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# Platform Virtual for Joint Amplitude Measurement Based in MEMS

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**Abstract :** Motion capture (MC) is the construction of a precise and accurate digital representation of a real motion. Systems have been used in the last years in a wide range of applications, from films special effects and animation, interactive entertainment, medicine, to high competitive sport where a maximum performance and low injury risk during training and competition is seeking. This paper presents an inertial and magnetic sensor based technological platform, intended for particular amplitude monitoring and telerehabilitation processes considering an efficient cost/technical considerations compromise. Our platform particularities offer high social impact possibilities by making telerehabilitation accessible to large population sectors in marginal socio-economic sector, especially in underdeveloped countries that in opposition to developed countries specialist are scarce, and high technology is not available or inexistent. This platform integrates high-resolution low-cost inertial and magnetic sensors with adequate user interfaces and communication protocols to perform a web or other communication networks available diagnosis service. The amplitude information is generated by sensors then transferred to a computing device with adequate interfaces to make it accessible to inexperienced personnel, providing a high social value. Amplitude measurements of the platform virtual system presented a good fit to its respective reference system. Analyzing the robotic arm results (estimation error RMSE 1=2.12° and estimation error RMSE 2=2.28°), it can be observed that during arm motion in any sense, the estimation error is negligible; in fact, error appears only during sense inversion what can easily be explained by the nature of inertial sensors and its relation to acceleration. Inertial sensors present a time constant delay which acts as a first order filter attenuating signals at large acceleration values as is the case for a change of sense in motion. It can be seen a damped response of platform virtual in other images where error analysis show that at maximum amplitude an underestimation of amplitude is present whereas at minimum amplitude estimations an overestimation of amplitude is observed. This work presents and describes the platform virtual as a motion capture system suitable for telerehabilitation with the cost - quality and precision - accessibility relations optimized. These particular characteristics achieved by efficiently using the state of the art of accessible generic technology in sensors and hardware, and adequate software for capture, transmission analysis and visualization, provides the capacity to offer good telerehabilitation services, reaching large more or less marginal populations where technologies and specialists are not available but accessible with basic communication networks.

**Keywords :** inertial sensors, joint amplitude measurement, MEMS, telerehabilitation
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