ABSTRACT

This research aims to develop an automated system for weighing and classifying laboratory animals with high accuracy by utilizing load cell sensors and the Kalman Filter algorithm. The study was motivated by the need to overcome limitations in manual classification methods, which are typically slow, error-prone, and heavily reliant on operator expertise. The proposed system automatically classifies animals into three weight categories—3–11 grams, 12–21 grams, and 22–40 grams—using servo actuators and a conveyor mechanism.

The development process followed a prototyping methodology, comprising stages of requirement analysis, system design, implementation, testing, and refinement. The load cell functions as the main sensor for weight measurement, the HX711 module amplifies and digitizes the signal, and the Arduino Mega acts as the central controller. The Kalman Filter is implemented to reduce signal noise and enhance measurement accuracy. The system includes automated classification logic and a sorting mechanism powered by servo motors.

Test results indicate that the system successfully reduces weight reading fluctuations to within ±0.01 grams and improves classification accuracy from 83.2% to 96% after applying the Kalman Filter. The average processing time per sample was recorded at 7.23 seconds, significantly faster than manual methods. The system demonstrated stable performance in 125 trials and is ready to be deployed in small to medium-scale laboratory environments. This solution has strong potential to accelerate biomedical research through efficient, accurate, and fully automated classification of laboratory animals.

Keywords: Animal Classification Automation, Load Cell, Kalman Filter, Automation System, Arduino Mega, Prototyping.