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BRIGHT LIGHT SHINES ON CANESTA PATENT

From Strong Sunlight to Flickering Shadows, Unique *SunShield*™ Technology Allows 3-D Sensors to Operate in Any Ambient Light; Critical for Automotive Safety and Other Applications

SUNNYVALE, CALIFORNIA – December 5, 2006 – Electronic perception technology pioneer Canesta announced today that the company's latest generation of low-cost, CMOS-based 3-D time-of-flight imaging sensors have been shown to operate effectively in both extreme sunlight, and in rapidly changing lighting conditions – two environmental conditions that have plagued other sensors and methodologies in the past. Such capability is critical for many of the potential applications of electronic perception technology, particularly automotive safety, which is a dominant focus of the company today. The new *SunShield*™ technology has been granted U.S. Patent No. 6,919,549, *"Method and System to Differentially Enhance Sensor Dynamic Range".*

"The future of both machines and vehicles is that they will be equipped with sensors able to resolve objects and persons in real-time and three dimensions," said Jim Spare, Canesta's president and CEO. "But to really be practical, the sensors will have to be able to operate in the brightest sunlight, and in rapidly changing lighting conditions – such as a car rushing past the shadows of nearby trees – without making errors in discrimination. This is the problem that we have solved."

Canesta's fundamental electronic perception technology, which features low-cost, fingertip-sized sized sensors, is able to recognize objects in real time, and separate them out from any background, using sophisticated, RADAR-like ranging techniques accomplished with infrared light. Of the numerous uses for a technology that enables machines – in effect – to "see", the most vigorous development has been occurring among automotive OEMs and Tier 1 suppliers, who are looking to significantly enhance automotive safety with applications such as "smart" airbags, adaptive cruise control, blind spot detection, backup warning systems, pedestrian detection, and parking assistance. (See: *"Honda Invests in Canesta"*, September 20, 2006, and related news).

A key challenge in uncontrolled lighting conditions, such as those common in automotive applications, has been dealing with both bright sunlight and the rapidly flickering shadows that often accompanies it. Canesta's native technology uses bursts of infrared light from tiny lasers or light-emitting diodes (LEDs) to illuminate the field of view, and then measures the "time of flight" that it takes the photons of infrared light to bounce off of nearby objects and return to the sensor. From this, the sensor chips form a real-time 3-dimensional image, at 30 frames per second or better, which can be used to detect objects.

In the presence of strong sunlight, however, the extremely low-level illumination from the laser or LED is, in effect, swamped out. If a system is made sensitive enough to perceive the infrared bursts, then it completely saturates in the presence of bright light, not unlike our eyes do when surprised by a camera flash. By contrast, if the system is configured to work at the highest levels of sunlight, then the infrared pulses become too faint to measure accurately.

Canesta solved this problem with a simple and elegant solution. Rather than allowing the sensor to saturate by having it observe the scene for too long a time – in this case the duration of one "frame", a series of shorter samples are taken that keeps the amount of ambient light for any one sample within the dynamic range of the sensor. During each sample, the system receives photons from both the ambient background and from the infrared ranging signals. At the end of the sample, the signal from the ambient sources is simply discarded, while the ranging signal is saved. When the time comes for the sensor array to output a frame – say, every 30th of a second – the results from each sample, which now only contain the ranging signal component, are added together to determine its final value.

Metaphorically, this process is akin to determining the total weight of sand particles suspended in the waters of a swimming pool by carrying buckets of water taken from the pool to a nearby scale. Rather than dealing with the weight of the water – here representing the ambient light from a 3-D scene recorded by a pixel – the water is simply poured off through a filter before it ever reaches the scale. The few grains of sand that remain are transferred to the scale. After enough buckets – samples – of water have been transferred from the pool, a little pile of sand will have developed that is substantial enough to measure. But all the water – which would have figuratively *and* literally swamped out the measurement system – is gone.

The fact that the sunlight effects are cancelled essentially instantaneously with the taking of each sample, rather than at the completion of an entire frame, or later, using so-called “adaptive” techniques, is a key feature of Canesta’s invention. Moreover, Canesta attributes the ease of implementing the *SunShield*™ technology into the sensor, as well as other future cutting-edge enhancements, to its use of a standard – yet state-of-the-art – 0.18 micron CMOS fabrication process.

The *SunShield*™ technology is available in Canesta’s latest CanestaVision™ sensors and DP300 model development kits, and is a planned feature of all future products.

For a full-text version of the patent, see:

http://www.canesta.com/assets/pdf/patents/6919549.pdf

About Canesta

Canesta is the inventor of a revolutionary, low-cost electronic perception technology that enables machines, vehicles, and ordinary electronic devices to perceive and react to objects or individuals in real time.

When sight-enabled with Canesta's unique CanestaVision™ *SunShield*™ electronic perception chips and software, consumer, automotive, industrial, military, and medical products can gain functionality and ease of use not possible in an era when such devices were blind.

Canesta believes future applications of electronic perception technology are virtually as broad as the imagination. They may include intelligent automobile airbag systems that can sense the size and position of an occupant to control deployment and avoid injury, a low-false-alarm security system that could detect the difference between an intruder and normal activity, such as a pet moving or child visiting the bathroom at night, or robotic tools that can successfully operate in a dynamic, rather than static environment.

Canesta was founded in April 1999, and is located in San Jose, CA. The company has filed in excess of forty patents, 17 of which have been granted so far. Investment to date exceeds $44 million, from Carlyle Venture Partners, JP Morgan Partners, Korea Global IT Fund (KGIF), Venrock Associates and others.

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Editors, note: All trademarks and registered trademarks are those of their respective companies.

Additional background information on Canesta is available at
http://www.roeder-johnson.com/RJClient.php?client=Canesta.

See also: *"Honda Invests in Canesta"*, September 20, 2006,
http://www.roeder-johnson.com/RJDocs/CAhondainvests0906.html

"Canesta Recognized by Frost & Sullivan for Technology Innovation in Inventive Automotive Vision System", February 15, 2006,
http://www.canesta.com/html/press_release_021506.htm