VDG presents at SACAM 2012

Mr Theunis Botha and **Ms Anria Strydom** presented papers at the 8th South African Conference on Computational and Applied Mechanics held in Johannesburg from 3 to 5 September 2012. **Prof Schalk Els** (VDG group leader) also chaired a track at the conference.

Mr Theunis Botha (PhD Student) presented a paper, co-authored by Prof Schalk Els, entitled "**High Speed Autonomous Off-Road Vehicle Steering**". The abstract is given below and the full paper will be available in the proceedings of the conference.

Abstract:
High speed cornering of an off-road vehicle poses considerable challenges to the development of an autonomous vehicle due to the non-linear dynamics of the tyre road interface as well as those of the vehicle as a whole during high lateral accelerations. Most driver models are developed for low speed applications using linear control methods under the assumption of linear vehicle dynamics. The dynamics of a vehicle however become highly non-linear as the lateral acceleration increases, thus rendering these linear models almost unusable during high speed manoeuvres. In this paper two robust driver models for use in an autonomous vehicle capable of path following at both low and high speeds are presented. The controllers make use of the relationship between the yaw acceleration and steering rate to control the yaw angle of the vehicle. This is coupled together with a controller to reduce the lateral error. Simulation and experimental results show the vehicle performing manoeuvres at 90% of the vehicle's maximum achievable lateral acceleration with the vehicle remaining stable throughout the manoeuvre.

Ms Anria Strydom (Masters student) presented a paper, co-authored by Prof Schalk Els, entitled "**Semi-active suspension control of an off-road vehicle for ride comfort optimization**". The abstract is given below and the full paper will be available in the proceedings of the conference.

Abstract:
Handling and ride comfort are two important aspects of vehicle development with regard to demands on vehicle safety, driver comfort and health. These characteristics require contrasting suspension settings that are not obtainable using traditional passive suspension systems. Controllable suspension systems that allow independent tuning of damping, such as semi-active implementation of magneto-rheological (MR) dampers, have the ability to offer optimal ride comfort and handling characteristics under different loading conditions. Optimal ride comfort is obtained by implementation of control strategies such as skyhook control. However, improvement of ride comfort is challenging especially when passive damping can't be removed entirely from the system due to constraints on the damping characteristics of the controllable damping devices. Although there are several semi-active suspension control strategies available in the literature, the combination of passive and semi-active systems is scarcely explored. This paper presents skyhook control implemented on a quarter car model of an off-road vehicle in order to determine suspension settings for optimal ride comfort. The effect of an underlying passive suspension on the dynamics of a controlled model is demonstrated. It is also demonstrated that implementation of semi-active suspension control yields negligible improvement in ride comfort over a passive suspension system that has been optimized for ride comfort.

For more information visit:
http://samechanics.co.za/uj/node/1

Ms Strydom presenting her work

Mr Botha presenting his work