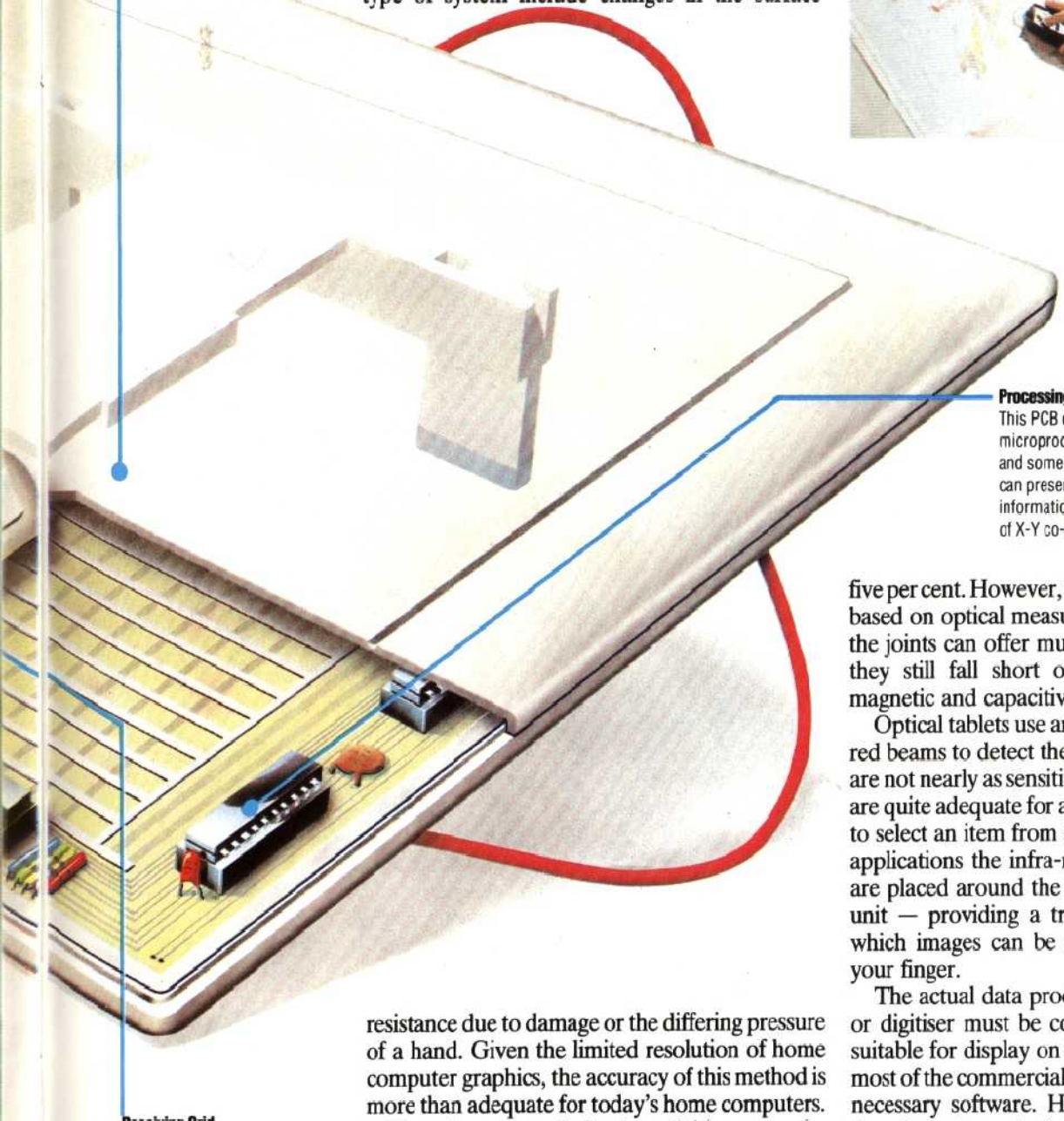
through the object.

At the lower end of the scale is the pressure-sensitive tablet: the image is placed on it and then traced with a stylus. This requires more pressure than the other systems. Two electrically conductive sheets are separated by a cellular insulator and two different high-frequency signals are fed into the layers. The signal detected by the stylus when it makes an electrical connection between the two sheets provides a measure of its position. Typical problems encountered with this type of system include changes in the surface resistance due to damage or the differing pressure of a hand. Given the limited resolution of home computer graphics, the accuracy of this method is more than adequate for today's home computers.

The cheapest and simplest digitisers are the pantographs — based on the principle of the old-fashioned drawing aid, constructed from linked arms. They use co-ordinate geometry to provide a direct measure of the position of the stylus. Variable resistances mounted at the two joints provide voltages proportional to the angles in the 'shoulder' and 'elbow' of the jointed arm. The resolution of the pantograph is limited by the accuracy of both the variable resistances and the mechanical linkages; typically it is only around five per cent. However, sophisticated pantographs based on optical measurement of the rotation of the joints can offer much better results although they still fall short of the capabilities of the magnetic and capacitive systems.

Optical tablets use an intersecting grid of infra-red beams to detect the position of a stylus. They are not nearly as sensitive as the other systems but are quite adequate for allowing a finger to be used to select an item from a program menu. In some applications the infra-red sources and detectors are placed around the edge of the visual display unit — providing a truly interactive screen on which images can be drawn simply by moving your finger.

The actual data produced by a graphics tablet or digitiser must be converted into information suitable for display on the screen and to this end most of the commercial products come with all the necessary software. However, just entering the data isn't the end of the usefulness of graphics tablets. Once the information is stored in the computer the tablet can be used as an editing tool, allowing colour to be added or changed and shapes to be modified. The surface of the tablet can be programmed to act as a menu that selects standard options from the program so that the keyboard need only be used for selecting the main functions. Computer animation systems (see page 181) all have a high-quality graphics tablet as their main form of input.



Baseboard
The image to be digitised is placed flat on this board. On some systems, an electrostatic charge is applied to the board to 'glue' the paper temporarily flat. It is very important that the image doesn't move relative to the board

Processing Board
This PCB contains a microprocessor, some ROM and some RAM. This is so that it can present the computer with information in the form of pairs of X-Y co-ordinates

Receiving Grid
Embedded in the baseboard is a grid of wires that can pick up the signal given out by the coil. The spacing of the grid is considerably coarser than the finest resolution of the digitiser, because the processing circuitry can interpolate from the relative strength of the signal picked up by adjacent wires

SIMON LEWIS

Mapping It Out
One of the most widespread professional uses for digitisers is collecting data from maps and surveys. Here, the computer is being used to predict the location of new oilfields from digitised geological data