three-eyed bandit

From time immemorial man has played games of chance. In primitive societies the men often sat around throwing dice or playing other games while the women did the work. Nowadays, alas, this situation no longer exists, but modern technology has considerably widened the scope of games of chance so that a whole range of 'gaming machines' can be seen today.

The most common type of mechanical or electromechanical gaming machine is the 'one-armed bandit' or 'fruit machine'. In such machines three cylinders bearing numerals or symbols are set into rotation simultaneously by pulling a handle or pressing a button. The cylinders ultimately stop or can sometimes be stopped by the player and the combination of symbols appearing in a window when the cylinders have stopped determines whether a win has occurred and the magnitude of that win. The less probable combinations are, of course, awarded the higher prizes.

The 'Three-eyed bandit' described here works on the same principles but is completely electronic. Instead of mechanical drums there is a display of three columns of four lamps. When a start button is pressed the three columns of lamps flash until individually stopped by three stop buttons. A win is indicated when a row of three lamps is lit and the magnitude of the win depends on which row is lit.

Referring to figures 1 and 2 the system operates as follows. Each column of lamps is driven by an oscillator, a decade counter and a decoder. The oscillators are independent and of different frequencies. The three oscillators are started simultaneously by the start button and are stopped individually by three stop buttons. The rate of flashing of the lamps is sufficiently high so that no cheating can occur when pressing the stop buttons. Pressing the start button also resets the counters.

The weighting of the various combinations is achieved as follows. Referring to the column marked X in figure 1 the decoding is arranged such that L4X lights 4 times in a cycle of ten pulses from the oscillator, L3X lights 3 times, L2X lights twice and L1X lights once. The decoding is mutually exclusive, that is only one

Table 1

COUNT	D	C	B	A	L_1	L_2	L_3	L_4	LAMP LIT
0	0	0	0	0	0	0	0	1	L_4
1	0	0	0	1	0	0	1	0	L_3
2	0	0	1	0	0	1	0	0	L_2
3	0	0	1	1	1	0	0	0	L_1
4	0	1	0	0	0	0	0	1	L_4
5	0	1	0	1	0	0	1	0	L_3
6	0	1	1	0	0	1	0	0	L_2
7	0	1	1	1	0	0	0	1	L_4
8	1	0	0	0	0	0	0	1	L_4
9	1	0	0	1	0	0	1	0	L_3

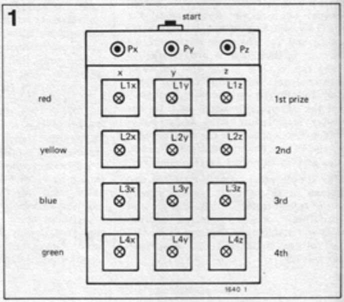
Table 1. The truth table for the lamp decoding. The Boolean functions for the four lamps in a column are as follows: (referred to the BCD outputs of the 7490)

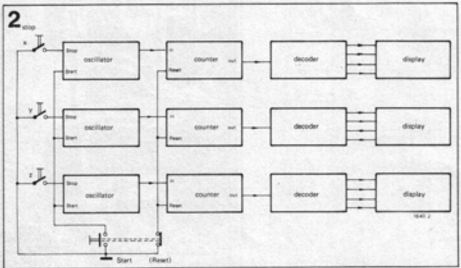
$$L_1 = A \cdot B \cdot \overline{C} \qquad L_3 = A \cdot \overline{B}$$
$$L_2 = \overline{A} \cdot B \qquad L_4 = A \cdot B \cdot C + \overline{A} \cdot \overline{B}$$

Figure 1. Suggested front panel layout for the Three-eyed Bandit.

Figure 2. Block diagram of the Three-eyed Bandit.

Figure 3. The complete circuit of the Three-eyed Bandit.





lamp is lit at any time. It is therefore obvious that when the stop button is pressed it is most probable that L4X will be alight and least probable that L1X will be lit. The respective probabilities are:

$$P_{L4} = 4/10$$
$$P_{L3} = 3/10$$
$$P_{L2} = 2/10$$
$$P_{L1} = 1/10$$

This is true for all three columns of lamps. The probability of all three lamps in a row being lit simultaneously is given by the product of the individual probabilities thus:

$$P(\text{row } 1) = P_{L1X} \cdot P_{L1Y} \cdot P_{L1Z}$$
$$= 1/10 \cdot 1/10 \cdot 1/10$$
$$= 1/1000$$

Similarly

$$P(\text{row } 2) = 2/10 \cdot 2/10 \cdot 2/10 = 1/125$$
$$P(\text{row } 3) = 3/10 \cdot 3/10 \cdot 3/10 = 1/37$$
$$P(\text{row } 4) = 4/10 \cdot 4/10 \cdot 4/10 = 1/16$$

Since the probabilities of all the lamps in row 1 being lit is the smallest row 1 obtains the highest prize. Of course a win need not be awarded just on a complete row. Wins could be awarded for part rows as in a mechanical one-armed bandit where a prize might be awarded for two 'oranges' in a row. All that is needed is to calculate the probabilities of a particular combination and award prizes or points such that the lower the probability the larger the prize.

The operation of the circuit is as follows. Only column 1 will be described as the others are identical. In figure 3 N_3 and N_4 form an astable multivibrator. N_1 and N_2 form a set-reset flip-flop. When the flip-flop is reset by P_X the output of N_1 is low. Pin 10 and pin 12 of N_3 and N_4 respectively are held low, the outputs are thus high so the astable will not start. When the start button is pressed the flip-flop is set and the astable starts, thus driving the 7490 decade counter until the stop button P_X is pressed. The output of the counter is decoded in accordance with the truth table of table 1. Note that a '1' under a lamp number indicates that the lamp is lit. Note also that the lamp driver transistors $T_2 - T_4$ are NPN, whereas T_1 is PNP. Therefore when a '1' appears at the output of N_{13} L_1 will go out, whereas when a '1' appears at the output of N_{12} for instance, L_2 will light. T_1 thus inverts the output of N_{13} as far as lighting the lamp is concerned.

Warning: This Three-eyed bandit is intended for private amusement only. There are very strict laws in the U.K. governing the use of gaming machines for money and other prizes in clubs, public-houses &c. – Ed.

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