Running Text Display with Seven LEDs

By F. Wohlrabe

In the search for original running text displays that catch your eye, manufacturers keep coming up with interesting variations that combine maximum functionality with minimum cost.

Conventional running text displays use various sizes of arrays of light-emitting diodes or other optical display elements. For example, the Running Text Display described in the February 2000 Supplement of *Elektor Electronics* contains a total of 245 LEDs (7×35) in order to be able to display up to six characters at the same time. In order to keep current consumption, wiring effort and component costs within limits, the light-emitting diodes are operated in multiplexed mode in nearly all running text displays. This means that individual rows, consisting of seven diodes arranged in a vertical line, are driven at a rate of 1000 Hz (for example) and thus are lit for only around 1 ms.

In **Figure 1**, you can see that power is applied to the first row at time t_1 and the information to be displayed is output at the same time (two LEDs on). After one millisecond, row 1 is switched off and row 2 is driven with the information that it has to display. The desired information is complete after 5 ms. Although only seven LEDs at most are driven at the same time, the visual inertia of the eye causes you to see an image composed of many more points of light.

In spite of multiplexed operation, it must be possible to drive each row separately, which requires a not inconsiderable amount of driver ICs or power gates. However, things can be made even simpler, as far as the electronics are concerned, if we want to have running text that appears to float freely in the air. The inertia of the eye is also exploited here to combine many individual images into a single pattern. The image shown above ('Good morning') is built up using only seven LEDs. The trick here is to repeatedly displace these diodes by a small amount in order to display the desired information. In this case, electronic components of the previously mentioned running text display are partly replaced by mechanical components. A circuit board that carries the LEDs arranged in a vertical line is moved quickly back and forth by a motor. The total displacement is divided into small segments using software, with specific data to be displayed by the LEDs being assigned to each segment. The start of a sweep can for example be optically signalled to the microcontroller by a light barrier detector, or magnetically signalled by Hall sensors.

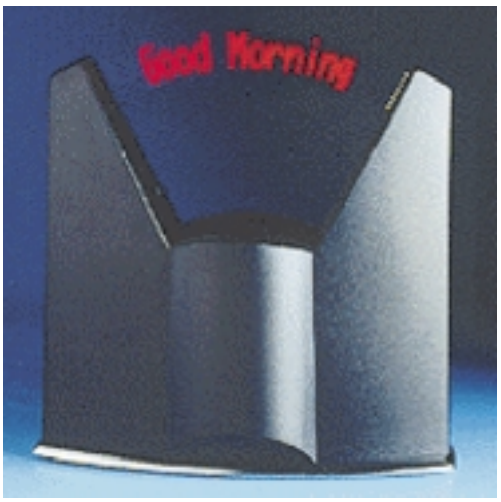

Figure 2. 'Free-floating' running text.

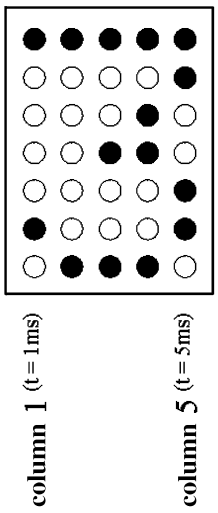

Figure 1. Driving the rows of a running text display.

Figure 3 shows how the numeral '3' is displayed using seven LEDs. The starting signal for the microcontroller to output a pattern is the switch closure, and LEDs 2 and 7 (counting from the bottom) are driven at this time. Every following millisecond, when the circuit board has moved a few millimetres, a new pattern is sent out.

The amount of information that can be displayed depends on the length of the circuit board and how far along the circuit board the LEDs are located. The mechanical robustness of such a system is naturally a good indication of its life expectancy, and thus its quality. In order to produce a clean, stationary image that does not

appear ‘washed out’, the display board must be moved at a high speed so that only the LEDs are visible, and not the circuit board.
There are even ‘breakdown help batons’ available for car drivers. These are fitted with seven LEDs and are supposed to be waved manually back and forth in front of the body. When they are moved this way, they generate the message ‘Help’, by means of which the hapless driver of a broken down vehicle can call attention to himself or herself (note that is may not be allowed in all countries in which *Elektor Electronics* is published — *Ed.*)
To find out more about what can be displayed using only seven LEDs, look at the home page of Bob Blick at http://bobblick.com/bob/projects/. It explains the mechanical and electronic construction of clocks and running text displays that operate on the principle described here.

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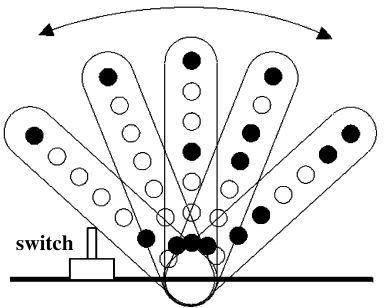

Figure 3. Basic motion of the carrier circuit board with seven LEDs.