Terminator-style info-vision takes step towards reality

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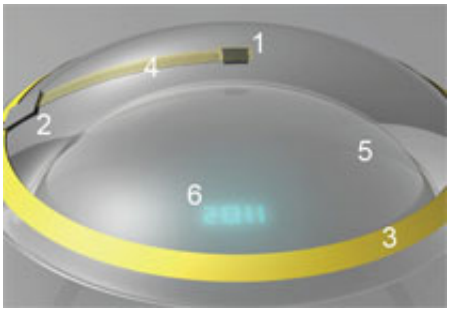

The streaming of real-time information across your field of vision is a step closer to reality with the development of a prototype contact lens that could potentially provide the wearer with hands-free information updates.

In a study published today in IOP's *Journal of Micromechanics and Microengineering*, researchers constructed a computerised contact lens and demonstrated its safety by testing it on live eyes. There were no signs of adverse side effects.

At the moment, the contact lens device contains only a single pixel but the researchers see this as a "proof-of-concept" for producing lenses with multiple pixels which, in their hundreds, could be used to display short emails and text messages right before your eyes.

The device could overlay computer-generated visual information on to the real world and be of use in gaming devices and navigation systems. It could also be linked to biosensors in the user's body to provide up-to-date information on glucose or lactate levels.

The contact lens, created by researchers at the University of Washington and Aalto University, Finland, consisted of an antenna to harvest power sent out by an external source, as well as an integrated circuit to store this energy and transfer it to a transparent sapphire chip containing a single blue LED.

One major problem the researchers had to overcome was the fact that the human eye, with its minimum focal distance of several centimetres, cannot resolve objects on a contact lens. Any information projected on to the lens would probably appear blurry.

To combat this, the researchers incorporated a set of Fresnel lenses into the device; these are much thinner and flatter than conventional bulky lenses, and were used here to focus the projected image on to the retina.

After testing the contact lens in free space, it was fitted to the eye of a rabbit, under the strict guidelines for animal use in the laboratory, to evaluate the effect of wearing the contact lens on the cornea and the body in general. In addition to visualising techniques, a fluorescent dye was added to the eye of the rabbit to test for any abrasion or thermal burning.

After demonstrating the operation and safety of the contact, the researchers state that significant improvements are necessary to produce fully functional, remotely powered, high-resolution displays. For instance, the device could be wirelessly powered in free space from approximately one metre away, but this was reduced to about two centimetres when placed on the rabbit's eye.

Co-author of the study, Professor Babak Praviz, said "We need to improve the antenna design and the associated matching network and optimize the transmission frequency to achieve an overall improvement in the range of wireless power transmission.

"Our next goal, however, is to incorporate some predetermined text in the contact lens."

More information: 'A single-pixel wireless contact lens display', Lingley A R et al 2011 *J. Micromech. Microeng.* 21 125014 iopscience.iop.org/0960-1317/21/12/125014

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