FITTING THE BILL

As we continue our series on the topic of robotics, we examine some of the products sold commercially under the name 'robot' to see if they fill the role expected of them, and if they fit our carefully constructed definition of the term.

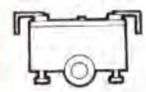
Up to this point in the Robotics series, we have dealt primarily with theoretical considerations of robot design and operation. In practice, many of the concepts discussed have not been implemented, or are restricted by a lack of funding, intricate mechanical parts, and/or intelligent software. Existing robots, whether they are intended for home or industrial use, tend to fall short of what we have come to expect of robots over the years. Sensors exist to make a robot see, hear, or feel, but as yet the sensations the robot experiences have no meaning for it, and cannot be synthesised to stimulate the robot to original, non-programmed behaviour. Robbie the Robot and his other fictional counterparts are still a long way from reality.

Nevertheless, many products are now being sold under the name 'robot'. These range from small toys for under £1 to vastly expensive R2D2 lookalikes and industrial robots. After examining the components of robot design and theory for several instalments, we must now consider what constitutes a true robot. We must not be too demanding, but we should be able to take what we know and apply it in a workable definition.

The first consideration, and one that eliminates many of the lower-priced 'robot' products, is movement: can the robot move about a space by itself? We cannot expect the robot to program itself, or to set a course of action without human guidance, but we can expect a robot, once set in motion, to be able to operate independently of continuous human control. Without this freedom of movement, an object cannot be considered a robot.

Having passed the test of movement, our robot candidate must now be evaluated on the basis of how the movement is effected. A small toy car can be given a motor and batteries that keep it moving in a straight line. Add bumpers to it, and the car can turn away from obstacles such as walls and tables. Give the car a slightly unusual centre of

Spot The Robot



Our Robot
Powered and controlled from its parent computer, the robot is equipped with touch- and light-sensitive sensors

Big Trak
LOGO-like distance and direction instructions can be programmed into this microprocessor-driven device through its keyboard

Bumper Car
This battery-powered toy will run in a straight line until it hits an object, in which case it will turn clockwise 90° and continue

STEVE CROSS

Amazing Tracks
The three devices are attempting to run a maze: the toy car simply blunders from wall to wall, Big Trak follows its human operator's programmed instructions for running the maze, while our robot learns the maze through the interaction of its software and sensors. We can be sure that the robot will solve the maze eventually, no matter what happens; Big Trak will follow its program, so may solve the maze if the operator's directions are correct; the toy car could solve only 'right-handed' mazes, and then only by chance.

When the car collides with Big Trak, the car is unaffected since its behaviour is purposeless; Big Trak, however, is diverted 90° off its course (shown in green) but continues to turn and travel as if it were still on track (shown in red). Both devices react unintelligently to this unforeseen event where the robot would treat it as just one more aspect of an unpredictable environment