ABSTRACT

In military activities, such as combat exercises or actual battles, various aspects must be considered, one of which is the resilience of combat vehicles with minimal impact on casualties (passengers). Currently, combat vehicle testing still involves human assistance, and the results obtained from this method are not highly accurate. This research aims to create a smart mannequin capable of providing a solution for detecting damage impacts or assessing the safety level of armored vehicle drivers based on IoT (Internet of Things) technology. In this testing, the MQ-2 and ADXL345 sensors are used as indicators for gas detection and motion detection in the smart mannequin. The gas sensors are used to detect relevant gases in military settings, while the motion sensors employ the Kalman Filter method to provide data on body movements, vibrations, and g-forces, which are then graphically displayed to aid in analyzing the comfort and ergonomics of military vehicles in various terrains. The data generated by both sensors will be integrated into a Raspberry Pi 4B, and the output will be sent to a web-based system in real-time. The information collected by the sensors on the mannequin can be used to analyze the physical and thermal impacts on passengers during testing. The results of the research indicate that the MQ-2 sensor can detect gases within specific ranges: gas is detected up to 40 cm in a large air-conditioned room, up to 60 cm in a large non-air-conditioned room, up to 20 cm in an open space, and up to 100 cm in a small room. Meanwhile, the ADXL345 sensor can measure the mannequin's impact with better accuracy when using the Kalman Filter method, and the resulting data is graphically presented on a web interface.

Keywords: Mannequin, MQ-2, ADXL345, Raspberry Pi 4B, Kalman Filter.