

# Biomedical Applications of Smart Piezo Sensors Based on EMI Technique

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## ABSTRACT

Research for application of smart materials in bio-sensing is increasing day by day because of their lower cost and inert nature which makes them biocompatible. In this paper the electromechanical impedance technique (EMI) using piezo sensors has been used to detect changes in the bone structure due to fracture or crack or due to change in elastic property like young's modulus, damping, etc. A 3D bone model has been numerically analyzed to obtain realistic conductance signatures and simulate the changes in the properties of the bone. FEM modeling of the 3D bone structure based on the EMI technique shows that it is possible to detect cracks in bone, which are manifest as changes in the conductance signatures on the occurrence of cracks. At the same time, attempt has been made to detect pulse rate/heart beat using piezo sensors. The pulse rate measured has a range of 65-85 beats per minute and has appreciable repeatability. Thus, this paper emphasizes on the future use of piezo based smart materials for bio medical applications.

**Keywords:** Piezo, EMI, Biomedical, Bone, Crack, Pulse Rate