

The write idea

A digital pen tracks and records its own movements – making it possible to know what is written, when, and even by whom.



It is the most advanced data input screen ever developed. It offers high resolution, perfect contrast, and costs a fraction of a penny to produce. Any graphical interface can be printed on it, and people get years of full-time education, paid for by the government, to learn how to use it. It will not be beaten in our lifetime. It is, of course, paper.

It is also ubiquitous – as almost every organisation trying to improve efficiency and reduce costs knows. In spite of the dreams of the 1980s visionaries who forecast the imminent arrival of 'the paperless office', paper is still a mainstay of any business. It may be expensive to handle and store, it may not be searchable like a database, it may not integrate into back-office systems, and it may be difficult to edit the content it stores; but for all this, paper still remains far too useful, simple and cheap to be entirely replaced by computers.

What businesses need is a way for the data-processing capabilities of computers to be added to pen and paper, without the complexity or expense of having to scan all their documents. And in spite of years of work on digital paper at research laboratories, such as the Massachusetts Institute of Technology and Xerox Parc, no-one has yet come up with a solution to that. Commercially, the best solution to date is probably the expensive and clunky Tablet PC.

But there is another approach, and it may be the one that finally begins to close the divide between paper and computers: the digital pen. This device is able to track and record its own movements, so that any handwriting is captured as digital coordinates. From there, it can be converted into handwriting, data or text.

Ready and waiting

"We identified the technology as being potentially important quite some time ago. But there have been a number of

DIGITAL PENS IN PRACTICE: CES MICROCARE

Malcolm Skinner, managing director of microwave repair company CES Microcare, is already a digital pen convert: his company has made significant savings using a digital pen-based system developed by Glasgow-based Sysnet.

Until recently, a CES Microcare engineer working at a remote repair site that needed to order parts or file a job completion report had to submit that data to head office by fax or post.

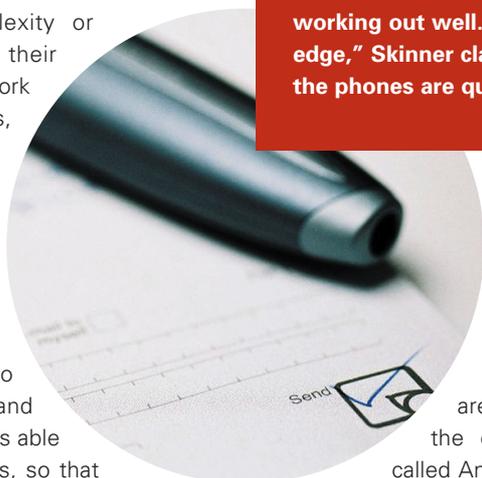
Sysnet, however, has now introduced a system that has given CES Microcare near real-time capabilities. "We digitised their forms and gave the engineers digital pens," explains MD Peter Burtwistle. "Now, as soon as they tick boxes on the forms, the data is sent back to the office using Bluetooth-equipped mobile phones."

As a result, the company can order required parts instantly, deliver quotes sooner and invoice more quickly. Its customer service has also improved. "We've gone from six phone lines to four," says Skinner.

"Customers no longer have to phone for updates on jobs because they get an email within 40 seconds of a change in status," he says.

Although he admits the feedback is purely anecdotal, Skinner says that customers say service is "brilliant" and that they do not get similar service from his competitors.

For staff and MD alike, the new system is working out well. "It gives us a competitive edge," Skinner claims. "The staff are happier. And the phones are quieter."



developments recently that have revised upwards our opinion of its importance," explains Ceri Carlill, a partner at Accenture Labs, in Sofia, France. "We feel the technology is ready for the enterprise market."

Carlill argues that although there are a number of competing technologies, the emergence of a Swedish company called Anoto as the technological leader in this nascent market will make the digital pen attractive for a huge variety of applications.

Its pens have one big advantage over those of its competitors: they know where they are on the paper, as well as what they are writing, making them extremely useful for form-filling, among other tasks.

HOW DIGITAL PENS WORK

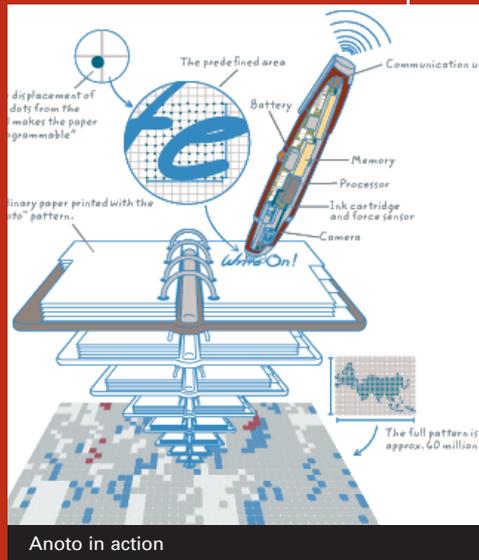
All digital pens are based on the same principle: instead of waiting until a document is complete before capturing it as an image and then extracting the useful information from its background, why not capture the process of writing the data?

Then it is possible to know what was written, when, and even by whom, without having to battle against poorly contrasted document backgrounds for optical character or handwriting recognition.

There is also far less data to store and upload, since only the pen's movements need to be recorded, not the whole page. A typical digital pen with 1 megabyte (MB) of memory can store 40 A4 pages of dense handwriting, for instance, and send back data from a form for less than 3p via GPRS. And, in an office situation, the pen is simply plugged into a USB port attached to a PC and the data downloaded.

The most popular pen technology has been developed by Swedish company Anoto and relies on special paper as well as a pen equipped with an infrared camera and a small amount of computer technology. The paper (although any surface that can carry a pattern, including plastic

and laminate, is suitable) has a barely visible irregular grid of dots on it that the camera in the pen can pick up, even through seemingly opaque marks.



Since the dots are generated by an algorithm rather than at random, the microprocessors in the pen can work out exactly where on the paper the tip of the pen is at any given moment using the grid. It can then either keep a record of that information for uploading later onto a PC or it can transmit it 'on the fly' using a Bluetooth connection to a mobile phone or similarly equipped device

for transfer into corporate systems.

The pen does, however, require a patterned medium to work; it won't work on plain paper.

The SmartQuill, originally developed by BT Exact but now licensed to another (as yet unnamed) company, will be released before the end of 2003. It works on a different principle: rather than relying on special paper, the SmartQuill keeps track of its movements using an accelerometer. Instead of knowing its position on the paper, it knows how it is being moved by its user and so can record pen strokes.

This means that even if there is no suitable writing medium available, the user can write in the air rather

than on a surface and the pen will still be able to register the writing.

It also means that it is only suitable for serial writing, rather than context-specific writing, since it carries no information about the surface on which it is writing. It would not be suitable, for example, for filling in forms.

Other technologies include the Compupen and the Vpen, but these have little mass-market support.

"Before we invested heavily in the technology, we looked at all the different types out there, like accelerometer pens," concurs Peter Burtwistle, managing director of Glasgow-based systems integrator and Anoto-reseller Sysnet (see box, *How digital pens work*).

"But the key thing about Anoto functionality is that it has context. The pen knows where exactly on a piece of paper it is, but more importantly on what piece of paper. It knows whether it's on a form or on the pages of a notepad. And



Ceri Carlill, Accenture

"Digital pens are ready for the enterprise market."

because it knows exactly where it is, you can take areas of that page and make it do things."

By this, he means that part of the page could, for example, be turned into a

form capable of turning the pen-strokes into XML data.

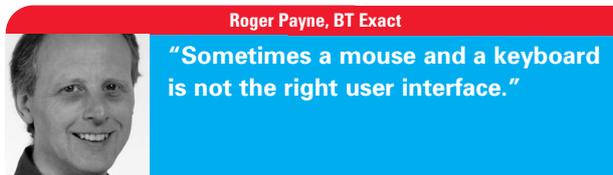
Overcoming resistance

Roger Payne, head of the pervasive ICT (Information and Communications Technology) group at the emerging

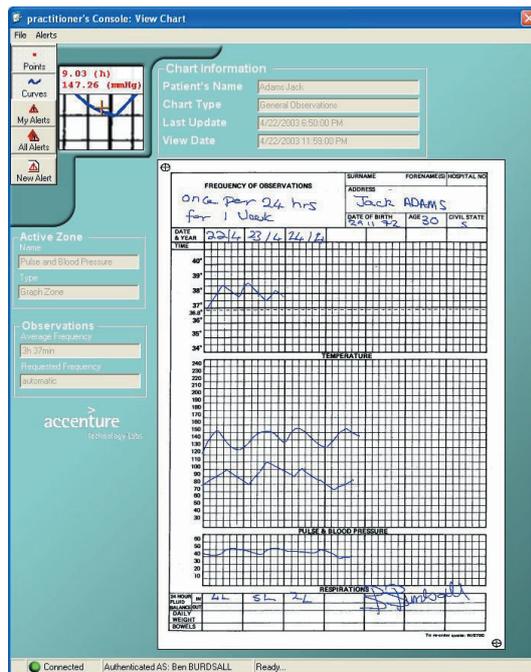
technologies lab of BT Exact, headed up a project to develop a digital pen called the SmartQuill, which has now been licensed to another company for release this year.

Payne believes that the digital pen is both a good way to overcome resistance to technology and useful in situations with a high degree of interaction. "What we were trying to do was bring down that phobia of technology that some people have. When you try to offer people services, sometimes giving them a mouse and keyboard is not the right interface."

Synet's Burtwistle cites the example of Don Homes, a construction company whose sales team of mostly late middle-aged women have "a very good client manner, but aren't interested in technology". They are interested, however, in getting half a million pounds out of a customer, "so they need good eye contact and a non-intrusive technology that can instantly send information to the back office".



Digital pens and patient care



Source: Accenture

The big advantage of the system is that it lets doctors and nurses continue working as they always have – with pens and charts. The difference now is that pens are digital. The medical staff update the physical, paper chart, and this continues to be accessible to staff without a computer – usually at the foot of the patient's bed; but since the charts are printed on micro-patterned paper, the pen is also able to record the amendments made to the records and, therefore, to update the computerised patient record almost instantly. That means the data is instantaneously available to, for example, a doctor at a remote location. Analytics and exception alerts – to tell the doctor that blood pressure is falling too fast, for example – make the doctor's job easier still.

An added benefit is that the uniqueness of the pattern used for each chart means that the system knows precisely whose chart is being updated, preventing mix-ups; it can also keep a record of

when changes are made and by whose pens.

Carlill predicts that digital pens will be widely taken up within the next year. "I see it being adopted, if not in 2003, then over the next 12 months, certainly," he says.

BT Exact's Payne agrees that the time of the digital pen is approaching soon, as a wave of vendors release new technology. "I could have sold them by the bucket-load. Everyone I've shown it to thought it was the best thing since sliced bread. They all saw applications for it in everyday life."

What may stop the onrush of the digital pen is cost. At \$200 or so for a pen (excluding Bluetooth- and GPRS-equipped mobile phone for mobile workers) they are not cheap. But with prices already falling, Burtwistle says that objections will also drop away. "There's always someone who has to go up ladders and do the physical work. They can't carry big expensive mobile phones, PDAs, or laptops. Pen and paper is how it's done." ■

■ Article by Rob Buckley edit@infoconomy.com

M-ID Resources

- Accenture Technology Labs researchers are exploring ways to allow people to interact with technology more naturally. For more information, go to www.accenture.com
- Anoto provides a range of training materials and seminars to help companies learn more about digital pens. For more information, go to www.anoto.com

Similarly, he believes that sales, financial services, and those working out in the field will be big adopters.

Accenture Labs, meanwhile, is focusing on healthcare. "There is a huge movement globally to electronic patient records. But the obstacle to that is the extent to which patient records are handwritten," says Carlill.

Accenture has developed a proof-of-concept system for hospitals that illustrates the advantages of the digital pen for that environment. It is based around observation charts, which doctors and nurses use to record changes in patients' vital signs over time.