ABSTRACT

In this work, an ANSYS-based simulation, fuzzy analysis, development and testing of a microelectromechanical system (MEMS) based energy harvesting systems has been presented. Energy harvesting from physical motion such as finger motion, heart beating, walking and running are becoming so important now-a-days. A novel technique for adjusting the outputs by changing the inputs has been proposed in this study. Fuzzy logic-based control systems are widely used in various fields like home appliances, medical instruments, automobiles, textile machinery, agriculture equipment and aviation for process control and data analysis. Fuzzy logic technique has shown great potential to solve the complex problems of physical world due to similarity with human understanding. Here, the outputs of system like voltage and current of the MEMS based energy harvester can be controlled by using fuzzy logic. Its advancements have gained widespread attention in different research areas. In several cases, it is very suitable for electronic devices which need to be precisely self-powered. Further Zinc oxide (ZnO) nano rods were synthesized on an anodic aluminum oxide (AAO) template to form the MEMS energy harvester and study the effect of energy generation by applying force. The power of 5.16 nano Watts has been obtained by taking the numerical value of voltage (V_{oc}) and current (I_{sc}) as 3.16 mV and 0.985 μA respectively using fuzzy logic tool. Experimental testing of the harvester shows that the range of V_{oc} is 3–6.4 mV and I_{sc} is 0.45–1.5 μA. The results depict that this device can be used for touch screens to generate energy that can be further utilized for charging smart devices.