Behavior Research Methods & Instrumentation
1975, Vol. 7 (4), 389-390

NOTES

A timing light for use with super-8 film cartridges

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Observational studies of behavior and experimental studies involving visual analysis of movements or postures generally use cinemagraphic film or magnetic video tape for recording events in time. For cinemagraphic work (usually where the resolution afforded by video tape is not adequate for detailed observational analysis), the 16-mm format has been the traditional favorite. But recent advances in the state of the art of super-8 equipment make the latter worth considering in place of 16-mm. Besides being much more compact and convenient to use, super-8 cameras are available which feature interchangeable C-mount lenses, variable shutters, filming speeds as high as 70 fps (and reportedly as high as 250 fps on one specially manufactured model), synchronized sound tracks, and other rather sophisticated features. Super-8 film is also considerably less expensive to purchase and process, while utilizing proportionately more of the film area than standard 16 mm.

A time base is often an essential requirement for recording events in time in either format. This is particularly true when one is attempting to measure the speed or frequency of rapidly occurring events [e.g., social flight reactions in pigeons (Davis, in press); flea take-offs (Rothschild, Schlein, Parker, Neville, & Sternberg (1973); vibrissae movements (Larsson & Komisaruk, 1972); and sniffing movements in rats (Welker, 1964)]. In some cases, the camera's nominal filming speed can provide a time base, but its accuracy may vary too much from moment to moment to be of much value. Another approach is to place a clock or other timing device (e.g., a light pulsating at a known frequency) in the visual field of the camera. Although this solution is often suitable under most laboratory conditions, it becomes impractical when the camera's field of coverage is subject to change, as in tracking the position of a moving subject or in changing the focal length of a zoom lens.

Specialized high-speed cine cameras overcome this problem by mounting a neon lamp inside the camera so as to expose a portion of the moving film at a precise pulse rate. The super-8 film cartridge presents a serious obstacle to this approach since the film is completely encased except as it passes through the film gate. Modification of the film gate to accept a timing light hardly seems feasible due to the compactness, delicate nature, and expense of the components involved.

It is possible, however, to drill a hole in the cartridge at a more accessible point and mount a miniature light-emitting diode (LED) to expose a portion of the sprocket side of the film as it passes through the cartridge. The best location for doing this is on the edge beneath the identification label (see Figure 1), 13 mm from the label side and approximately 3 cm from the front edge. Depending upon one's particular needs, the timing blip can be located within the film frame, so as to be visible on the edge of the image when projected, or in the normally unexposed area containing the sprocket holes. (Blips in the latter location can still be easily detected and used as timing marks when the film is viewed on a manually operated movie editor.) Once the best location for the hole has been determined, the drilling of several cartridges can be facilitated by using a jig. The drilling procedure can be safely carried out in room·light since the size of the hole and the interior design of the cartridge prevent extraneous light from fogging the film. Care must be taken, however, that the drill bit does not penetrate more than 2 mm past the outside wall of the cartridge.

Because of the small dimensions of the film and, in many super-8 cameras, the snug fit of the cartridge compartment, the size of the LED is critical. A Monsanto MV50 LED is only 2.5 mm in diam and in height and is almost flush with the cartridge surface when inserted in a No. 49 drill bit hole and taped in

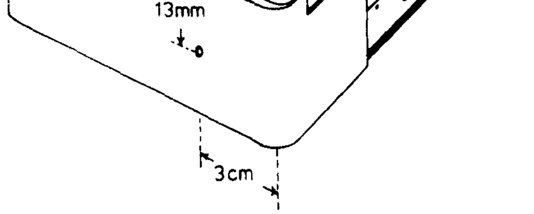

Figure 1. Location for mounting the LED. Due to the distance between the LED and the film gate, the light blip appears on the film 14 frames ahead of the image that was actually exposed at the moment the timing pulse occurred.

I thank E. T. Regan for designing the timing circuit and assisting in developing and testing this device. I. Lloyd also provided consultation on the circuit design. This work was supported by USPHS Grant 1 R03 MH25659-1. My present address is: Department of Zoology, South Parks Road, Oxford OX1 3PS, England.

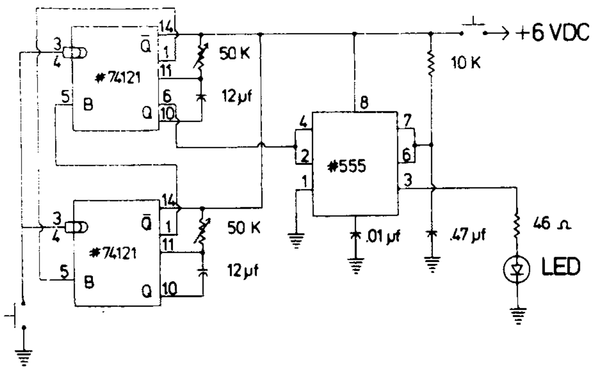

Figure 2. Schematic diagram of the timer circuit. Power is supplied by four 1.5-V AA alkaline batteries (Mallory MN1500 or equivalent). Average current drain: 50 mA.

place. Due to its proximity to the film, the blip it exposes is about the same size as the LED itself. Connecting leads to the LED can be either small gauge round wire or ribbon wire. The latter may be preferable if the leads are to pass around the edge of the door to the camera's film compartment. For some cameras, however, it may be more convenient to drill a hole, or modify an existing one, and use a miniature phone jack connection between the timer output leads and the LED input leads.

A schematic circuit for pulsing the LED is shown in Figure 2. In addition to the switch for the power supply, a switch is needed for the two oscillator ICs (No. 74121) to prevent occasional "lock-ups." Adjustment of the pulse rate and pulse duration is made through the potentiometers for the two oscillator units. Since pulse frequency and duration tend to interact in this design, adjustment must be made by trial and error, using an oscilloscope, until the desired values are obtained. Experience has shown that a pulse duration on the order of 5-10 msec provides acceptable exposure of Kodachrome-II, Plus-X, and Tri-X movie films. A pulse rate of 2/sec has been found satisfactory for filming at speeds from 18 to 70 fps, but a faster frequency might be preferable if high filming speeds are to be used exclusively. The precision of the settings seems to be quite stable, not varying detectably over a minimal period of 5 months.

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ERRATUM

Johnson, J. H., Cole, E. B., & Williams, T. A. PROSE: A simple user-oriented program for computer constructed narratives. Behavior Research Methods & Instrumentation, 1975, 7 (3), 309-310. The part of the paper containing Page 10 was inadvertently omitted in the printing of the issue. It is now produced below. We apologize for the error.


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The patient is a 24 year-old single male who was seen for
evaluation on April 1, 1974 by Barbara Hoff.  At the time of interview
his appearance and behavior were not appropriate to the situation.
Posturing, silliness, and agitation were noted.  The patient was
oriented for time, place, person.  He was not cooperative during the
evaluation.
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Figure 5. Output report; observations.

Several other features should be mentioned. Text insertion points need not be in numerical order or in the same order as the list of insertion points in the narrative. Text insertion points must have an associated number that is greather than Ø. A Ø identifying number is considered a dummy insertion point and is skipped by PROSE. A dummy insertion point is useful in delimiting text within the scope of a Skip command. Using Skip, the user can conditionally include or exclude text.

Availability. A program listing and documentation developed by Mr. Cook are available without charge from James H. Johnson, Psychiatric Service, VA Hospital, Salt Lake City, Utah 84113.

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