional viewing time, or the display time can be changed while the slide show is in progress.

The user can exit slideshow at any time by a pressing the exit slideshow button. Upon exiting the slideshow, users are returned to the page they were viewing before selecting the slideshow option.

COMPARE AND MARK PAGE. UIPLANTS offers several options through the compare/mark page button. This button brings up a menu that allows a user to mark a page for review later or compare any image with one of those already marked or with any of the other 8000 images in the program. The two chosen images are displayed side by side on the monitor, allowing for careful comparison. In this manner, students or professionals may compare leaves or any other feature of a closely related plant side by side (Fig. 4) so the differences can be studied. These comparisons are difficult to accomplish with standard printed references.

Availability and future development

UIPLANTS will be available through a commercial software publishing company in late 1996. Details on the publisher and product price are not available. A UIPLANTS homepage is available on the World Wide Web at <http://www.mallorn.com/uiplants>. UIPLANTS is being upgraded continually to meet new user needs. Although the existing program features are more than adequate for the average user, there are still some things that we would like to see in future releases. These include

- adding sound for pronunciation of scientific names,
- incorporating artificial intelligence in the quiz portion of the slideshow, telling the user why an answer was wrong,
- RTF or HTML support for text,
- access to plants via common names,
- adding more images and cultivars,
- marketing a generic shell with a developer's package to allow purchasers to create their own program for other plant materials or any other educational topic, and
- printing capabilities

Literature Cited

Dirr, M.A. 1990. Manual of woody landscape plants. 4th ed. Stipes, Champaign, Ill.

Flint, H.L. 1983. Landscape plants for eastern North America exclusive of Florida and the Immediate Gulf Coast. Wiley, New York.

Phillips, R. and M. Rix. 1989. The Random House book of shrubs. Random House, New York.

Phillips, R. 1978. The Random House book of trees of North America and Europe. Random House, New York.

Wyman, D. 1990. Trees for American gardens. 3rd ed. Macmillan, New York.