

gravity and big rubber tyres and it can even climb up a wall and turn itself over, then continue driving. The car is moving on its own, and is independent of human control, but can it truly be called a robot? The answer, fairly clearly, is 'No', but it is crucial to our study of robots to understand why this is so.

Robot movement, as we have seen, can fall into two categories: simple movement under program control, and intelligent movement. The key to both is programming. Our motor-driven car cannot be a robot because it cannot be programmed to move in different ways. It has a set pattern of operations built into it mechanically, but it cannot respond to human commands and it has no means by which a human controller could generate alternative motion. An interesting variant on this point is the motor-driven car, lorry, or other object that can be programmed by

punching a pattern onto a card. The card is read mechanically and the car follows the pattern, turning left or right or continuing straight ahead in accordance with the instructions on the card. By our definition, this type of car would be a robot because it can be programmed with the punched card software. The need for programmable movement eliminates many other small, inexpensive products from the label 'robot'.

Several other considerations can be applied. Does the object have sensors to give it input from the outside world? Can it respond to its environment and create a changing internal model? Can it play a good game of chess? Any of these criteria can be applied to our robot but, in the final analysis, the element of programmable movement is crucial.

The following products, all billed as robots, are available from stockists for less than £200.



**NAME:** Beasty  
**TYPE:** Robot Arm  
**PROGRAMMABLE:** Yes  
**SOFTWARE PROVIDED:** Yes  
**SENSORY FEEDBACK:** Positional feedback  
**PRICE:** £110, complete  
**DISTRIBUTORS:** Commotion Ltd, 241 Green Street, Enfield, Middlesex EN3 7SJ

The Beasty receives its commands from the user port of the BBC Micro and is powered from the BBC's auxiliary power supply. It is supplied in kit form, and includes three servo motors. Also supplied are two manuals, a construction booklet and an operating manual. The Beasty comes with its own operating system — Robol — that allows the user to move each of the servo motors independently. (See page 770 for a more detailed review.)



**NAME:** Hebot II  
**TYPE:** Floor Robot  
**PROGRAMMABLE:** Yes  
**SOFTWARE PROVIDED:** Yes  
**SENSORY FEEDBACK:** Tactile  
**PRICE:** £95 (kit), £169 (assembled)  
**DISTRIBUTORS:** Powertran Cybernetics Ltd, West Portway Industrial Estate, Andover, Hampshire, SP10 3NN

The Hebot II is a robot turtle that is driven by DC motors connected to two wheels. The turtle is interfaced to the edge connector on the Sinclair ZX81, although the manufacturers claim that with some rewiring the Hebot can be made to run from any home micro. The Hebot II comes in kit form with construction booklet. The turtle has a retractable pen and four collision detectors to provide tactile feedback. Power is provided directly from the computer.