

# Consumer Electronics Is the Driver of Smart Cars

By Saraju P. Mohanty

Welcome to the September 2018 issue of *IEEE Consumer Electronics Magazine*. Since 2016, we have discussed various aspects of smart cities at length. A smart city can have one or more components, such as smart transportation, health care, infrastructure, grid, and governance, depending on its design and operation budget. Generally speaking, smart transportation allows citizens to easily select different options for the lowest cost, shortest distance, or fastest route for the highest level of travel comfort. Features of smart transportation include automated driving, effective traffic management, real-time vehicle tracking, vehicle safety using automatic brakes, vehicle-to-vehicle communication, better scheduling of trains and aircraft, and easy payment systems.

Autonomous, driverless, or self-driving vehicles (e.g., cars, trucks, and buses) are emerging. There is a demand, and research is in full swing in both industry and academia to make it a reality. We can define the term *autonomous vehicle (AV)* as a vehicle that is capable of sensing its environment and navigating without human input, which applies to the autonomous car as well. Depending on the level of autonomy, AVs can range from level zero to level five. In level zero, the vehicle is in complete control of a driver; whereas in level five, the vehicle can perform all



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safety-critical functions in all environments and scenarios.

Various terms such as *autonomous*, *driverless*, *autonomous smart*, *self-driving smart*, *smart*, and *connected cars* are used interchangeably in the existing literature. However, I would differentiate the fact that autonomous driving, or self-driving, is one aspect of a smart car. Autonomous cars can be considered a subset of smart cars, and smart-car concepts can include other features, such as energy-consumption management. The smart car needs to have many features, including energy efficiency, security, safety, self-drivability, and connectivity. This issue has several articles related to key aspects of the smart car. Similar to other components of smart cities, the smart car is made possible by the use of the Internet of Things.

## SOCIETY NEWS

### IEEE CE BANGALORE MEMBERSHIP OUTREACH AND THE IEEE CE SOCIETY STUDENT BRANCH INAUGURATION

We take a look at an IEEE CE Society Student Branch in the southern

part of India that has held its inaugural event.

### IEEE CE HONG KONG CHAPTER RUNS SUCCESSFUL ONE-DAY WORKSHOP

Activities during a one-day event covering devices and systems for consumer health and preventive care, which was held in Hong Kong by the local IEEE CE Chapter are discussed.

## FEATURE ARTICLES

### IS CONSUMER ELECTRONICS IS REDESIGNING OUR CARS?

This article relates to the image on the cover of this issue focusing on smart cars. The challenges of integrated technologies for sensing, computing, and storage in autonomous vehicles are reviewed.

### ADVANCED DRIVER-ASSISTANCE SYSTEMS

The smart car theme is discussed and details are presented of the advanced driver-assistance systems that are critical to make smart cars safer.

## SPECIAL SECTION

The special section, "Recent Advances in Consumer Electronics," includes articles that present advances in research related to audio and video technologies. I would like to thank the guest editors for all the hard work they put into making this a strong special section,

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software runs very efficiently on the device, enabling it to observe the video stream at 100 frames/s, which is fast enough to give real-time feedback to the user. Exploiting this video stream also helps achieve a high recognition accuracy, as combining several images gives a more confident and accurate result than using any one of the frames individually. Last year, we upgraded our OCR technique to a convolutional neural network-based approach, which runs 30% faster and improved accuracy by 40%.

**Wilson:** Why did you decide to go the SDK route and not make a consumer-facing product?

**Kinigadner:** This was a tough decision. When we started winning awards and gaining a lot of publicity, everyone around us wanted to hear a big story and started extrapolating all the things we could do. In hindsight, it was a blessing that, with limited resources, we had to ask the question, are we going to be the best OCR tech company for mobile devices, or do we want to be the best utility meter-reading app?

But it wasn't plain sailing, and we learned the hard way that you must show use cases that illustrate how something can be useful for your potential customers. You can't expect them to do the hard work of imagining the potential of your



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generic solution. Sales were easier when we simplified our messaging to: "We are the market leader in mobile OCR tech for utility meter reading, license plate identification, and passport scanning."

**Wilson:** What was the hardest experience you've had so far?

**Kinigadner:** After two years of start-up developer culture, our revenues were not growing in line with our expenses, and I was forced to reorient the company into a sales-driven organization. This included introducing procedures and formal job descriptions and giving the sales team more influence on the 12-month product road map, which is now the axis around which everything is organized. No one had left the company during the first two years, and suddenly my colleagues—friends—were resigning emotionally, so this was very tough for everyone, including me personally. But it was absolutely necessary for the

survival of the company, and since then our revenue has grown every quarter.

**Wilson:** What does the company look like now?

**Kinigadner:** We are a team of 30 based in Vienna, [Austria], with seven-digit revenue, and we serve 100 enterprise customers in more than 50 countries. It may come as a surprise to some engineers when I say that we have as many staff working on sales and marketing as we do on software development.

**Wilson:** What advice would you give to engineers considering becoming entrepreneurs?

**Kinigadner:** I would encourage them to follow their dreams. In my experience, engineers tend to underestimate themselves from a business perspective, but their logical approach can actually make them great founders. Business degrees and investors often encourage entrepreneurs to chase the biggest market opportunities to get rich quick. In contrast, engineers love solving challenging problems, and doing so often makes a more useful contribution to the world.

## ABOUT THE AUTHOR

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## Notes from the Editor (continued from page 3)

which will be enjoyable reading for the CE community.

### COLUMNS

#### **BITS VERSUS ELECTRONICS**

The article "From Broadband to Infrastructure" presents an evaluation of the Internet.

#### **THE ART OF STORAGE**

Selected digital storage devices presented at the 2018 Consumer Electronics Show are presented.

#### **ENERGY AND SECURITY**

In "Supercapacitors Outperform Conventional Batteries," a supercapacitor-based power converter is presented for CE systems that is better than conventional battery-based energy sources. I envision that supercapacitor and chemical hybrid energy storage can be effective for new CE systems, including smart cars.

#### **PROFESSIONAL DEVELOPMENT**

Entrepreneur Lukas Kinigadner engages in a discussion in "Entrepreneurs in Consumer Electronics."

#### **LOOKING FORWARD**

I hope this issue dedicated to the smart car is useful for a wider set of CE communities to advance their knowledge on smart products. With the help of the editorial board and authors around the globe, I would like to see these themes covered further as well as other emerging hot topics in future issues of *IEEE Consumer Electronics Magazine*.

