EMERGING
TECHNOLOGY
AWARDS

ROBOTICS

EYES
ON THE ROAD

Mobileye puts a robotic vision system on a chip.

STORY BY MICHAEL ABRAMS • ILLUSTRATION BY THOMAS ROMER

The promise of autonomous cars is that they will be more attentive to the hazards than distractable human drivers. To make good on that potential, the Jerusalem-based company Mobileye has been designing hardware and training software algorithms to help vehicles detect and avoid other vehicles. In a major advance, the company has been able to shrink its Advanced Driving Assist System to fit on a single silicon chip it calls EyeQ.

When wired to a camera, the system offers superior cruise control, keeps its vehicle in lane, recognizes traffic signs, and can automatically brake for pedestrians and other dangerously close vehicles.

The company, which was founded by Amnon Shashua, a professor of computer science at the Hebrew University of Jerusalem, has already sold 20 million of its chips. The advantage of having so many of them already traveling the world's highways extends beyond the immediate safety they provide. Mobileye is mining the data those chips collect—24 million miles worth of video so far—to create a high definition mapping system that will work with real-time data to help vehicles navigate and eventually become fully autonomous.

"Several years ago, we identified mapping as one of the technical roadblocks to fully autonomous driving," said Dan Galves, the company's chief communications officer. "We developed a system that processes raw camera data into small chunks of relevant data that can be communicated to the cloud through normal LTE wireless."

However good the map, autonomous cars must be able to manage every tricky situation that human drivers can finesse. Some of those are trickier than others. When two lanes of traffic join with two other lanes of traffic, for instance, the rules of vehicular behavior seem fuzzy at best, yet humans perform such merges with little difficulty. Mobileye is using AI to figure out how best to maneuver vehicles automatically through such thickets.

"We use semantic cues and reinforcement learning algorithms to train vehicles to negotiate with other agents in double-lane merge type situations," Galves said.

Another hurdle for the Advanced Driving Assist System is understanding which objects are actually on the road and which aren't. Humans instinctually distinguish the leaves and branches of an overhanging tree from a fallen branch in the path of a car. How do you teach a machine to do that? Mobileye intends to mate 8-megapixel cameras to a vision system chip that can analyze 250 million pixels a second, in hopes of crunching enough data to make distinctions between different kinds of obstructions.

In addition, a new version of its EyeQ chip will be able to recognize the front, rear, and sides of a vehicle—crucial information when it comes to knowing which direction a vehicle is going.

Shashua and co-founder Ziv Aviram took Mobileye public in 2014 and sold the company to Intel earlier this year. Now the company is working with more than 25 automakers worldwide. Thanks to Mobileye's mix of AI, software development, massive data collection, and general ingenuity, one day we may be able to travel safely with our eyes off the road and our hands off the steering wheel. **ME**
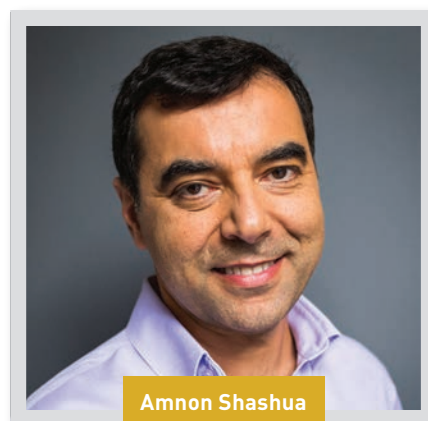
MICHAEL ABRAMS is a writer based in Westfield, N.J.

VEHICLE VISION SYSTEM

INNOVATORS Mobileye. Amnon Shashua, founder.

INNOVATION Hardware and software that help vehicles detect and avoid other vehicles, with the entire system miniaturized so that it fits on a single silicon chip.

IMPACT Improved vision systems will enable autonomous vehicles to navigate unexpected hazards more ably than human drivers.

Amnon Shashua