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A Gyro-stabilized Autonomous Multi-terrain Quadrupedal-wheeled Robot: Towards Edge-enabled Self-balancing, Autonomy, and Terramechanical Efficiency of Unmanned Off-road Vehicles

Authors : Mbadiwe S. Benyeogor, Oladayo O. Olakanmi, Kosisochukwu P. Nnoli, Olusegun I. Lawal, Eric JJ. Gratton

Abstract : For a robot or any vehicular system to navigate in off-road terrain, its driving mechanisms and the electro-software system must be capable of generating, controlling, and moderating sufficient mechanical power with precision. This paper proposes an autonomous robot with a gyro-stabilized active suspension system in form of a hybrid quadrupedal wheel drive mechanism. This system is to serve as a miniature model for demonstrating how off-road vehicles can be robotized into efficient terramechanical mobile platforms that are capable of self-balanced autonomous navigation and maneuvering on rough and uneven topographies. Results from tests and analysis show that the developed system performs as expected. Therefore, our model and control devices can be adapted to computerizing, automating, and upgrading the operation of unmanned ground vehicles for off-road navigation.

Keywords : active suspension, autonomous robots, edge computing, navigational sensors, terramechanics
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