



**The Center for Control, Dynamical Systems, and Computation
University of California at Santa Barbara
Winter 2007 Seminar Series
Presents**

The Human Reaction Time: What can Control do to Overcome it?

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Abstract:

An aircraft pilot or car driver is good at decisions that can wait for a second. A second may be a long time, however, for fast dynamical processes as they occur for example, when an aircraft engine fails or a car begins to skid or roll over.

The seminar will show how an automatic feedback system can assist a pilot or a driver to overcome such dangerous situations. The basic idea is to compensate for rotational motions that have not been commanded by the human operator.

First, a structurally robust control concept for car steering is introduced. It is then modified so that the automatic control system assists the driver for only 0.5 to 1 seconds after a disturbance. The same control concept is used to alleviate the load in the vertical fin of an Airbus after an engine-out.

Finally, car steering is used to avoid rollover. In all three cases the automatic control reacts faster and more precisely than the human operator. The benefits are increased safety on the roads and weight reduction and simpler design of the vertical fin for an aircraft.

About the Speaker:

Dr. Jürgen Ackermann has made major contributions to control theory engineering. He has authored many papers and several books on sampled-data and robust control systems. He is well known for Ackermann's pole placement formula and holds numerous patents. He studied with Prof. Oppelt at Darmstadt and Prof. Jury at Berkeley.

From 1974 to his retirement in 2001, Dr. Ackermann was director of the Institute of Robotics and Mechatronics at the German Aerospace Center in Oberpfaffenhofen, Germany, to which he attracted many well known researchers, including G. Hirzinger, W. Kortüm, G. Grübel, K. Well and G. Kreiselmeier. With them he conducted research on robust autopilots and jet engine control; trajectory optimization of aircraft, missiles and spacecraft; control of large flexible structures; robotics for space and manufacturing applications, modelling and control of trains, maglev vehicles and automobiles.

In the experiments with BMW, his theory for robust steering of vehicles has shown great safety advantages in road tests with side-wind and mu-split braking. Transferred to flight control, the same concepts resulted in significant weight reductions.

In 1996, Dr. Ackermann received the first Nichols medal of IFAC "for robust control design methods and their use to improve automobile safety" and also presented the IEEE Bode Prize lecture. In 2005 he was appointed IFAC Fellow "for outstanding and extraordinary contributions to the field of automatic control and involvement in IFAC activities in the promotion of the field". He is adjunct professor at the Technical University Munich and has held visiting appointments at Urbana-Champaign, Canberra, Irvine, Berkeley and Stanford.
