Seeing Eye – *Flexi-vision*

THE Seeing Eye (see Fig.1 – sorry about the pun!) responds to minute fluctuations in light level, auto-adjusting over the range of about 200 lux to 10,000 lux (a modestly lit room to bright shade).

Since virtually every motion around us causes such fluctuations (except when it is dark), it has a very wide range of possibilities. It will respond, for instance, to a car entering a driveway, a person moving in a room, or wind rustling the leaves of a tree. It has a high level of rejection of natural light variations, such as sunrise, sunset, or the movement of clouds.

Flexible response

While this is a 'passive' system, it may also be used as an 'active' system – that is, in conjunction with a light beam. Its great advantage here is that, since it responds to *fluctuations* in light level, rather than the crossing of a specific light threshold, it is much more flexible than a typical 'active' system. It may be placed within the line-of-sight of almost any light source, including vague ambient light, and simply switched on without any adjustment.

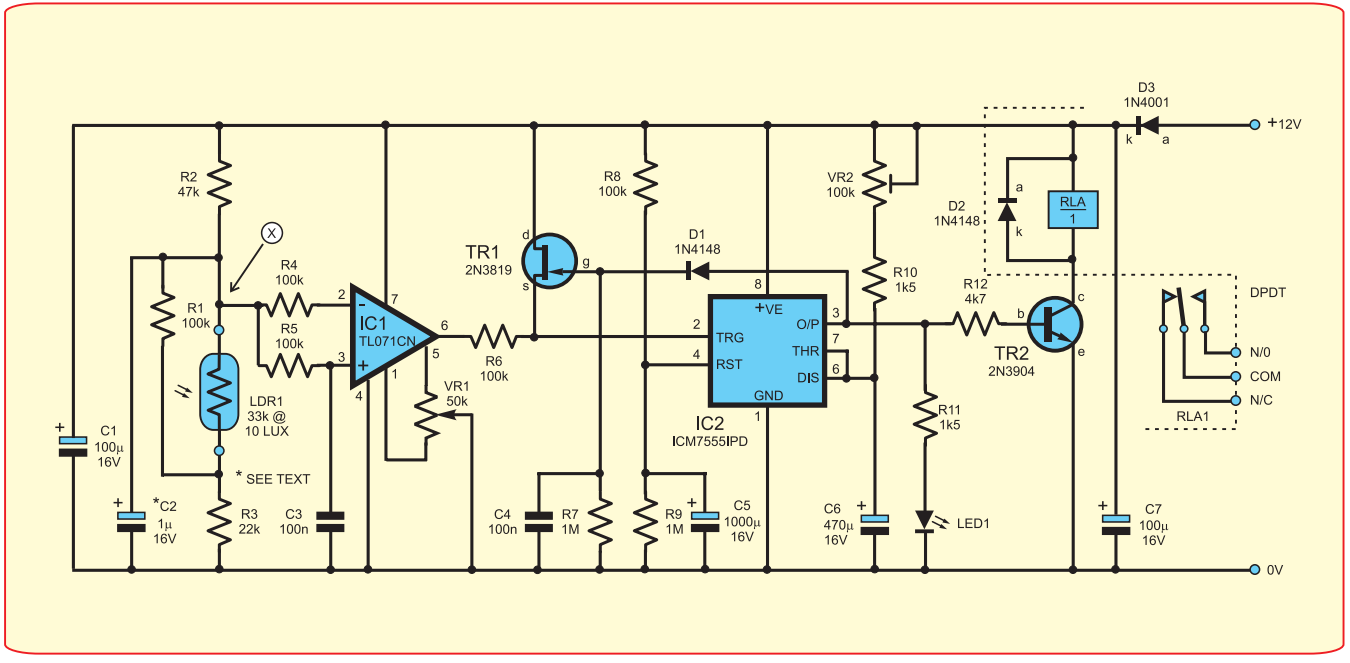

Fig.1.Complete circuit diagram for the Seeing Eye

In daylight, the circuit will typically detect a single finger moving at a distance of two metres – without the use of any lenses. It will also detect a person crossing a path at 10 metres distance – without lenses. Under AC lighting, as an 'active' system, it will typically detect a person walking in front of an ordinary light source at more than 10 metres – without the use of lenses. This range is achieved by sliding a black tube over the light dependent resistor (LDR) as shown in Fig.2.

Circuit description

The full circuit diagram for the Seeing Eye is shown in Fig.1. The light-dependent resistor (LDR1) is wired in conjunction with resistors R1 to R3 so that, between darkness and full sunlight, it offers a potential at point *X* of between roughly one-quarter and three-quarters of the supply voltage.

The present circuit differs from the more usual 'passive' light sensor in that it uses the offset-adjust feature of comparator IC1 to balance the inputs instead of a potential divider. This makes for a more sensitive and reliable circuit. A wide variety of sensors may be used in place of the specified LDR, including phototransistors, photo-diodes and infrared and ultra-violet devices.

The potential at point *X* is presented simultaneously, through resistors R4 and R5, to the inputs of comparater IC1. As the potential fluctuates at point *X*, the changes in potential are delayed at the comparator's non-inverting input (pin 3) through capacitor C2. Thus an imbalance occurs, causing the output of the compator to go 'low'. Hence, monostable timer IC2 is now triggered, switching relay RLA. Timer IC2 may be adjusted by means of trimpot VR2, to hold the relay closed between about three and 30 seconds.

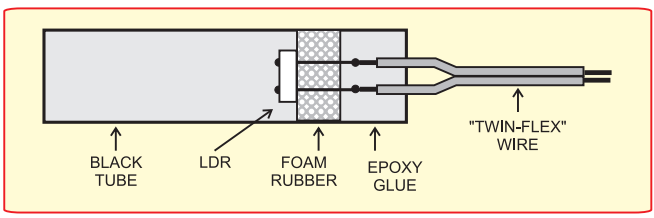

Fig.2.Suggested method for fixing the LDR inside a black plastic tube for increased range

Problems solved

As with all such circuits, the Seeing Eye may not work as well under AC lighting compared to natural lighting. If AC lighting should prove to be particularly problematic, a capacitor (say 1μF) may be added between point *X* and 0V, to smooth the potential presented to comparator IC1's inputs.

Because the circuit is very sensitive, a special problem presents itself in the form of relay RLA, which carries a relatively heavy current when switched by monostable IC2. This would ordinarily upset the circuit and reduce its sensitivity.

Beside the use of supply decoupling, this problem is overcome by 'blanking' the relay's action through transistor TR1, which disables the trigger input of timer IC2, thus allowing the circuit to settle after relay RLA has disengaged. The 'blanking' also makes it possible to run external circuits off the same power supply as the the Seeing Eye. Current consumption is nearly 20mA on standby, so that unless the circuit is run off a car battery, a 12V 'plugpack' adapter is recommended.

Setting up

Switch on, and wait for the circuit to settle and come to life (capacitor C5 first needs to charge). Adjust potentiometer VR1 for good sensitivity. The Seeing Eye will work best in situations of good contrast (eg, shadows on a white wall). It would be best to adjust it to less than its maximum sensitivity, to exclude any unwanted triggering.

With some experimentation, it may be set to transition seamlessly from natural to AC lighting – but this, unfortunately, will not occur at maximum sensitivity for both. If maximum sensitivity under natural lighting triggers the circuit under AC, then adjust for maximum sensitivity under AC – and vice versa.

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