Postural Stability of Humans

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This study explores postural stability of humans using motion capture, EMG and dynamic pressure under the feet. Subjects each perform three different tasks: a lifting task, a stair climbing task and a motion platform task that simulates shipboard motion. It is hoped that several useful pieces of information can be extracted from the data collected in order to determine the merit of more detailed future studies. First, the relation between changes in center of mass and center of pressure will be explored. It is expected that both will have similar functions but be shifted in phase. Of interest will be the amount of phase shift and how much this varies from subject to subject. Secondly, a quantification of which muscle groups play the largest role in postural stability will be useful in determining the most efficient means of modeling postural stability (accuracy versus complexity). Third, the strategies used by humans for postural stability will be compared to the Zero Moment Point (ZMP) strategy employed in biped robotics to determine how well this strategy mimics humans. Finally, analysis will be performed to determine whether there is a predictive relation between the activation (EMG signals) of various muscle groups used in postural stability. If such a relation can be found, it is hoped that it could be used in the development of a feed forward control system to bridge the human nervous system to active lower-limb prosthetics and/or to bridge severed nerve pathways in individuals suffering from neural diseases.