Making of Safer Automobiles and Intelligent Highways: A Human-Centered Approach

Dr. Mohan M. Trivedi, Professor and Director, Laboratory for Intelligent and Safe Automobiles, University of California at San Diego

Abstract
The United Nation’s World Health Organization estimates that over 3,400 people die and about 100,000 are seriously injured every day on the roads worldwide. A disproportionate number of these accidents occur in Asian countries with rapidly growing economies. In this presentation, we discuss research studies directed towards making road travel safer and more efficient. We will discuss multidisciplinary research activities focused on the design and evaluation of new types of “passive” and “active” safety systems. We will introduce “Human-Centered” approaches which incorporate driver behavior and ethnography surrounding the task of driving in the design of intelligent driver assistance systems. Novel instrumented vehicles are used for conducting experiments, where the rich contextual information about vehicle dynamics, surround and driver state are captured for careful, detailed ethnographic studies, as well as realistic data for developing algorithms to analyze multi sensory signals for active safety. In this presentation, we will provide a systems-oriented framework for developing multimodal sensing approaches, inferencing algorithms and human-vehicle interfaces for safer automobiles. We will consider three main components of the system, driver, vehicle, and vehicle surround. We will discuss various issues and ideas for developing models for these main components as well as activities associated with the complex task of safe driving. The presentation will include discussion of novel sensory systems and algorithms for capturing not only the dynamic surround information of the vehicle but also the state, intent and activity patterns of drivers. We will also introduce a new type of visual display called “dynamic active display”. Illustrative safety systems for smart airbag deployment, collision avoidance, automatic lane keeping, incident detection and congestion mitigation will be presented. We will also discuss emerging trends in vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication based safety systems.

Biography
Dr. Mohan Manubhai Trivedi is a Professor of Electrical and Computer Engineering and the founding Director of the Computer Vision and Robotics Research Laboratory at the University of California in San Diego. Dr. Trivedi has a broad range of research interests in the intelligent systems, computer vision, intelligent (“smart”) environments, intelligent vehicles and transportation systems and human-machine interfaces areas. In partnership with several automobile companies, he established the Laboratory for Intelligent and Safe Automobiles (“LISA”) at UCSD to pursue a multidisciplinary research agenda. He served on the Executive Committee of the California Inst. for Telecommunication and Information Technologies [Cal-IT2] as the leader of the Intelligent Transportation and Telematics Layer at UCSD and he is elected Vice-Chair of the University of California System Wide UC Discovery Digital Media Program. He was the Editor-in- Chief of the Machine Vision and Applications (1996-2004) and is an Editor of the IEEE Transactions on Intelligent Transportation Systems. He served as the Chairman of the Robotics Technical Committee of the IEEE Computer Society and Program Co-Chair of the 2006 IEEE Intelligent Vehicles Symposium. He has received the Distinguished Alumnus Award from the Utah State University, Pioneer Award (Technical Activities) and Meritorious Service Award from the IEEE Computer Society. He serves regularly as a consultant to industry
and government agencies in the USA and abroad, including serving as an Expert Panelist for the National Academy of Science Strategic Highway Research (Safety) Program. He is a native of Wardha (India). He received B.E. (Honors, Electronics) in 1974 from the Birla Institute of Technology and Science, Pilani.
Modular Integration of Intelligent Systems
Professor Ajith Abraham, Norwegian University of Science and Technology, Norway

Abstract
The emerging need for hybrid intelligent systems is currently motivating important research and development work. It is well known that the intelligent systems, which can provide human-like expertise such as domain knowledge, uncertain reasoning, and adaptation to a noisy and time varying environment, are important in tackling practical computing problems. The integration of different learning and adaptation techniques, to overcome individual limitations and achieve synergetic effects through hybridization or fusion of these techniques, has in recent years contributed to a large number of new intelligent system designs. These ideas have led to the emergence of several different kinds of intelligent system architectures. This talk presents some of the generic modular hybrid architectures which have evolved over the past decade in the hybrid intelligent systems community. We further attempt to discuss the importance of these architectures with an emphasis on the best practices for selection and combination of intelligent methods. Two application examples will be presented to demonstrate how such systems could be used for solving real world problems.

Biography
Professor Ajith Abraham's research and development experience includes over 18 years in the Industry and Academia spanning different continents in Australia, America, Asia and Europe. He works in a multi-disciplinary environment involving computational intelligence, network security, sensor networks, e-commerce, Web intelligence, Web services, computational grids, data mining and applied to various real world problems. He has authored/co-authored over 350 refereed journal/conference papers and book chapters and some of the works have also won best paper awards at international conferences and also received several citations. Some of the articles are available in the ScienceDirect Top 25 hottest articles. His research interests in advanced computational intelligence include Nature Inspired Hybrid Intelligent Systems involving connectionist network learning, fuzzy inference systems, rough set, swarm intelligence, evolutionary computation, bacterial foraging, distributed artificial intelligence, multi-agent systems and other heuristics. He has given more than 20 plenary lectures and conference tutorials in these areas.

Currently, he is working with the Norwegian University of Science and Technology, Norway. Before joining NTNU, he was working under the Institute for Information Technology Advancement (IITA) Professorship Program funded by the South Korean Government. He was a Researcher at Rovira i Virgili University, Spain during 2005-2006. He also holds an Adjunct Professor appointment in Jinan University, China and Dalian Maritime University, China. He has held academic appointments in Monash University, Australia; Oklahoma State University, USA; Chung-Ang University, Seoul and Yonsei University, Seoul.