

World's smallest micro-camera promises to revolutionize smart sensors

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Customized 3D vision-in-package (18.5 x 18.5 mm)

Swiss researchers at CSEM in Neuchatel have developed the smallest-ever complete vision system on a chip, called Vision-In-Package (VIP). With a variety of potential uses—including brand recognition, robotic surgery guidance, driving assistance, and even home security—the optics, processor and wireless transmitter are combined into a single easily-integrated package. The concept and complete packaging, to be unveiled at the Sensor+Test Fair in Nuremberg on May 19, is a camera three times smaller than the very latest in optic sensors and eight times smaller than what is currently used in motor vehicles for assisted driving—less than one cubic centimeter in total volume; not much bigger than a 10-cent euro coin.

"By completely rethinking what an optical sensor does, by approaching the [technology](#) development for what we want it to do and not simply thinking about how to combine already-existing components, we have created a new way to approach optical applications," says Edo Franzi, CSEM researcher and project leader.

In order to drastically reduce the size of the entire system, the researchers turned to technology developed in the solar energy domain for inspiration. Based on the principle of a solar concentrator that directs and guides light, the researchers turned this technology of non-imaging optics on its head to produce an image that can be interpreted and correctly read in extremely close situations; even in direct contact with the object.

By coupling the optical component to a microcontroller equipped with a Bluetooth transmitter, the entire low-power system is autonomous and versatile. Measuring only 16.5 mm by 16.5 mm and a mere 3 mm in height, the stand-alone system can communicate to other elements via various ports and can be easily integrated into existing technology platforms with its [software development kit](#).

"Not only is it very small, it is also inexpensive to produce and extremely energy-friendly," Ross Stanley, CSEM researcher, explains. "By putting everything into this single package, the VIP should open doors to new uses for smart sensors in a wide range of sectors. We are able to provide custom solutions for anything from medical technology with a precision of one nanometer to drone applications for agriculture—all of the capacities are already there, the client need only change the firmware."

The ease of integration and unobtrusiveness of the VIP system will enable smaller, more efficient and effectively invisible contributions of optical technology to our homes, industry and medicine. As machine vision is to be an increasing integrated part of everyday objects, future applications for this miniature camera are numerous: robotic guidance, autonomous driving applications, smart homes, personal health monitoring, automated farming, and product verification are only a few examples.

The Vision in Package system is a culmination of many years of research and expertise in several fields. It will be commercialized before the end of 2015, ready to be seamlessly integrated into existing systems as well as become the basis for new [applications](#) that had never before been possible.

Technical specifications

- ARM Cortex M4F
- 2 MB Flash
- 64 MB SDRam
- HDR Log QVGA imager
- Composite optics for flat (in contact) imaging
- RF transceiver (2.4 GHz)
- Easy to integrate into existing systems (I2C, SPI, USB, GPIO, ...)
- Software available

Provided by CSEM

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