LABORATORY AND TEACHING APPLICATIONS

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ArtWare: Macintosh multimedia software for aesthetics research

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This paper describes ArtWare, a HyperCard stack for the Apple Macintosh that allows researchers to configure and run simple experiments in visual aesthetics. ArtWare allows researchers to (1) choose paintings or other works of art from commercially available laser discs to use as stimuli, (2) create and edit sets of semantic differential response scales, and (3) create an experiment stack that randomizes the presentation of stimuli and scales as well as collects data from subjects. In addition, the paper discusses revisions planned for the current software to broaden its utility to areas beyond visual aesthetics.

A great deal of software has been written to allow researchers to set up and run perceptual and cognitive psychological experiments on Macintosh computers. For example, MacLab (Costin, 1988) and SuperLab (Haxby, Parasuraman, LaLonde, & Abboud, 1993) both allow researchers to configure and run sophisticated psychology experiments with little programming effort. While these general-purpose programs can be used to construct experiments over a range of areas of psychological research, other researchers have found it useful to develop specialized programs. For example, STM Experimenter (Cox, Hulme, & Brown, 1992) was created for memory experiments and demonstrations with auditory verbal stimuli; MacLaboratory (Chute, 1986) was designed as courseware, but can also be used to run simple psychophysical and reaction-time-paradigm experiments. Several other software packages have been created for studying memory for visually presented verbal stimuli (Tversky, 1990), digit span (Martin & Allan, 1991), text comprehension (Nason & Zabrocky, 1988), visual illusions (Dougherty, 1990), face perception (Jensen, 1987), and psychomusicology (Boltz, Kapadia, & Joyner, 1991).

One area of research in psychology that could benefit greatly from stimulus presentation and data collection via computer is visual aesthetics. Research in visual aesthetics typically requires the use of photographs or slides of various works of art; it can, however, be costly to produce and duplicate images at a desirable level of resolution. Until now, researchers interested in visual aesthetics have had few options if they wished to present stimuli and collect data on computers. They could either rely upon general experimental software (such as MacLab or SuperLab) or write their own programs. This paper describes ArtWare, a HyperCard stack that allows researchers to design and conduct visual aesthetics experiments on Macintosh computers.

Software and Hardware Requirements

ArtWare is a HyperCard stack developed on an Apple Macintosh PowerBook 160 with 4 MB of RAM and a 40-MB hard drive and an Apple Macintosh Quadra 700 with 8 MB of RAM and a 400-MB hard drive. A Pioneer Model CLD-V2400 CD laser disc video system player is attached to the computers through a serial port; a Sony Model PVM-1390 color video monitor is used to display the video images. ArtWare requires HyperCard 2.1 and System 6.0.8 or higher to run. In addition, it requires the use of the Voyager Videodisc Settings stack (distributed without charge for educational purposes with the compliments of the Voyager Company). ArtWare has been tested with the above configurations. The stack should run on any Macintosh computer with at least 2 MB of RAM

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(including the Plus and the Classic) attached to any laser-disc player with an RS-232C interface via a serial port.

Software Description

The ArtWare stack allows researchers to select works of art from a laser disc to use as stimuli. Several laser discs containing libraries of visual art are now available. Examples include collections from the Louvre (Hatala & ODA, 1990a), the National Gallery of Art (Whiteley, 1983), and the Musée d'Orsay (Hatala & ODA, 1990b). ArtWare works as a remote control for the laser-disc player, allowing researchers to browse through frames of a laser disc and select stimuli. Once a list of stimuli is created, it can be saved as a text file. In addition, the stimuli can be viewed on a video monitor connected to the laser-disc player. ArtWare contains a set of semantic differential scales that was developed by Berlyne (1973). This set of scales is commonly used in research on visual aesthetics. Researchers also have the option of creating their own set of scales by entering adjectives to serve as anchors. Finally, ArtWare creates a new HyperCard stack that runs an experiment. The experiment stack drives a laser-disc player in order to present the stimuli. The experiment stack randomizes the presentation order of the stimuli as well as the semantic differential scales. The experiment stack collects data from subjects and writes those data to an ASCII file which can be accessed by a spreadsheet or statistical analysis program.

Using ArtWare

When ArtWare is run, experimenters are presented with a *Main Menu* which allows them access to the various parameters for an experiment. The *Scales* card allows experimenters to select an existing set of 7-point semantic differential scales or create a new set. New sets of scales are automatically saved as a part of the ArtWare stack. Existing scales can be modified to suit an individual researcher's needs.

The *List of Artworks* card allows experimenters to enter a list of stimuli "on-line" by putting a laser disc in the player and selecting frames while browsing through the contents of the laser disc or by typing in frame numbers if they are known. The experimenter can also load an existing set of artworks that has been saved as an ASCII file.

The *Instructions* card (see Figure 1) allows experimenters to select either a standard set of instructions for subjects or to customize the instructions. In either case, a sample scale is provided for the subjects to practice responding. Finally, the *Create Stack* card allows experimenters to build a new HyperCard stack to be used to run an experiment. On this card, experimenters determine the parameters to be used for a particular experiment. Namely, experimenters select the laser disc that contains the stimuli, the set of semantic differential scales, and the set of instructions. By default, the new stack will be placed in the same folder as the ArtWare stack.

Figure 1. The Instructions card.

Running an Experiment

Prior to running an experiment created with ArtWare, experimenters should ensure that the Voyager Videodisc Settings stack is placed in the same folder as the experiment stack. Experimenters should also quit all other applications. To begin the experiment, the experimenter loads the appropriate laser disc into the player while the title card is displayed. Once the laser disc is loaded, the experimenter clicks the "Begin" button. After the subject has entered demographic information, an instruction card containing a sample scale is presented. When the subject has completed the instructions, he/she clicks on the button labeled "Click Here to Begin"; the order of the stimuli is randomized prior to the beginning of the experiment.

During an experiment, a particular stimulus is displayed on the video monitor while one of the semantic differential scales is displayed on the computer monitor. The order of presentation for the scales is randomized for each stimulus. The subjects make their responses by clicking the location on the scale that corresponds to their rating. Feedback is given to the subjects by highlighting the entire scale and the specific location of the click. The subjects may either change their responses on the currently displayed scale or move to the next scale. The stimulus remains on the video monitor until all of the scales have been completed for it.

Structure of the Data File

The data are recorded in ASCII format so that they can be readily accessed across a wide array of platforms. In addition, the data are written as tab-delimited columns so that the file can be easily imported into a spreadsheet or similar analysis program. The first row of data for each participant contains a subject number, age, gender (1 = male, 2 = female), the subject's initials, and the date and time the experiment began. The rows that follow contain a number for the stimulus, the frame number for that stimulus, the responses to each scale (in the order in which they appeared in the ArtWare stack), and the total time taken to complete a set of scales for a given stimulus (measured in ticks, where a tick is approximately 1/60 of a second).

Benefits, Limitations, and the Future of ArtWare

The current design of ArtWare offers a number of benefits over other, general-purpose research tools (e.g., MacLab, SuperLab). First, because stimuli are presented on a video monitor rather than on the computer's monitor, low-end Macintosh systems (e.g., Plus or Classic) can be used to run experiments. Second, to our knowledge, no other software is available that allows researchers to present stimuli from laser discs. Another advantage of ArtWare is that it requires low overhead in terms of memory requirements and hard disk space due mainly to the fact that the images are contained on the laser disc. Our rationale for the current design of ArtWare is that it will allow researchers with a relatively limited budget to make

a minimal investment for a computer system so that a laser-disc player and stimulus materials can be purchased.

However, the fact that a laser-disc player is a necessity is also the major limitation of the current design, since it limits the types of stimuli available to researchers. For this reason, in future versions we are planning to give users access to a variety of graphic file formats (e.g., gif, jpeg, PICT, etc.). This will permit users to access stimuli stored on a hard disk or CD (including Kodak PhotoCDs), thus expanding the types of stimuli that could be presented. For example, rather than rating works of art for aesthetic qualities, other complex visual images (e.g., photographs of people) could be presented and rated on several dimensions (e.g., attractiveness, etc.). While the program described in this paper has been designed specifically for aesthetics research, implementing these planned features would broaden its utility for researchers in other areas of psychology.

Software Availability

ArtWare is public domain software. Readers desiring a copy should send \$5 (to cover the cost of a disk and postage) to D. J. Polzella, Department of Psychology, University of Dayton, Dayton, OH 45469-1430. Included with ArtWare is the Voyager Videodisc Settings stack, which can be distributed at no charge for educational purposes with the compliments of the Voyager Company. ArtWare without the Voyager Videodisc Settings stack may also be obtained through MacPsych (see Huff & Sobilloff, 1993).

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