Laboratory / Center profile

Mobility Systems Management Center

Representative:
Professor Hidekazu Nishimura

Research Interests:
Model-based systems engineering, system safety for personal mobility, integral control system management

Members:
Yoji Suhara (Community Technology Institute Inc.), Kensuke Kawai (SDM Research Institute senior researcher), Professor Shoichi Sasaki, Professor Tetsuro Ogi, Professor Masaru Nakano, Project Assistant Professor Terumasa Narukawa, Executive Advisor of SDM Research Institute Yoshiaki Ohkami, Noriyasu Kitamura, a doctoral student, and master's students.

The Mobility Systems Management Center was established in April 2010 to combine academic activities across the Universal Design Lab, Model-Driven Systems Development Lab, Control Systems Design and Dynamics Lab, and to collaborate with off-campus regional and private activities that contribute to public transportation. It conducts research towards developing solutions on issues related to the relationships found in the physical spaces and regions utilized by various modes of public and private transport including trains, buses, cars, motorbikes, personal mobility vehicles, bicycles, wheelchairs as well as pedestrians.

Mobility for local residents is an essential component of regional revitalization. In addition, other services and systems are also necessary, such as modes of personal mobility including private cars, car sharing, bicycles, and motor bikes and it is also essential to coordinate them with para transit to connect them. Moreover, such services require fundamental improvements such as road maintenance and barrier-free design. (Figure 1: Example in Toyama City)

The Study Group of Public Transportation, which was established with a support of Japan Transportation Planning Association, is researching mobility systems management from the perspectives mentioned above. As a part of its activities, the lab held a symposium titled "Think about future regional mobility" in the Collaboration Complex, Hiyoshi Campus, on November 16 (Wed).

Figure 1: Toyama City: Toyama Light Rail (Community Cycle System "Aville" has been introduced)
Copyright: Community Technology Institute Inc.

Maintaining and improving safe driving of elderly drivers

As a joint research with Tokio Marine & Nichido Risk Consulting Co. Ltd, we are researching how to promote safe driving among elderly drivers. Though physical depression is often considered to be the main cause of car accidents involving elderly drivers, the lab research group conducted actual driving tests and found that unsafe driving habits are also a factor. On top of these basic data, the lab uses an immersive driving simulator (Figure 2), which combines Professor Tetsuro Ogi's immersive display technology and Professor Hidekazu Nishimura's driving simulator technology, to more precisely understand elderly drivers' driving behavior and to determine how to maintain and improve their safe-driving habits and skills. It is said that attentiveness while driving and dynamic vision start deteriorating from age 40. The lab research group, which is working to establish an environment for safe mobility, would like to remind everyone that we should all improve our safety awareness.

Figure 2: Driving in the immersive driving simulator

Safety control system design for passenger protection

Figure 3: Validation of driver assistance system using driving simulator

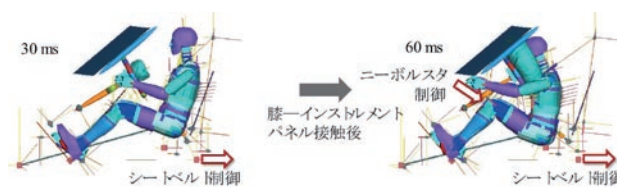Figure 4: Passenger protection control system reducing lower limb damage

In order to improve vehicle safety, the Model-Driven Systems Development Lab and the Control Systems Design and Dynamics Lab are conducting research in various areas, including (1) integral management of steering systems such as EPS (Electrically-assisted Power Steering) and suspension systems, (2) front-steering assist control for a motorcycle[1], (3) driver assistance system management (Figure 3), (4) environment friendly ACC (Adaptive Cruise Control) using wireless communication between vehicles, (5) transportation control system to prioritize emergency vehicles, and (6) identification of function requirement for obstacle avoidance system using SysML (Systems Modeling Language)[2]. Nevertheless, when a driver cannot avoid a collision, the passenger protection system should work to minimize injury to the passenger(s)[3]. In joint research with Honda Motor Co., the Lab research group focuses on solutions to reduce lower limb damage that involves lengthy rehabilitation and recovery time, and proposes cooperative active control with a lap-belt and knee bolsters. Figure 4 shows an example of the results of 3D simulation using MADYMO ®.

Reference:

1) Motorcycle Cornering Characteristics and Driving Stability Control, Hidekazu Nishimura, TOPICS: Technology "kind" to Humanity, JIDOSHA-GIJUTSU, Journal of Society of Automotive Engineers of Japan, Vol.64, No.12, p.43-48, (2010)
2) Expectations to Model-Based Systems Engineering and SysML (The Systems Modeling Language), Hidekazu Nishimura, Special Issue: Modeling Language SysML and Design of Systems, Journal of Japan Society for Design Engineering, Vol.46, No.5, pp.241-246, (2011)
3) Safety in Vehicle Collision, Hidekazu Nishimura, Journal of Japan Society for Safety Engineering, Vol.48, No.5, pp.288-292, (2009)

SDM Research Institute Symposium, Keio University

Date and time: 14:00-17:00 November 16, 2011, Wednesday
Collaboration Complex room C3S10, Hiyoshi Campus

"Think about future regional mobility"

▶ http://www.sdm.keio.ac.jp/news/2011/10/05-173259.html
Max 90 people, free admission, registration required.

SDM Research Institute, Graduate School of System Design and Management at Keio University
Collaboration Complex, Keio University, 4-1-1 Hiyoshi, Kohoku-Ku, Yokohama, Kanagawa 223-8526
Tel：045-564-2518   Fax：045-562-3502   E-mail：sdm@info.keio.ac.jp

SDM
System Design and Management