TECHNICAL NOTE

*A SYSTEM FOR THE CONVERSION OF A SLIDE PROJECTOR
INTO A VISUAL DISCRIMINATION APPARATUS¹*

A difficulty with the use of slide projectors for presenting visual discrimination problems is devising a system for arranging contingencies between responses and other events such as reinforcement. This paper outlines a system in which the slide projector is in series with the contingency program, an arrangement in which contingencies may be automatically established by a code on individual slides. The system described was added to a Sawyer 35-mm straight-magazine loading slide projector for a visual discrimination program containing four response alternatives and only one correct response for each visual discrimination slide.

¹This work was supported in part by the United States Defense Atomic Support Agency and by United States Air Force contract number F29600-67-C-0024. Reprints may be obtained from D. N. Farrer, 6571st Aeromedical Research Laboratory, Holloman Air Force Base, New Mexico 88330.

The system is described within the latter context, but it is adaptable to other straight-magazine loading 35-mm slide projectors (*e.g.*, Argus, Sears Roebuck) and a variety of visual discrimination problems.

The upper and lower plastic cradles which hold the slide once it has been entered into the projector were removed and replaced with phenolic cradles of the same dimensions as the originals (see Fig. 1). The plastic cradles can be used but they wear much faster than phenolic cradles.

The slide slot of the bottom cradle was lined with a strip of brass (0.01-in. thick) cemented into place (Fig. 2). A screw, tapped into the inside end of the cradle, held an overlap of the brass strip and served as a connector for wiring.

The original top cradle on the Sawyer projector is constructed with a pre-formed rectangular well in the upper part of the cradle (Fig. 2). The four 0.12-in. holes for the contacts were drilled from the floor of the

Fig. 1. Interior of part of the projector showing the slide cradles and the carriage arm microswitch. The slide carriage arm and other internal projector parts have been removed for clarity of presentation.

well into the slide slot. The phenolic cradles did not have the pre-formed well, so four 0.23-in. holes were drilled from the top of the cradle to within 0.05 in. of the slide slot and the 0.12-in. holes were then drilled into the slide slot.

Fig. 2. Slide cradle components.

Spring-loaded brass contacts, 0.55-in. long and 0.11-in. in diameter (Fig. 2), were then placed into the holes drilled in the top cradle. A 0.22-in. diameter lip was formed 0.66 in. from the tip of the contact to keep the contact from falling and to restrict movement of a light spring about 0.55-in. long which slipped over the contact. A 20-gauge stranded insulated wire was soldered to the top of each contact (Fig. 1).

The mounting board (Fig. 2) was not available as original equipment and had to be constructed. The phenolic board was 0.06-in. thick and had four 0.12-in. holes centered above corresponding cradle holes. Plastic pieces, corresponding to the indentations on the ends of the upper cradle, were attached with screws and plastic cement to the mounting board to insure rigid mounting on the cradle. When the mounting board was attached with screws and plastic cement to the upper cradle, 0.01 in. of the contact protruded into the slide slot. The

function of the mounting board is to keep the contacts in position and to maintain a slight compression on the contact spring.

A microswitch was mounted in the projector (Fig. 1) in such a position as to be closed by the slide carriage arm only when the arm was in the "slide-in" position.

The 35-mm slides used with this system must be encased in metal slide binders. The tops of the slide binders were coded with pieces of "Handi-Tape" plastic bandage, but any electrical insulating material can be used. A small piece of tape was placed across the top of the slide binder to correspond to the position of one of the four contacts.

The bottom cradle was connected with a positive line (Fig. 3). Each of the contacts was connected with individual reading circuits held at negative voltage by resistors. The aluminum slide binders were used as conductors between these two cradles. Differential voltages were obtained by insulating one of the contacts from the slide binder by means of the plastic tape on the top of the slide binder.

Fig. 3. Reading circuit and switches.

A reading circuit consisted of two 2-input AND gates and an inverter³ (Fig. 3). The signal from the contact was normal on one input of one gate and inverted on one input of the other gate. The response lever for that reading circuit was connected to the other inputs of the two gates. A lever response on a reading circuit would satisfy only one of the two gates to produce a correct or incorrect output. For

³DigiBits 200 series electronic components obtained from BRS Electronics, 5451 Holland Drive, Beltsville, Maryland.

example, if the contact that corresponded with the lever 3 reading circuit was insulated, it would be held at negative voltage. The negative voltage would invert to positive at the correct gate and remain negative at the incorrect gate. A pulse from lever 3 would satisfy only the correct gate and produce a positive output. The other three non-insulated contacts would be positive, via conduction from the bottom cradle, and pulses from the other levers would satisfy only the incorrect gates of each reading circuit if those levers were activated.

A positive level from the closed carriage arm micro-switch (Fig. 3) was gated with each of the response switches so that a response event could reach only a reading circuit when the slide carriage arm was in the "slide-in" position.

The output from the reading circuit can be used for a variety of functions such as the operation of counters, timer, and shutters.

The reliability of the system can be improved by

using the positive output from the reading circuit inverter to indicate which contacts are insulated from the slide binder.

The system described here has been in use in the 6571st Aeromedical Research Laboratory for about 2 yr. The first system used the plastic cradles which served for about 500,000 slide presentations. The system now in use has phenolic cradles and there is no sign of wear after approximately 500,000 slide presentations. The total cost of the cradle and contact materials is about 50 cents.

ALBERT R. MAEZ
ERNEST S. GRAHAM
GARY W. McVEAN
Washington State University
DONALD N. FARRER
Holloman Air Force Base