Software Announcements

VIAT: A Windows Program for Demonstrating Visual-Attention Effects

Visual phenomena have always attracted people's attention. Many of them, such as geometrical illusions, illusory aftereffects, color illusions, subjective contours, or Gestalt principles, are relatively easy to demonstrate in textbook figures (see, e.g., Shiffman, 1990). However, the situation is quite different for phenomena such as apparent movement and others, the demonstration of which require the rapid presentation of several stimuli. Such demonstrations are rather difficult to produce and are accomplished usually through the showing of movies. This is also the case for visual attention, where for the effects to show up, short stimulus presentation times and highly flexible stimulus conditions are essential. While research on attention was boosted by the emergence of computers, and several interesting visual-attention phenomena have recently been discovered (see, e.g., Treisman, 1986), it is hard to find tools for demonstrating them appropriately. Usually, one has to rely solely on textbook figures.

In order to provide such a tool, I have developed the program VIAT, aimed at demonstrating many interesting phenomena related to visual attention and preattentive processing. The phenomena comprise (1) pop-out in visual search for targets with attributes such as color, orientation (global orientation, local orientation contrast), certain forms and patterns, movement of luminance patterns, scene-based properties (shading, lighting, 3-D orientation); (2) no pop-out in visual search for movement of isoluminance patterns (needs 256-color video mode), conjunctions (of color and form, color and color); (3) texture segregation of regions whose elements differ in attributes such as color, orientation, orientation gradient, crossings, blob size, number of terminators, statistical properties; (4) color-word interference; and (5) negative priming.

Within each paradigm, one can display a new stimulus configuration by simply pushing a mouse button. This allows one to respond to a certain stimulus display by switching to a new one and to get an impression of the task difficulty. In the visual-search paradigm, for instance, one can repetitively switch to a new stimulus display as soon as one detects the target and thereby observe one's speed of responding. This procedure is sufficient to demonstrate, for example, search asymmetries for certain stimulus attributes—that is, response time differences between conditions in which the role of target and distractors are exchanged. Exchanging the role of target and distractors is accomplished by simply pushing another button.

Since most of the interesting effects can be demonstrated with this simple procedure, data collection is not provided by the program.

VIAT runs under the Windows 3.1 operating system and allows easy manipulation of a number of display parameters. For instance, for visual search one can choose the number of distractors, element size, and other parameters. It is also possible to import user-created bitmaps as distractors and targets. This property allows new stimuli to be tested quickly before one runs experiments with them.

Furthermore, the program allows the user to save the window area as a bitmap which can then be used, for example, to create transparencies. Finally, an on-line help file provides at least one reference for each demonstration, where details can be found.

Availability. The program VIAT is freeware and is located as a file (viat1.zip) on a World-Wide Web (www) page with URL: <http://www.tu-bs.de/institute/AllgPsych/viat.htm> from where it can be downloaded.

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Utilizing the Sound Blaster 16 Board for Dichotic Listening Studies

Dichotic listening (i.e., auditory stimuli with two competing stimuli simultaneously presented to the two ears; see Hugdahl, 1988) has been utilized in studies of attention since its introduction by Broadbent (1954), and in studies of cerebral lateralization of function since the original studies of Kimura (1961). A major limitation of this methodology has been the difficulty of generating stimuli. With the advent of computers with analog to digital (A/D) conversion capabilities, automated production of stimuli became feasible. Until recently, however, only a few research laboratories had actually acquired adequate hardware and then developed software specific to their hardware systems to successfully produce dichotic stimuli. A/D conversion boards were relatively expensive, and programming to control the boards for dichotic studies was not trivial. For example, dichotic listening generation for on-line research was originally imple-

mented in this laboratory on an IBM XT with a 12-bit dynamic range Data Translation 2801A board, which cost approximately as much as the computer. Although this system was adequate (see Graves, Morley, & Marcopulos, 1987), it, like all other systems of the time, was not something that other laboratories would be likely to reproduce, and it is now obsolete.

With the appearance of the Sound Blaster 16 board by Creative Labs, Inc., however, high-quality, 16-bit, A/D capabilities became very inexpensive. The popularity of this board is such that virtually all psychology laboratories, and indeed many students, either already have, or could easily have, hardware sufficient for very good dichotic studies. However, software (and/or documentation of the commands necessary to control the board) has not been readily available.

One method of producing dichotic stimuli that is now available is to use a general-purpose sound-editing program. For example, Cool Edit Version 1.50 (Johnston, 1995) is an elegant Windows program that can be used to produce a dichotic tape. If all that is needed is a method of recording and playing back a set of stimuli for tape recording, the few options of sampling rates and the inability to control the precise sample duration may be acceptable. In this case, Cool Edit and a Sound Blaster 16 card may be all that are needed. However, if more precise sampling rate and duration control are needed, and/or if one needs to manipulate stimuli on line, then a direct method of controlling the selection and generation of samples is needed.

This paper outlines software that was developed for recording monophonic 16-bit samples and playing back pairs of samples in two-channel mode. While the language is QuickBASIC and assembler, the essential procedures and port command information for controlling the board can readily be extracted from the source code for use in other languages. The methods can be used to provide not only left- versus right-side stimuli, but also binaural stimuli (e.g., spoken warning signals), and thus can be employed in a wide variety of behavioral research. The structure of the hardware (PC and A/D board) control subroutines is adapted from subroutines written for the Data Translation board, which were based on routines published in a Data Translation (1983) programming manual. The Sound Blaster 16 hardware control information was obtained from the Sound Blaster Developers Kit (Creative Technology, 1993).

Recording samples with SBSAMPLE. The software consists of two programs, SBSAMPLE and SBPLAYDL. Before these programs can be run, the Sound Blaster utility program SB16SET must be run to set the input (e.g., microphone or line) and output gains. SBSAMPLE then requests the sampling rate and sample duration and then outputs corresponding data to the board and to the DMA controller. Recording is started with a keyboard stroke to record 32K of data (e.g., 2 sec at 8,000 two-byte samples per second). The waveform is displayed on the monitor with logarithmic scaling (of the absolute value of voltage) to capture the low-amplitude details. If the ampli-

tude is acceptable, the user then moves a cursor to select the starting point of the desired sample. Playback of the selected sample is provided to assist in selecting the optimum sample segment. The program will then taper the final 2 msec of data to zero amplitude (to avoid clicks) and store the sample on disk. An ASCII text editor is then used to create a data file with the number of trials, the number of dichotic pairs per trial (1–4), and the list of samples to be played.

Playing samples dichotically with SBPLAYDL. SBPLAYDL requests the name of the data file, the interpair interval, and the intertrial interval. It will then retrieve the samples, interdigitate them in RAM as required by the Sound Blaster board (using an assembly language subroutine), program the DMA controller, and initiate sound output at the proper times. Because of limitations of DMA segments, the maximum sample length is 32K to stay within a 64K block for the dichotic data pair. (This limit could be overcome by programming multiple blocks or using disk access function calls, but this is not necessary for the usual dichotic applications in which individual samples are less than a second long.)

Availability. Copies of the QuickBASIC 4.5 and assembler source code; the QuickBASIC libraries, which also contain millisecond timer subroutines (Graves & Bradley, 1991); and the compiled executable files may be obtained gratis from the author via e-mail or via the University of Victoria Psychology Department internet site <http://castle.uvic.ca/psyc/>.

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