ABSTRACT

This study aims to develop an automatic medicine vending machine system capable of dispensing medication with high precision and efficiency, energi stability, and integrated monitoring features. The system is designed using Arduino Mega 2560 as the main microcontroller, DC motors to drive the spiral mechanism, rotary encoders to count motor rotations, and ultrasonic sensors to detect successful medicine ejection. The addition of rotary encoders allows the motors to rotate according to the specified pulse per revolution, thereby enhancing the accuracy of medicine dispensing. Meanwhile, ultrasonic sensors serve as supplementary monitoring tools to verify whether the medicine has exited the spiral correctly. The system was tested on nine channels with various input configurations, both individually and simultaneously. The results show that the system is capable of dispensing the correct amount of medicine according to the input, without any over-dispensing, under-dispensing, or jamming. The average dispensing time per unit ranged between 2.59 and 2.74 seconds. The average RMSE value of 1.04 and MAPE of 24.20% indicate an acceptable level of deviation, particularly considering the nature of the small and fast-moving objects being detected. Furthermore, the five-day power consumption test recorded a total energy usage of 0.181 kWh, indicating that the system is energy efficient during both standby and active operation. In conclusion, the developed system successfully integrates accuracy, and operational stability to support modern and integrated healthcare services through automated medicine dispensing technology.

Keywords **:** *DC Motor, Healthcare, Rotary Encoder, Ultrasonik Medicine Vending Machine,*