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Fiber Braggs Grating Sensor Based Instrumentation to Evaluate Postural Balance and Stability on an Unstable Platform

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Abstract : This paper describes a novel application of Fiber Braggs Grating (FBG) sensors on an unstable platform to assess human postural stability and balance. The FBG sensor based Stability Analyzing Device (FBGSAD) developed demonstrates the applicability of FBG sensors in the measurement of plantar strain to assess the postural stability of subjects on unstable platforms during different stances in eyes open and eyes closed conditions on a rocker board. Comparing the Centre of Gravity (CG) variations measured on the lumbar vertebra of subjects using a commercial accelerometer along with FBGSAD validates the study. The results obtained depict qualitative similarities between the data recorded by both FBGSAD and accelerometer, illustrating the reliability and consistency of FBG sensors in biomechanical applications for both young and geriatric population. The developed FBGSAD simultaneously measures plantar strain distribution and postural stability and can serve as a tool/yardstick to mitigate space motion sickness, identify individuals who are susceptible to falls and to qualify subjects for balance and stability, which are important factors in the selection of certain unique professionals such as aircraft pilots, astronauts, cosmonauts etc.

Keywords : biomechanics, fiber bragg gratings, plantar strain measurement, postural stability analysis
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