

ABSTRACT

In the 21st century, the Food and Beverage (F&B) industry has experienced rapid development by utilizing technology, including robotics, to improve service efficiency. One of the latest innovations is the food delivery robot, which has the potential to replace human labor in delivering food to enhance safety, hygiene, and service consistency. However, technical challenges in the design and implementation of these robots, such as static *trays* and inadequate food protection, hinder their performance. This study aims to develop a mechatronic system that can improve the effectiveness of food delivery robots, including an automatic sterile *tray* and an accurate navigation system.

The research methodology involved literature review, modeling, simulation using design software, testing of sensors and actuators, and analysis of results based on the robot's angle and position measurements. The designed system integrates an Arduino Mega microcontroller for *tray* control and a Raspberry Pi for robot movement, along with Internet of Things (IoT) technology for monitoring through the Kodular software.

The test results show that the PID configuration produces stable and precise tray movements, as indicated by an average error of only 2,66% at a distance of 27,5 cm and 3,21% at a distance of 8,5 cm. This proves that the system has a high level of accuracy, stable movement, and minimal oscillation and overshoot. The presence of an automatically monitored tray integrated with an IoT system makes the food delivery robot more innovative, providing greater convenience and comfort for users.

Keywords: *service efficiency, IoT, food delivery robot, automatic tray, mechatronic system.*