"Super" Artificial Compound Eyes Formed from Microlenses

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Technology description

Although current microscopic optical systems are highly sensitive, they are generally bulky and expensive, and most have a severely limited field of vision. One alternative is adaptive microlenses that mimic the mechanism of the human eye, autonomously adapting to local environmental parameters via stimuli-responsive hydrogels that change the shape and focal length of the liquid microlens (see WARF reference number P05131US). These microlenses offer a smaller and more flexible means of providing the same high sensitivity and resolution as current systems, but they are limited by the same small field of view. Another type of eye, the compound eye, uses many lenses to achieve a larger field of view, but sacrifices resolution in doing so. UW-Madison researchers have now combined many liquid-liquid microlenses on a planar or domed array to form a “super” artificial compound eye (SACE) with a large field of view and high resolution. By coupling the benefits of microlenses with those of compound eyes, this technology could provide low-cost, high-resolution imaging for medical, industrial and military applications. It could be used to develop medical devices, such as fiber endoscopes and laparoscopes, that make procedures like colonoscopy or appendectomy safer and easier. The SACE could perform image scanning without bulky control systems that can be cumbersome and costly. This technology could also improve current monitoring and surveillance instruments for the military, as well as consumer products, such as miniaturized digital cameras.
The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a “super” artificial compound eye (SACE) that could provide low-cost, high-resolution imaging for medical, industrial and military applications.

Application area

Low-cost, high-resolution imaging
Medical devices such as fiber endoscopes or laparoscopes
Military monitoring and surveillance instruments
Consumer products like digital camers

Advantages

Combines the large field of view found in compound eyes with the high resolution seen with liquid-liquid microlenses
Each microlens eye element can be tuned individually, facilitating adjustable focusing.
May be less expensive than current alternatives

Institution

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