An artificial eye on your driving

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With just a half second's notice, a driver can swerve to avoid a fatal accident or slam on the brakes to miss hitting a child running after a ball. But first, the driver must perceive the danger.

Research shows that a rapid alert system can help mitigate the risks, fatalities and severe injuries from road accidents, says Prof. Shai Avidan of Tel Aviv University's Faculty of Engineering. He is currently collaborating with researchers from General Motors Research Israel to keep cars on the road and people out of hospitals.

An expert in image processing, Prof. Avidan and his team are working to develop advanced algorithms that will help cameras mounted on GM cars detect threats, alerting drivers to make split-second decisions. His research has been published in leading journals, including the *IEEE Transaction on Pattern Analysis and Machine Intelligence* and featured at conferences in the field.

The challenge, says Prof. Avidan, is to develop a system that can recognize people, distinguishing them from other moving objects — and to create a model that can react almost instantaneously. Ultimately, he is hoping computer vision research will make cars smarter, and roads a lot safer.

An upgrade you can't live without

Cars are not much different from one another. They all have engines, seats, and steering wheels. But new products are adding another

dimension by making cars more intelligent. One such product is the smart camera system by MobilEye, an Israeli startup company. Prof. Avidan was part of the MobilEye technical team that developed a system to detect vehicles and track them in real-time.

He is now extending that research to develop the next generation of smart cameras — cameras that are aware of their surroundings. His goal is a camera capable of distinguishing pedestrians from other moving objects that can then warn the driver of an impending accident.

The challenge is in the development of a method that can detect and categorize moving objects reliably and quickly. Prof. Avidan hopes to realize such a method by combining powerful algorithms to recognize and track objects. Such a tool could double check for vehicles in your blind spot, help you swerve when a child runs into the street, or automatically block your door from opening if a cyclist is racing toward you, he says.

Eventually, he hopes cameras will be able to recognize just about anything moving through the physical world, offering a tantalizing vision of applications such as autonomous vehicles. The underlying technology could also be used in computer gaming to track a player's movements, or for surveillance to detect a potential intruder.

An automatic auto response

Previously, detection systems used radar, which is expensive and not particularly sensitive to human beings. A smart camera fuelled by a powerful chip, on the other hand, could detect the activities of people and animals, and prompt the car to react accordingly, braking more or locking the doors, for example.

To date, Prof. Avidan has demonstrated that his technology works on

infrared, greyscale, and color cameras. "Cameras are quite dumb machines unless you know how to extract information from them," he says. "Now, as the price of cameras drop and computer power grows, we'll see more exciting applications that will keep us safe and make our lives more comfortable."

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