MANY MOTORS

In the previous instalment of Workshop, we showed you how to connect a servo motor to a user port via the buffering system developed earlier in the course. There are eight data lines on a user port, however, and each of these could be connected to a servo motor. Here, we look at how to control several servo motors simultaneously.

There are eight data lines that may be connected to motors, although only four can be used by the buffer box that we have designed. All eight lines could be used by duplicating the output box circuitry for the other four lines.

To control eight motors simultaneously, the algorithm for a single motor that we developed on page 894 must be subtly altered. The pulses are all started together, but the second wait loop is replaced by a look-up table. 255 memory locations are reserved for the table and are all set initially to 255 ($FF).
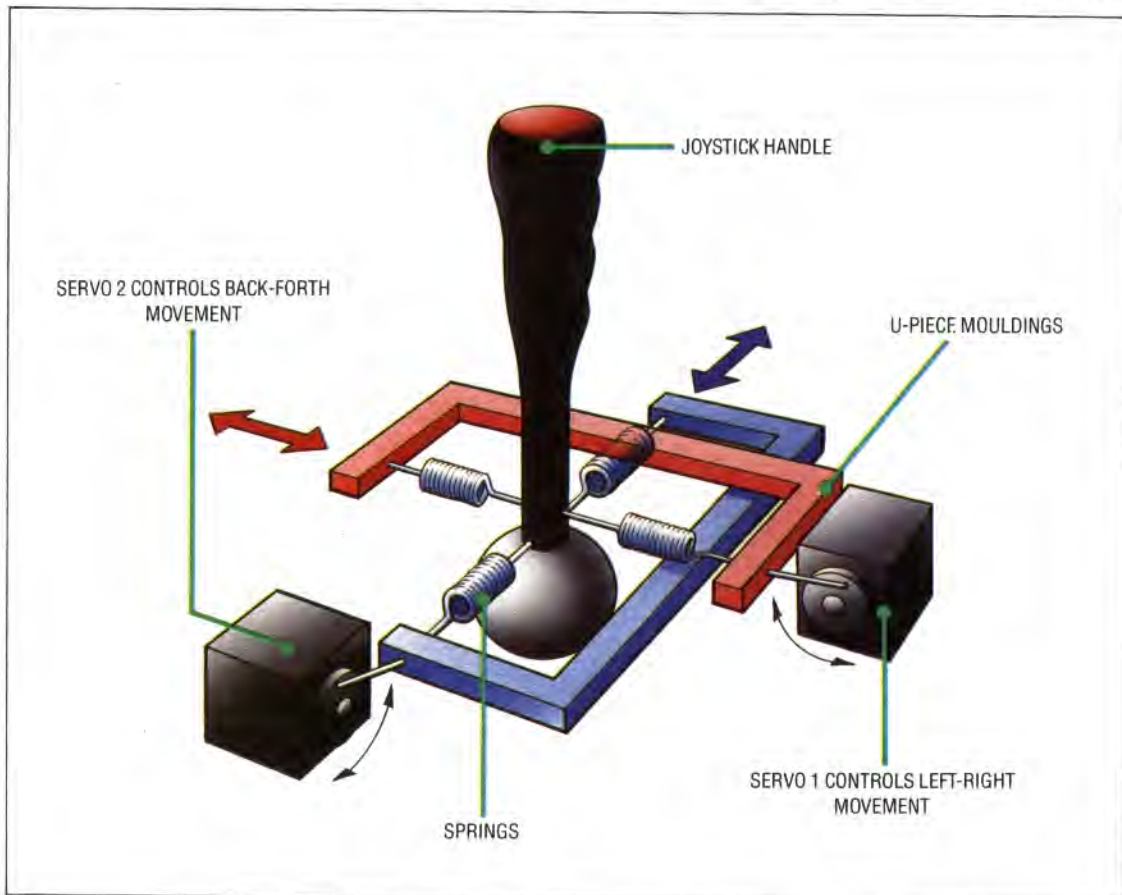
The exceptions — when a motor is switched off — are then entered into this table. For example, if data line 2 is to be turned off after a count of 20,

the 20th entry in the table will be altered from binary 11111111 ($FF) to binary 11111011 ($FB). Notice that in the Assembly listing, this is done by ANDing with the value already in the table. Once all eight exceptions have been entered in the table, the wait loop is started, but this time each element of the table is ANDed to the user port.

The algorithm for multiple motor control is:

1) Specify the angle of each motor by storing the angles in eight bytes (ANGLE+0 to ANGLE+7).
2) Set all user port data bits high to start the pulses together.
3) Insert the exceptions into the look-up table.
4) Wait for one millisecond.
5) Load the accumulator with binary 11111111 ($FF). Then AND the accumulator with each element of the look-up table in turn. When an exception is encountered, the appropriate bit will turn off. Since the ANDing continues to the end of the table, this bit will remain turned off to the end.
6) Set the exceptions in the table back to binary 11111111, ready for the next pulse.

The listings given for the BBC Micro have the same initial routine (lines 10 to 280) in both

JOYSTICK HANDLE

SERVO 2 CONTROLS BACK-FORTH MOVEMENT

U-PIECE MOULDINGS

SERVO 1 CONTROLS LEFT-RIGHT MOVEMENT

SPRINGS

KEVIN JONES

Joystick Feedback
Joysticks are normally used to provide directional information to be used by software. A possible computer application for servo motors is to use them to allow controlling software to feed back information to the joystick handle. Two servos are used to push and pull the handle in each horizontal plane, providing important feedback data in sophisticated flight simulators. A joystick that 'kicks' under the hand in response to a control movement by the pilot improves the simulation by providing tactile, as well as visual, information to the user