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Quantum-Enhanced Sensing: Revolutionizing Landslide Monitoring with Quantum Optics Technologies

Abstract:

Landslides continue to pose a significant risk to infrastructure and human safety globally, highlighting the critical necessity for more sensitive and dependable monitoring systems. Traditional sensing technologies, although effective to some degree, are prone to precision, noise robustness, and data security problems under extreme conditions. Advances in quantum optics offer a breakthrough solution to these challenges. This review outlines the fundamental principles of quantum optics—entanglement, quantum-enhanced metrology, and quantum communication—and their promise to transform landslide monitoring techniques. We explain how quantum sensors, by exploiting effects of squeezed light and single-photon detection, can drastically improve the sensitivity and accuracy of measurements with respect to ground deformation and micro-seismicity. Moreover, the implementation of quantum-secure communication protocols is set to enhance the integrity and confidentiality of geotechnical data networks.

Biography

Ajish U is pursuing PhD in Amrita University, Kollam, India. He is interested in doing research in landslide monitoring and detecting field by aiding with emerging technologies. He worked for more than 3 years as an Assistant professor in EEE department in various engineering colleges and is passionate in teaching field.