A "DIRECTION OF MOVEMENT" MEMORY

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In certain experiments it is imperative to know in which of two possible compartments an experimental animal is located. Valenstein and Myers, 1964 used the depression of a microswitch by the animal's weight to record its location. The microswitch was mounted under a spring-loaded platform, which had to be adjusted to the weight of each animal. Also, food became jammed under the platform which interfered with its operation.

Another method, that works on the principle that a relay "remembers" which one of the two adjacent light beams was interrupted last, has been developed at this laboratory. The absence of moving parts simplifies its operation and eliminates tactual feedback. The general principle seems applicable to most situations in which bidirectional movement of subjects is recorded. Although it was discovered that the power supply voltage should never fall below 27 v or rise above 32 v, the device is reliable when operated with the proper voltage. The experiment operated 160 hr with one cross over per minute, without any failures being observed.

The Plexiglass testing chamber was 16 by 10½ by 14 in. and was divided lengthwise into two equal compartments by a 2-in. high barrier. The photocells (Delco, Type LDR-25, on heat sink) were placed on the sides 4 in.

from the barrier, with the light source mounted directly across from them. As the rat moved from one compartment to the next, it would interrupt one of the two photocells, thus indicating direction of motion. This would be clearly shown on the indicator panel where lamps I₁ and I₂ are mounted. The rat's speed was controlled by the barrier, which it had to climb, allowing relays the required 15 msec to operate and the 10 msec to release.

When photocell PC1 is blocked from its light source, its internal resistance becomes high, causing relay K₁ to de-energize. This allows the arm to move to the normally closed position, energizing relay K₃, because ground is provided to the coil through this connection. As this happens, pins 6 and 8 of relay K₃ make contact and provide ground to lamp I₁ indicating which chamber the animal is in. Pin 6 can also serve as an output to trigger a stimulator, or recording time of stay. If the animal should move away from photocell PC1 its internal resistance will decrease, because the light source is restored, and relay K₁ will become energized. Lamp I₁ will stay illuminated because relay K₂ is the memory relay and will stay energized, since ground is now being supplied by relay K₄ pins 1 and 4.

The circuit will remain in this state until the animal blocks photocell PC2 which increases its internal resistance allowing relay K₂ to de-energize. This provides, through the normally closed position of this relay, a ground path to energize relay K₄. When this happens the ground connection is broken to the coil of relay K₃, and lamp I₁ goes out. Lamp I₂ is now on, because ground is supplied to it by pins 6 and 8 of relay K₄. This relay is also a memory relay and will stay in this position until photocell PC1 is again blocked.

REFERENCES

- Valenstein, E. S. and Myers, W. J. Rate-independent Test of Reinforcing Consequences of Brain Stimulation. *J. comp. physiol. Psychol.*, 1964, 57 (1): 452-60.