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The use of mechanical vibration absorbers to reduce the tremor in Parkinson's disease patients


Diseases of the central nervous system may lead to severe movement disorders. Parkinson's Disease (PD) – one of these disorders - is characterized by involuntary movement of body parts resulting from antagonistic muscle contractions. Symptoms of PD can mostly start to appear at an average age of 59 years. Although there are drugs to manage the symptoms – albeit potentially life-threatening - and social approaches to help cope with the disease, tremor progresses with time and becomes significant when the patient is elderly. Thus, to help elderly people who exhibit spatial and temporal movement variability, a mechanical treatment is suggested. Tuned vibration absorbers have been studied and designed to reduce the resting tremor of PD's patient when attached to the forearm of the upper limb. Numerical and simulation studies that are based on a three degree-of-freedom biodynamic modeling of the human hand in horizontal plane at the musculoskeletal level are used to model a system

of flexion-extension planar motion of the shoulder, elbow and wrist joints. The performance of the system is assessed in terms of the percentage of reduction in the primary system's displacement amplitude and the bandwidth of each designed passive controller.

Speaker Biography

Hassan M. Khachfe¹ earned a B.S. in Physics, a M.Sc. in Polymer Chemistry, and a Ph.D. in Biophysics and Molecular Medicine. He runs multidisciplinary research projects and supervises two interdisciplinary research groups. The Lebanese Institute for Biomedical Research and Application (LIBRA) deals with the structural determination and characterization of macromolecular assemblies, the analysis of complex signals, and the design of MEMS/NEMS for biomedical applications. Current projects focus on understanding the molecular details of the disease-causing plasma apolipoproteins, Apo B100 of the low density lipoprotein (LDL), on finding novel approaches for the decontamination and lengthy storage of foods, and on the design of mechanical absorbers as vibration suppressors for Parkinson's patients. Prof. Khachfe also heads the Business, Educational, and Medical Optimization REsearch (BE-MORE) group, which explores the design and implementation of automated quality management, control, assurance, and business systems for healthcare and educational institutions.

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