

# Tiny cameras have big market

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Having earned a reputation helping other companies make smaller and faster semiconductors, San Jose-based Tessera now hopes to use its miniature camera technology to revolutionize how a wide array of gadgets interact with people.

The technology, which some other companies recently have begun using to make tiny cameras for such devices as cell phones, will probably lead to far greater numbers of consumers in poor countries being able to afford phones with photographic capabilities, some industry analysts believe.

But that's just the beginning, according to Tessera's CEO, Henry "Hank" Nothhaft.

He foresees the cameras being used to prevent children from buying vending-machine cigarettes, to warn motorists when they are too sleepy to drive and even to enable toys to respond appropriately when a youngster smiles, frowns or makes some other [gesture](#).

"Anything that we can think of we can probably do," he said. "It's that wide open."

Founded in 1990, Tessera primarily has been known for its widely used semiconductor-packaging technology. That enabled chips to be made smaller and run faster by incorporating shorter electrical connections between the chip and the circuit board upon which the chip sits.

But about four years ago, executives at Tessera -- which earns most of its revenue by licensing its technology to others -- decided to branch out and the [camera](#) market seemed promising. So it bought several businesses to acquire the know-how to make a new type of camera that not only was extremely small but also much easier and cheaper to produce.

While most cell phone cameras have 40 or so components and tend to be bulky, cameras made by Tessera's method consist simply of a tiny lens module bonded with a tiny image sensor, with no moving parts. The technology also enables scores of cameras to be manufactured together on a sheet of silicon and then individually cut out for placement in phones or other devices.

The camera's diminutive size and assembly process reduce the materials and costs of production, Nothhaft said. He added that it costs about half to make a camera with his company's technology than it does to make the larger versions.

By eliminating the need for lots of components, "it also makes a more robust device," said Kevin Vassily, an analyst with Pacific Crest Securities. "Moving parts wear out and are subject more to a failure risk."

Many people in less affluent parts of the world can't afford camera phones. While about 82 percent of cell phones sold in North America and 95 percent in Western Europe have photographic capabilities, the percentage is only about 61 percent in Asia, 55 percent in Latin America and 48 percent in Africa, according to the research firm Gartner.

Thus, there is a big business opportunity for companies that can incorporate cameras into their phones inexpensively, said Gartner analyst Tuong Nguyen. Moreover, he said, being able to make cheaper cameras would enable cell phone makers to include multiple cameras, one for

taking still shots and another for shooting video, for example.

Tessera, which has seen its profit dwindle from about \$61 million in 2006, to \$45 million in 2007, to just under \$5 million last year, could use some extra sales. Company executives won't disclose how much revenue their tiny camera technology began generating this year, but say they're pleased so far.

Nothhaft envisions the cameras being built someday into a vast assortment of devices, including vending machines.

The Fujitaka company in Japan is developing a vending device that uses a camera to count the wrinkles on a customer's face to determine their age, in response to a new Japanese law forbidding vending-machine operators from selling tobacco to anyone under 20.

Because of the low-priced cameras it produces, Tessera's technology could help make age-recognition vending machines widespread, Nothhaft said.

Cars also could use the devices, he said. Since cameras already can be programmed to avoid taking pictures when a person blinks, he said, it shouldn't be hard to also make them count a motorist's blinks to determine if they are too sleepy to drive. If the number of blinks exceed a predetermined number, the camera could alert the driver about his or her condition, he said.

Still another application might be in toys. To prevent unwanted frowns from showing up in photographs, cameras using Tessera's technology already can determine when the subject is smiling and, thus, when it's OK to snap the picture. If a toy was equipped with such a camera, Nothhaft said, the toy "could laugh, smile or say something to the child" in response to how happy or sad the youngster seemed at the moment.

Hans Mosesmann, an analyst with Raymond James & Associates, agrees Tessera's camera technology "has great potential" but questions how much the company will profit from some of Nothhalf's ideas, particularly if other companies develop similar technology. "We're in the camp of 'show me,'" Mosesmann said.

However, Nothhalf is confident about his company's future.

"Cameras are going to be ubiquitous," he said. "This is just emerging. We're here on ground zero and so it gives us a chance to be a real market leader."

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