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Autonomous off-road vehicles challenges and opportunities

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Abstract

Control of autonomous off-road vehicles is getting more and more attention in the trend of self-driving vehicles. Off-road vehicles are widely used in different industries such as mining and farming. Off-road vehicles experience various ground conditions and should be able to work sufficiently accurately on undulating, sloping and very uncertain terrain. When off-road vehicles are autonomous, the guidance and control of them are challenging due to significant disturbances. In order to consider these disturbances in the guidance of an off-road vehicle, lateral and longitudinal sliding velocities are incorporated into the modeling and the control design. This makes control of autonomous off-road vehicles more challenging. There are a variety of vehicle types. Among them are wheeled vehicles, tracked vehicles, wheeled and tracked vehicles towing trailers and four-wheel steer and four-wheel drive vehicles. There are robust control methodologies to tackle the disturbances in driving off-road vehicles successfully. Moreover, in moving towards full-scale autonomous vehicle commercialization, there are obstacles such as laws and regulations as well as insurance policies on one hand and opportunities such as less direct contact with people and working in known environments such as farms and mines on the other hand.

Biography

Javad holds PhD in Mechatronics from University of New South Wales, Australia and MSc in automation and information from Bremen University, Germany. His research interest is on path tracking control of autonomous vehicles. He has extensive experience in modelling and control of nonlinear systems, filtering and data fusion in guidance systems with application in autonomous vehicles, robotics and collision avoidance. He has published peer-reviewed articles in the top-ranking journals and conferences. He is the main author of the book "Applied Guidance Methodologies for Off-road Vehicles".

He has more than 12 years of industrial experience; his industrial experience is on high-level control of complex logistics systems and leading technologies in robotics and control.

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