# COMPUTERS IN TEACHING

## Classroom Demonstrations in Perception and Cognition Using Presentation Software

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*Presentation software, notebook computers, and projection equipment are increasingly being used to present lecture material. However, the potential advantages of such presentation over more traditional lecture methods are often underutilized. In this article, I illustrate computer-based classroom demonstrations in perception and cognition that require no computer programming and can be presented with the same standard presentation software used for lecture presentation, thus allowing the demonstrations to fit seamlessly within the lecture. The demonstrations capitalize on the advantages of multimedia lecture presentations because they are interactive and cannot be achieved with more traditional pedagogical methods. Examples include apparent motion, anorthoscopic perception, illusory conjunctions, and the capacity of early visual memory.*

Advances in technology and plummeting costs of computers and projection equipment are making computer presentation of lecture material possible in more and more classrooms. These innovations in hardware have been mirrored by similar advances in software. Multimedia presentation software now enables professional, polished, multimedia lecture presentations. Advancing technology has also led many psychologists to rely on computers for running experiments. Thus, the use of a computer in the classroom might afford the instructor new possibilities for active student participation during the course of a traditional lecture. For example, an instructor could simply present stimuli via a computer projection system in much the same way the original researchers did with a computer monitor under more controlled conditions. This technique would provide the student with a concrete example of how the experiment under investigation was conducted. Depending on the experiment, it might even be possible to quickly collect some data and replicate the study in the lecture session. Although there are many good commercial software packages available for psychological experimentation, these packages are designed primarily for laboratory use and may not lend themselves easily to the lecture setting. In addition, they are often difficult to master or have a proprietary programming language. If one uses presentation software for both demonstrating experiments and presenting lecture material, the demonstrations can fit seamlessly into the lecture.

In this article, I briefly describe several classroom demonstrations appropriate for courses in introductory psychology, cognition, or perception that can be performed within the context of a lecture, using only the software that is typically used to present lecture material. The demonstrations require no programming knowledge, are relatively easy to set up, and are surprisingly compelling. Some of the demonstrations (e.g., illusory conjunctions and early visual memory) work better if they are presented first and then explained, so that students are not biased by their knowledge of the effect. Others, such as apparent motion and anorthoscopic perception, work equally well before or after the effects are explained.

### Apparent Motion

*Apparent motion* is the perception of motion when a succession of still images is presented. Commonly cited examples of apparent motion include the motion of flip books, marquee lights, and motion pictures.

There are different methods of demonstrating apparent motion with presentation software. Many software packages have a function whereby images or text can be made to appear sequentially on the screen. To create apparent motion one simply creates an image (a simple geometric figure works fine) and then copies it to successively displaced locations on the slide (see Figure 1). Then select the option that allows each image to be presented sequentially but is hidden when

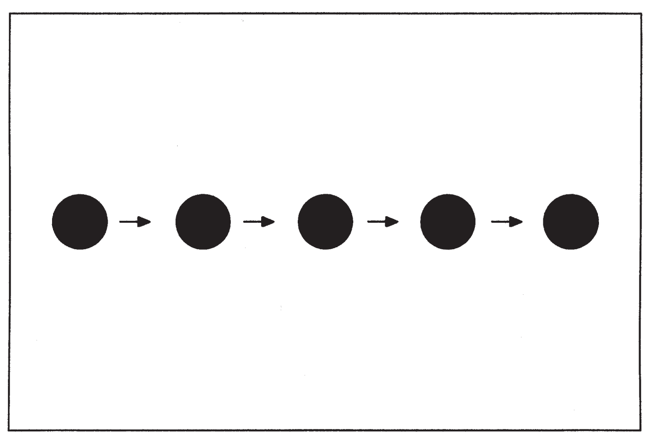

Figure 1. Apparent motion demonstration with presentation software. Several geometric forms appearing sequentially on a slide or series of slides are perceived as one form that moves across the screen.

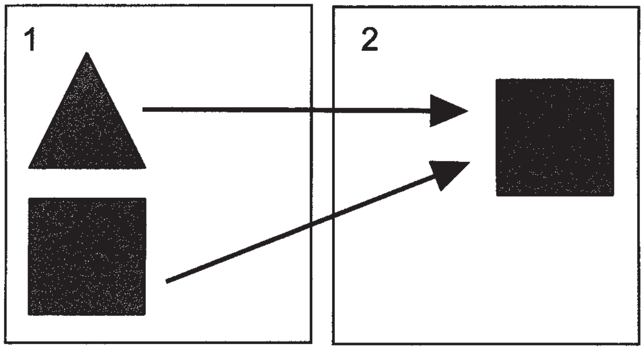


Figure 2. Illusory occlusion, from Slide 1 to Slide 2 both the square and triangle appear to move to the space occupied by the square. The square appears to occlude the triangle, which is not displayed at all (see Ramachandran & Anstis, 1986).

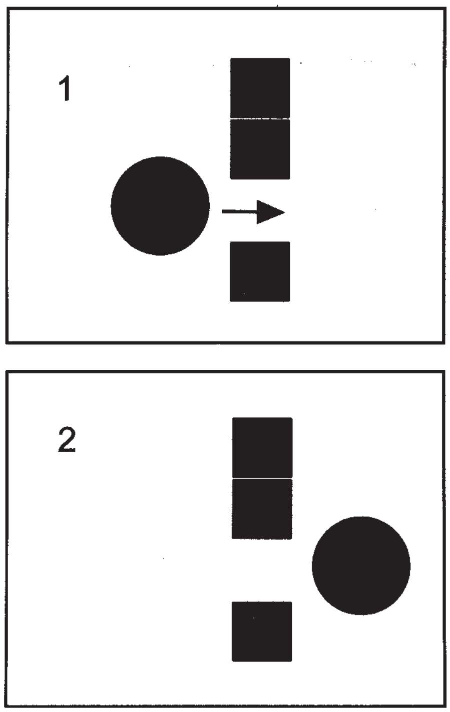


Figure 3. From Slide 1 to Slide 2 the circle moves from left to right. For some viewers the circle seems to swing forward or backward around the squares; for others it appears to squeeze through the opening between the squares.

the next image appears. Depending on the computer's processing speed, a little trial-and-error with distances between the successive images can produce an image that appears to move across the screen. An alternative means of creating the same effect is to slightly displace an image on successive slides. Cycling through the slides then creates the perception of apparent motion.

Illusions of occlusion with apparent motion (Ramachandran & Anstis, 1986) can also be demonstrated. Figure 2 shows two slides that, when shown in succession, demonstrate illusory occlusion. Both the square and triangle appear to move to the same spot, and the square appears to occlude the triangle, which is not displayed. When toggling back and forth between these two slides it appears as though the square covers and uncovers the triangle as they both move back and forth.

When the two slides in Figure 3 are shown in succession, various interpretations of motion can be obtained. For some viewers the large circle appears to swing out or back in depth and rotate to the other side. For others, the circle appears to squeeze through the opening between the squares. As in all apparent motion, the specific results are dependent on the distance between the images and the rate at which the images appear. However, most presentation software allows easy manipulation of these variables, thus allowing a wide range of possibilities.

One could even use digital photographs instead of geometric figures to demonstrate the biological constraints on apparent motion. For example, the apparent motion between two dots of light tends to follow a "shortest path" constraint. The motion between the two points appears to be a straight line. However, Shiffrar and Freyd (1990) showed that biological stimuli often violate the shortest path constraint and move in paths that are more typical of biological organisms.

## Anorthoscopic Perception

*Anorthoscopic perception* is the perception of form that results from viewing an image that moves behind a narrow aperture (Rock, 1986). Although the image is larger than the aperture and can be viewed only in successive sections, viewers can generally identify the image. However, the speed with which the image moves influences the perceived characteristics of the image. At slow speeds the image appears elongated, and at high speeds the image appears compressed (Anstis & Atkinson, 1967).

Anorthoscopic perception can be demonstrated with presentation software by first using either of the techniques for demonstrating apparent motion described previously. The addition of two rectangles placed close together can then be made to form an aperture. If the rectangles are brought to the foreground and the image is sent to the background so that the rectangles partially occlude the image (see Figure 4), the image appears to move behind the aperture as each successive image is shown.

## Illusory Conjunctions

Treisman's (1986) feature integration theory of object recognition proposed a preattentive stage in which object "primitives" (e.g., form and color) are identified but not yet combined into objects. Treisman argued that in the preattentive stage primitives exist independently of each other and are only combined in a later focused attention stage. As evidence, Treisman pointed to the occurrence of *illusory conjunctions,* occurrences in which object primitives are incorrectly combined.

This effect can be replicated in the classroom or laboratory using presentation software. First, create a slide that has three very large letters, each a different color (see Figure 5). Then, simply present the slide very quickly and ask students

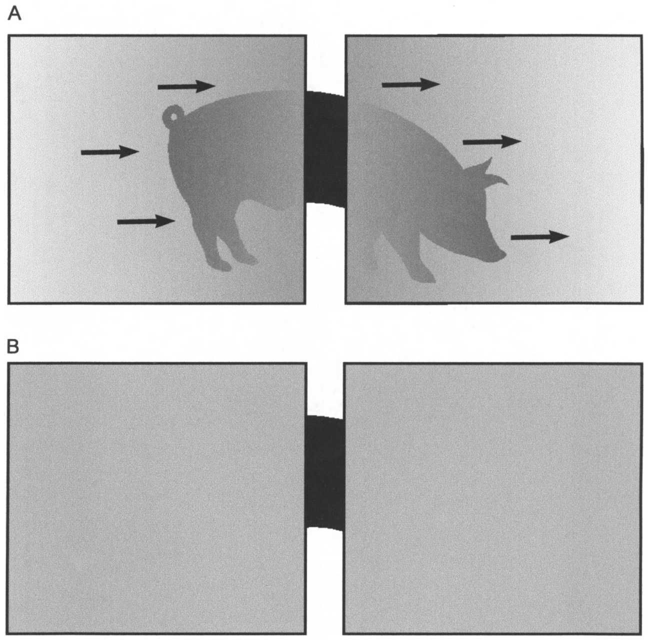


Figure 4. Anorthoscopic perception demonstration with presentation software. A moving figure is viewed through an aperture created by two occluding squares. Viewers can identify the figure despite seeing only partial sections of the figure over time. The speed with which the figure moves can distort the perceived length of the figure. Panel A shows the setup with transparent squares to illustrate the design.

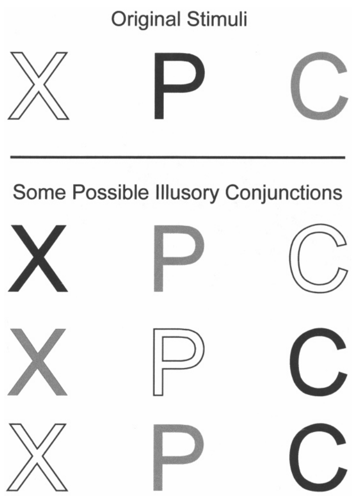


Figure 5. Illusory conjunctions with presentation software. The stimuli in the top panel are flashed briefly. Viewers report various illusory conjunctions, some of which are shown in the bottom panel.

to report what they saw. Invariably they will identify the three letters and three colors that were presented. However, there is generally considerable disagreement about which letter was what color. Treisman argued that these errors or illusory conjunctions are evidence of a sequential object recognition process with distinct preattentive and focused attention stages. Some presentation software has an option that allows you to flash an image or text string very quickly. Although this option may make the demonstration a little easier, the same effect can be obtained by simply presenting the slide for a very brief duration.

## Other Demonstrations

Sperling's (1960) partial report procedure demonstrating the capacity of early visual memory can also be demonstrated with presentation software. An array of letters can be briefly presented on screen, and either an auditory or color cue can be used to signal the to-be-reported row. Similarly, almost any research paradigm that uses a slide projector (e.g., eyewitness memory) can be demonstrated with presentation software.

## Conclusions

The variation in timing between and within computers, as well as various other confounds, are such that presentation software is generally not suitable for experimentation. However, the ease with which some experimental paradigms can be re-created with presentation software makes it ideal for demonstrating these principles to both large and small lecture sections. Thus, presentation software can provide students with an opportunity to become actively engaged in classroom demonstrations of computerized experimentation without requiring any programming knowledge on the part of the instructor. Given that many experimental techniques involve computerized presentation of stimuli, this is one area in which multimedia instruction has clear advantages over more traditional pedagogical methods.

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## Note

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