

IMAGING

Ophthalmoscope enters digital age

By James Tyrrell

A smart ophthalmoscope that takes digital photographs of the back of the eye is being developed in the UK. When commercialized, the instrument will enable opticians to email electronic images of a patient's retina to specialist clinics. This could ease the burden on eye hospital equipment and speed up the diagnosis of conditions such as diabetic eye disease.

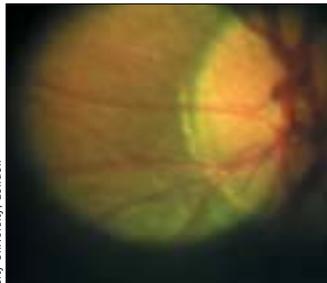
At the moment most high street optometrists do not have an objective method of recording images. They rely on notes and sketches and often refer patients to clinics.

A prototype of the hand-held device was demonstrated at the Smart Optics Project Review Forum in London in July. It is the result of a three-year project that kicked off in September 2002 to develop a non-contact, high-resolution (>100 µm) technology demonstrator.

The partners in the project are: the ophthalmoscope manufacturer Keeler, Davin Optronics, Sira



Researchers Luis Diaz-Santana and Joe Zohng demonstrate the prototype device.



Damaged blood vessels in the retina can indicate diseases such as diabetes.

Technology, the University of Warwick, the School of Ophthalmology at University College London (UCL), and City University's Applied Vision Research Centre.

The £450 000 (€680 000) government- and industry-backed project is just one of several within the Smart Optics Faraday partnership, a UK initiative sponsored by the DTI, PPARC and EPSRC.

Fred Fitzke of UCL hails the new device as the biggest advance in hand-held ophthalmoscopes in 100 years. Certainly the ophthalmoscope, which acts as an illumina-

nated microscope formed by the eye of the optometrist and the patient's own eye, has changed little in design until now.

"It's like putting man on the Moon – we knew what to do, but it was a case of waiting for the technology," City University lecturer Luis Diaz-Santana told *OLE*. The team's main hurdle was finding a high-performance colour CCD camera that was small enough for what had to be a hand-held device.

The solution turned out to be a 1360 × 1024 pixel camera, measuring 39 × 39 × 68 mm, made by

the German firm PCO. The team then fitted their own custom optics.

"We need access to the gain and colour balance channels to process a true colour image," explained Diaz-Santana, acknowledging the importance of colour in the diagnostic process.

Ergonomics also played an important role in the design, with UCL responsible for looking at how health professionals use the ophthalmoscope. "You have to get the optics as close as possible to the patient's eye to increase the field of view," Diaz-Santana explained. "If you're too far away the field of view is reduced by the patient's pupil." Warwick University engineered custom lens mounts to shrink the size of the prototype.

Precision optics specialist Davin Optronics is on board for the final round of product development, with Keeler driving the commercialization programme. Keeler's Clive Burrows told *Optics.Org* that the firm hopes to launch a product in 2005.

DISPLAYS

Bluetooth display animates clothing

Fashion victims and cyclists could soon benefit from wearable, flexible displays that can talk to mobile phones. France Telecom's R&D division has developed a Bluetooth-compatible LED screen that fits into clothing and displays text, drawings and animations sent by multimedia messaging service (MMS).

The wearable screen is part of the company's forward-looking Communicating Clothes project. However, the team says this working device is much more than a proof-of-concept prototype and it is keen to exploit the innovation commercially.

The range of potential applications is vast, spanning wearable displays for cyclists through to fashion accessories that reflect



Convenient indicator: France Telecom says its flexible LED display could be used to communicate everything from braking and turning manoeuvres to your mood.



your emotional state. The firm has commissioned a range of purpose-made garments, and believes that

a commercial launch of the wearable display could happen soon.

The 4096-colour LED screen

comprises a flexible circuit board packaged in a fabric-layered sandwich. Weighing 150 g (including battery) and measuring 10 × 7 cm, these displays are lighter and easier to fit in clothing than the team's award-winning fibre-optic screens that were showcased at the Avante textile trade show in 2002. The new screens insert into a special pocket in the garment and connect to a rechargeable battery that has a four-hour charge life.

The display's image and brightness adjustment can be accessed remotely via a mobile phone. Embedded software technology lets users transfer animations downloaded from the Internet. The screen can also function as a stand-alone device, with images and visual sequences triggered by integrated sensors that respond to sounds and gestures.