NOTE

Portable apparatus for recording direct frontal views of conversing subjects' faces

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Detailed records of faces and voices of a pair of subjects can be obtained with a single TV camera and videotape recorder. Subjects converse through an opening in a portable partition, and lightly silvered mirrors divert images of both faces into a TV camera. On a monitor, the two faces appear side by side, and a subject looking at his or her partner's face appears to be looking straight out of the monitor. The equipment is useful for studying visual behavior and facial displays in dyadic interactions.

Understanding the structure of informal conversation requires studying both verbal and nonverbal cues, and cues from the face are particularly important. Conversation proceeds too rapidly, however, to be studied in detail while it is taking place, and some means of recording for more leisurely analysis is needed. Video recording is sometimes used, but recording close-up frontal views of subjects' faces during normal conversation is difficult.

One way of recording is to use two TV cameras, each filming one subject from across the shoulder of the other subject. A signal generator can merge the two camera signals into a split-screen image on a single monitor and videotape. However, if subjects are framed tightly enough that their faces fill the screen and show maximum detail, slight movements will take the faces out of the picture. Also, one cannot obtain a direct frontal view of a subject's face, because the partner's head will be in the way, and as a result, it will always be somewhat difficult to score eye contact from videotape. Wellens (1978) has used an interactive TV system for obtaining direct frontal views, but the equipment is expensive and the two centered images of subjects' faces cannot readily be merged and recorded for playback on a single monitor.

The approach described here uses a single TV camera and videotape recorder to record two subjects. Figure 1 shows the overall arrangement. Subjects converse through a 5 x 5 in. opening in a 2 x 2 x 1 ft box on a table between them. Subjects are given comfortable swivel chairs and are encouraged to sit back and relax. They appear to do so, usually ending up about 2 ft from the box. The size of the opening in the box is dictated by the size of the mirrors A and B, which in the present case were 5 x 7 in. Larger mirrors and a larger opening could be used (although larger beam splitter mirrors are hard to find), but the 5-in. opening is large enough for subjects to see the full faces of their partners (Figure 2).

Figure 1.

Subjects seem to find conversing through the small opening normal after a few moments. A limited opening has the advantage of forcing subjects to "frame" their faces correctly; as long as subjects are in each other's fields of view, they will both be in the field of view of the camera.

Between the subjects is a pair of 5 x 7 in. beam splitter mirrors, each transmitting 70% and reflecting 30% of incident light. Light available for the subjects to see each other passes through the two mirrors and is reduced by the equivalent of 1 f stop, which is hardly noticeable. The reflected light is diverted into a TV camera; light at the camera is reduced by about 2 f stops from its initial level at the subjects' faces. Four front-surface mirrors (C-F) inside the box increase the overall subject-to-camera distance, thereby increasing the depth of field and making it easier to keep subjects in focus despite variations in seating distance. The TV camera records a picture of the faces of the two subjects side by side (Figure 3).

The box itself is simple to build. Left and right sides (from a subject's perspective) should be removable

for adjusting mirrors and camera. Mirrors are available from Edmund Scientific Company.

Before being placed in the box, the beam splitter mirrors are cemented together at right angles with silicon cement, with their reflective surfaces outside. Beads of silicon cement are allowed to dry and form gaskets along the top and bottom edges of the mirrors. The mirrors are placed in the box and held in position between two boards by friction. The front-surface mirrors are secured with tile tape to 1-in. boards, which are mounted inside the box with single screws in each end. Mirrors are positioned such that light going around the inside of the box to the TV camera travels perpendicular to the sides of the box. Final adjustment of the beam splitter mirrors is done by turning on the camera, holding a stick perpendicular to the box in front of each mirror, and changing the angle of the mirror until the stick appears to point straight out of the TV monitor. The inner side of the box behind the beam splitter mirrors (from the perspective of the camera)

Figure 2.

Figure 3.

is painted flat black to reduce stray light. The box is placed on 2-3 in. of boards or books to elevate the center of the opening to subjects' eye level. Of course, the box can be made larger. Adjustment for unusually tall or short pairs of subjects can be made by shimming the box up with books, journals, or reprints.

The TV camera is a standard Vidicon type with a 75-mm telephoto lens. This lens frames the faces as sketched in Figure 3. Normal room lighting supplemented with table or floor lamps set equidistant from the subjects at about eye level on both sides of the box provides enough light for an aperture setting of about 2.0 f stops. With this aperture a subject can move about 2 ft and stay sufficiently in focus for an observer to score eye movements.

Eye movements can be scored in considerable detail. To an observer viewing the TV picture, a subject who is looking directly forward appears to be looking straight out of the monitor. If voices of the two subjects are recorded on two audio tracks of the videotape, detailed studies of speech and gaze are possible. I have used this equipment to study left looking, right looking, and facial regard during various vocal states.

REFERENCE

- WELLENS, A. R. A device that provides eye-to-eye video perspective for interactive television. *Behavior Research Methods & Instrumentation*, 1978, 10, 25-26.

(Accepted for publication July 17, 1979.)