

Optimal Design of Linear Generator to Recharge the Smartphone Battery

Authors : Jin Ho Kim, Yujeong Shin, Seong-Jin Cho, Dong-Jin Kim, U-Syn Ha

Abstract : Due to the development of the information industry and technologies, cellular phones have must not only function to communicate, but also have functions such as the Internet, e-banking, entertainment, etc. These phones are called smartphones. The performance of smartphones has improved, because of the various functions of smartphones, and the capacity of the battery has been increased gradually. Recently, linear generators have been embedded in smartphones in order to recharge the smartphone's battery. In this study, optimization is performed and an array change of permanent magnets is examined in order to increase efficiency. We propose an optimal design using design of experiments (DOE) to maximize the generated induced voltage. The thickness of the poleshoe and permanent magnet (PM), the height of the poleshoe and PM, and the thickness of the coil are determined to be design variables. We made 25 sampling points using an orthogonal array according to four design variables. We performed electromagnetic finite element analysis to predict the generated induced voltage using the commercial electromagnetic analysis software ANSYS Maxwell. Then, we made an approximate model using the Kriging algorithm, and derived optimal values of the design variables using an evolutionary algorithm. The commercial optimization software PIANO (Process Integration, Automation, and Optimization) was used with these algorithms. The result of the optimization shows that the generated induced voltage is improved.

Keywords : smartphone, linear generator, design of experiment, approximate model, optimal design

Conference Title : ICAMCME 2016 : International Conference on Advanced Motion Control and Mechanical Engineering

Conference Location : San Diego, United States

Conference Dates : January 21-22, 2016