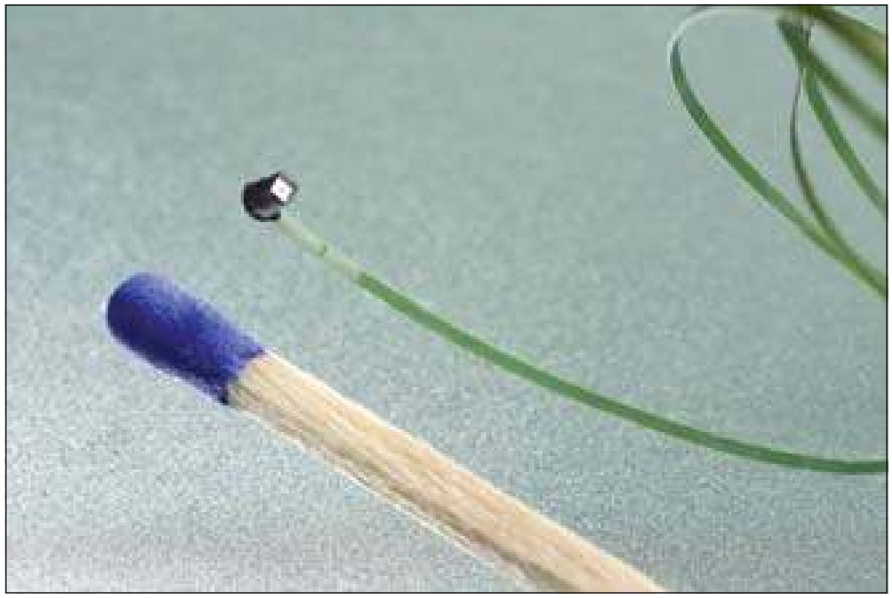
Ultra-Miniature Image Sensor

A wafer-level camera operates at low power and may be customized for application needs, which include endoscopy, surgical robots, and 3D model generation.

AWAIBA, Madeira, Portugal

Minimally invasive surgery has increasingly required imaging devices to have the smallest possible dimensions but also deliver high-resolution vision capabilities. There has also been a rising demand for disposable medical devices. With these criteria in mind, in 2004, the first prototype of the NanEye sensor was created in the lab. The miniature 0.25 mm^2 camera module measured 0.5 mm × 0.5 mm, with 140 × 140 pixels at a frame rate of 40 frames/second.

Further research and development yielded the NanEye 2B image sensor. It is considered a wafer-level camera, meaning that no external components, not even an external capacitor, are needed to run the sensor. This digital camera's head dimensions are 1 mm × 1 mm × 1.5 mm. The optionally available optics include one aspherical surface and one aperture. It is glued directly on the image sensor and has its best focus



The **NanEye** family of image sensors is suitable for integration into endoscopy and surgical robot applications.

position designed in, so no mechanical focus correction is required.

The NanEye is customizable to OEMs' application needs, which include integration into endoscopy, dental imaging, and surgical robot solutions that call for miniaturization as well as exacting precision. Furthermore, 3D model generation, guidewire visualization, intubation equipment visualization, disposable equipment, and imaging for medical analysis equipment are other possible medical applications.

The lens of the sensor is based on B33 (Borofloat glass) and designed such that the surface toward the object is flat. This is so that the lens performance is not influenced by the medium between the object and lens. Therefore, only the opening angle of the lens is reduced when the system operates in liquid, which is important in applications that involve contact with body fluids. Meanwhile, the lens does not increase the diameter of the sensor, making the NanEye the world's smallest compact digital camera.

With a total of 250 × 250 pixels at 3 µm pitch rolling shutter, the sensors provide clear and sharp color images utilizing color filters implementing the standard Bayer pattern. The sensor is wire bonded on a flex substrate. The standard length is 56 cm, but may be increased if necessary. The maximum length the camera can drive the signal, without external components, is 2.5 meters. The flex cable has a width of 700 µm and a diameter of 1.5 mm at the tip where the sensor is mounted. The thickness of Flex cable is 65 µm. A very small bend radius can be achieved, down to ~100 µm. Power consumption is consequently minimized and is only 5 mW operating at 44 frames/second. A low power variation using only 600 µA from 1.8 V supply is also available for battery-powered applications.

Image data are transmitted over a 10-bit digital LVDS using an in-house developed data transmission protocol. Optionally available software enables the camera to run on a PC in real time with image corrections. The software runs under Microsoft Windows XP and includes a USB driver. It displays the image on a PC in real time and performs a number of functions such as offset and gain correction for delay-free, smooth video operation.

This technology was done by AWAIBA, Madeira, Portugal. For more information, visit ***http://info.hotims.com/34453-196***.

Motion Artifact Extraction Technology for Non-Invasive Blood Pressure Measurement

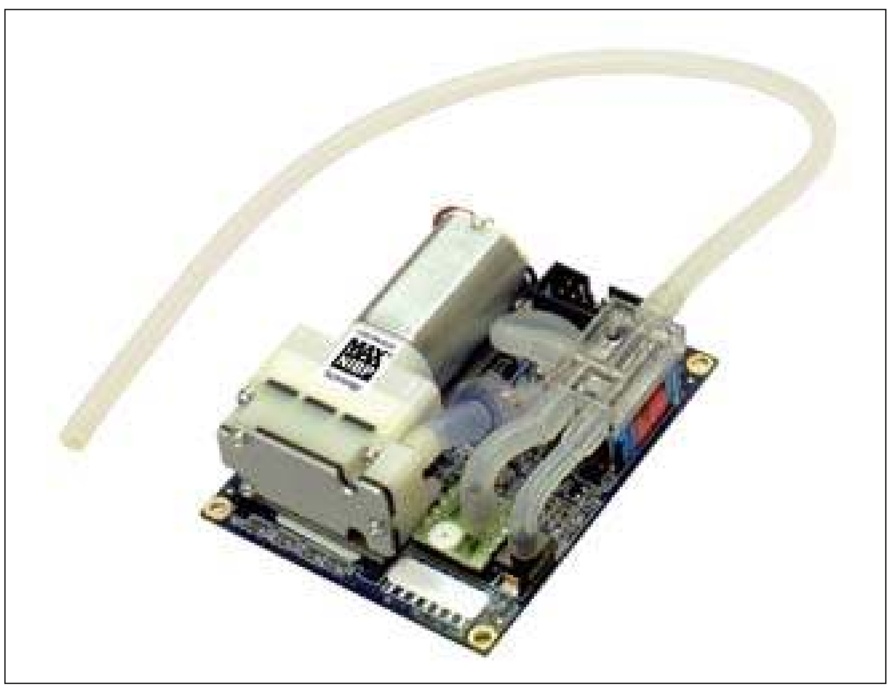
A module employs highly complex pulse matching criteria and analysis tools and is suitable for challenging clinical environments.

CAS Medical Systems, Branford, CT

Non-Invasive Blood Pressure (NIBP) is a widely used vital sign for cardiovascular assessment. Vital signs monitors obtain a non-invasive blood pressure measurement through the use of commercially available OEM blood pressure modules incorporated into their devices. These devices typically employ the oscillometric technique for the determination of blood pressure. NIBP devices approved for clinical use are tested for compliance to standards, including the AAMI/ANSI SP10-2002.

Although the devices are validated clinically, this testing does not represent the true performance of the NIBP Module when operated in real-life conditions, including the presence of motion artifact that occurs, for example, during patient transport or when the patient may be subject to motion (shivering, tremors).

Critical to an accurate and reliable NIBP measurement is the understanding that every pressure pulse detected may not be caused by the flow of blood into the patient's limb. Strategies must be employed to manage a wide variety of false pressure pulses. A clear differentiator when evaluating NIBP technology is an assessment of these strategies during NIBP measurement with a high degree of motion artifact present. An understanding of the technology and level of sophistication employed by the OEM NIBP Module is critical to properly assess the device's ability to render clinically reliable, timely, and accurate measurement.



The MAXNIBP® algorithm enhances the oscillometric NIBP measurement process at each step, including pulse detection, pulse qualification, artifact detection, and step qualification.