Belts and Loops

In 2004, approximately 1.2 million people worldwide died in automobile accidents, and another 50 million were injured. Modern transportation clearly comes at a cost.

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In 1956, a few car companies offered seat belts as an option, and many automobiles had seat belts by the mid 1960s. But it wasn't until the 1980s that seat-belt use became mandatory in much of the United States. It essentially took 30 years for this passive safety device to gain enough societal support for widespread usage and legal enforcement. Yet even now, seat belt usage in the United States is below 75%.

Seat belts are passive devices, which means that they require no energy

Contributors

Gridsada Phanomchoeng.

Jihan Ryu.

Derek Caveney at Red Rocks, Nevada, with his wife Peggy.

Neng Piyabongkarn with his daughter Tasha at the Mall of America.

(From left) Ufuk Topcu and Andy Packard.

Pete Seiler in front of the Hungarian Parliament.

Zongxuan Sun.

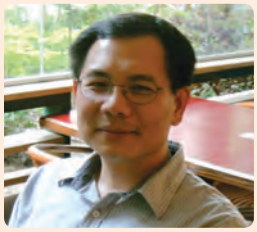
source for their operation, either in terms of sensing, actuation, or processing. They are purely mechanical devices that react to ambient motion. But the driver must play an active role, if only to buckle up and allow the device to work.

Automotive technology is reaching well beyond the stage of passive safety devices through active safety systems that use sensors, processors, and actuators. These systems are operative whether or not the driver participates. Air bags are perhaps the best known of these systems. This issue of *IEEE Control Systems Magazine* (*CSM*) focuses on several others that are either in operation or under development.

The special section of this issue on active safety begins with an introductory article by Guest Editors Zongxuan Sun and Shih-Ken Chen, who describe the benefits of active safety systems and the technology that is needed to realize these benefits. The article by Shih-Ken Chen, Nikolai Moshchuk, Flavio Nardi, and Jihan Ryu focuses on the problem of rollover, which results in numerous fatalities each year. Rollover arises from a combination of translational, yaw, and roll motion as well as tire-road friction. Based on measurements and estimates of the necessary states, active control techniques can apply a combination of steering and braking inputs to minimize the possibility of rollover.

The article by Neng Piyabongkarn, Jae Lew, Rajesh Rajamani, and John Grogg goes beyond rollover avoidance by managing the torque at each wheel to achieve enhanced mobility and cornering. In a related article, Rajesh Rajamani, Neng Piyabongkarn, Jae Lew, Kyongsu


Kyongsu Yi.


Shih-Ken Chen.


John Grogg and his daughter Amanda.


Gary Balas.


Jae Lew at Lake Michigan.


Rajesh Rajamani.


Zongxuan Sun (center) with students Mohd Azrin Mohd Zukefli (left) and Vivek Gupta (right).

The new department "CSS News" is intended to inform readers of current and future activities sponsored by the IEEE Control Systems Society.

Yi, and Gridsada Phanomchoeng describe methods that can be used to obtain online estimates of tire-road friction under diverse road-surface conditions. Experimental implementation of these techniques under snow-covered conditions show their effectiveness.

The article by Derek Caveney describes the development of techniques that would allow vehicles to exchange data in real time, thus opening up a broad range of opportunities for accident avoidance and mitigation.

In addition to this special section, this issue of *IEEE CSM* includes an "Ask the Experts" column in which Andy Packard and colleagues explain the intricacies of sum-of-squares methods for estimating the region of attraction of a nonlinear dynamical system.

For "People in Control," *IEEE CSM* speaks with Magdi Mahmoud and Nariman Sepehri. Magdi specializes in delay systems and large-scale systems, while Nariman explains the challenges of fluid power control as well as his teaching philosophy. We also introduce three new *IEEE CSM* associate editors. This issue brings you one book review, numerous book announcements, and several conference reports. Be sure to read the new department titled "CSS News," which is intended to inform readers of current and future activities sponsored by the IEEE Control Systems Society. We end this issue with a view of the road ahead.

We welcome your ideas for articles, either short or long, as well as comments on any aspect of this publication. Contact me any time.

Dennis S. Bernstein

Remembering a Master

Born in Grand Rapids, Michigan, July 6, 1908, Dr. Oldenburger received an AB degree in Latin and Greek with a second major in mathematics from the University of Chicago in 1928. He graduated with highest honors and was elected to Phi Beta Kappa.

He received his master's and doctoral degrees in mathematics from the University of Chicago in 1930 and 1934, respectively, and then taught at the University of Michigan, the old Case Institute of Technology, at Illinois Institute of Technology, and at DePaul University before leaving the mathematics field to become a practicing engineer. In 1937–38 he was a member of the Institute for Advanced Study at Princeton.

Among his engineering achievements are many contributions in the fields of prime-mover speed governors, in particular electric governors for hydraulic turbines, diesel governors with optimum non-linear control, and a new type of hydraulic governor without dashpots. He also developed a computer-type gas turbine control, a signal stabilization device, and a rapid method of finding the roots of algebraic equations especially for the problem of control design.

In 1956 he was named professor of engineering science and mechanical engineering at Purdue, later being appointed professor of electrical and mechanical engineering, and then professor of mechanical engineering in the School of Mechanical Engineering. He was also the founder and Director of the Automatic Control Center at Purdue.

Author of two books and editor-co-author of five others, Oldenburger wrote some 110 papers. Forty of these were on pure mathematics devoted to higher dimensional determinants and matrices, higher degree polynomials and forms, and symbolic dynamics. He read and spoke eight modern languages and lectured abroad extensively. He was a teacher cast in the mold of the "old school" but who fervently believed in the high value of research to education. He drove himself and set high standards for his students. Those of us who recognize and appreciate the benefits of automatic control are indeed fortunate that individual men such as Rufus Oldenburger have been able to conceive new structures of world organization and have been willing to work untiringly with others to make these organizations a contributing force for a better world. Oldenburger's presence and counsel are already missed by his many friends both within and outside IFAC.

—"Rufus Oldenburger (1908–1969)" by Charles Concordia, *Automatica*, vol. 6, pp. 355–356, 1970.