ABSTRACT

Neck injuries pose a significant risk to military troops when they are inside military vehicles. In order to solve this problem, a Smart Mannequin has been created as a replacement for humans in testing. It has been designed with a range of sensors, including a load cell. The purpose of this research is to assess the application of load cell and the effectiveness of the Kalman filter in improving the precision of force measurement on the neck of the Smart Mannequin. The Smart Mannequin was subjected to testing by being positioned inside military vehicles that traversed different types of tracks: flat, inclined at a 15° angle, parallel beam, sinusoidal paths 1 and 2, as well as inclines at 45° and 60° angles, while traveling at speeds ranging from 10 to 40 km/h. The research results indicate that the utilization of the Kalman filter greatly enhances the precision of force measurement, resulting in an average discrepancy of around 0.23% between filtered and unfiltered values. Furthermore, all force measurements recorded were found to be below 6 Newtons, suggesting a negligible risk of injury that is in accordance with safety rules.

Keywords: Kalman filter, load cell, military vehicle testing, Smart Mannequin.