**Investigation on Semi-Active Suspension System for Multi-Axle Armoured Vehicle using Co-Simulation**

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**Abstract**

The objective of the study is to evaluate the performance of various semi-active suspension control strategies for 8x8 multi-axle armoured vehicles in terms of comparative analysis of ride quality and mobility parameters during negotiation of typical military obstacles. Since the cost, complexity and time precludes realisation of actual system, co-simulation technique has been effectively implemented for this investigation. Co-simulation combines advanced virtual prototyping and control technology which offers a novel approach to investigate the dynamics of such complex system. The simulations for the integrated control system along with multi body model of the vehicle are carried out for the control strategies, viz. continuous skyhook control, cascade loop control and cascade loop with ride control and compared with uncontrolled suspension system. The vehicle with 8x8 configuration is run on the real world obstacle profiles, viz. step, trench, trapezoidal bump and corrugated road and the effect of control strategies on ride comfort, wheel displacement and ground reaction is presented. It is observed that cascade loop with ride control in semi-active mode offers better vehicle ride comfort while crossing the said obstacles. The improved performance parameters are achieved through stabilisation of heave, pitch and roll motions of the vehicle through outer loop and isolation of vehicle level uneven disturbances through the fuzzy logic controller employed in inner loop.

**Keywords :**Semi-active suspension, multi-body dynamics, obstacle-crossing, co-simulation.

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Brief Resume:

**Mukund W Trikande**  is working as Scientist G, Associate Director at VRDE,  Ahmednagar. He has been working on design and development of wheeled and tracked ground mobility systems. He has headed various projects of VRDE and presently engaged on development of wheeled armoured platform which is a technology demonstrator for providing indigenous solution for combat and combat support role vehicles for Indian defence forces.  His areas of interest are real time control systems, system engineering and configuration management.

**Vinit V Jagirdar** is working as Scientist E in VRDE, Ahmednagar. He has been working as a system manager for R-D projects. He is responsible for suspension system design and development. He has successfully developed the highly complicated under-chassis driveline for the 8x8 multi-purpose wheeled armoured platform. His area of interest are suspension systems, modelling and simulation of automotive systems.

**Vasudevan Rajamohan** is working as a professor of School of Mechanical Engineering at VIT University, Vellore, India. He obtained his Ph.D. from Concordia University, Canada. He has around 18 years of combined research and teaching experience in India and Canada. His research focuses on broad range of problems in Mechanics of composite structures, Dynamics and control, Smart Materials and Nano composites, Structural Health Monitoring, with applications in aerospace and automotive industries.

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