MEASURE FOR MEASURE

We return to our Workshop robot project to design a piece of software that will allow the robot to locate and accurately measure one side of a straight-sided object.

To allow our robot to locate and measure the side of an object requires a reasonably sophisticated piece of software. The robot will probe the object using the microswitch sensors that we fitted on page 876. Our first thoughts about a possible method of accomplishing this task were:

1) Find the object.
2) Find one end of the side located.
3) Probe along the side of the object until the other end is met.

The first stage can be accomplished easily if we assume that when the program starts the robot is pointed at the side of the object we want to measure. The main problem that can be foreseen is that the robot may catch one end of the side with a single sensor rather than make contact with both sensors. The possible variations are shown in the diagram. However, even if only one front sensor is closed, it is possible to tell whether it is the left or right sensor, and, therefore, we can develop a strategy to deal with this situation.

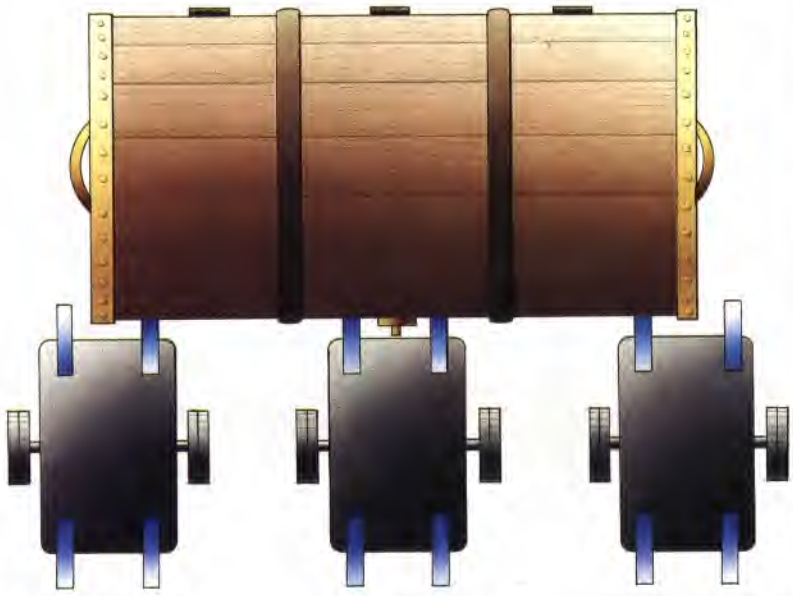
We must also make the assumption that the robot is initially positioned at 90° to the object side to be measured. This avoids our having to deal with cases where the robot makes an oblique contact with the object.

The second stage in our method is simplified so that the robot always moves to the right-hand end of the object before starting to measure it. To locate the right-hand end, the robot must 'feel' its way down the side, moving in discrete steps to the right until only the left sensor (rather than both) closes. In order to probe down the side, the robot has to perform a complicated series of manoeuvres — each step involving five movements. Assuming that the robot is initially in contact with the side of the object, then it must reverse back, turn through 90°, move forward a certain distance, turn back 90°, and finally move forward until the sensors again make contact with the object. The diagram shows the steps involved in the full manoeuvre. The 'step-length' (the distance between one contact point with the object's side and the next) is equivalent to the part of the manoeuvre when the robot moves parallel to the object's side.

To locate accurately the right-hand end of the object, it would appear that the robot would have to probe along the side in steps of a few millimetres, but this is unnecessary. Instead, we can use larger steps, probing down the side of the

Feelings . . .

This diagram shows the three alternatives that could occur when the sensors come into contact with the side of an object. When only the right-hand sensor is closed, the robot has detected the left-hand end of the side; if both are closed, it 'knows' that it's somewhere in the middle; if only the left-hand sensor is closed, it has stumbled on the right-hand end of the side



Right sensor only closed | Both sensors closed | Left sensor only closed

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