

## ABSTRACT

*Robotics technology, particularly in the field of industrial automation, has experienced rapid development and has provided significant benefits. The line follower robot is one type of robot that has begun to be used in industries to transport goods by automatically following a specific path. This research aims to design an Arduino NANO-based line follower robot using a Proportional Integral Derivative (PID) controller with the Ziegler-Nichols tuning method to improve accuracy and stability in following the path. The research methodology includes literature study, robot design and construction, component testing, PID controller integration, and robot performance testing. The robot is designed using 8 TCRT5000 sensors as line detectors, DC motors, an L298N motor driver, and 18650 batteries as a power source. Tests are conducted by adjusting the PID parameters and observing the robot's performance on various track shapes, including straight paths, 135°, 90°, 45°, and 30° turns. The research results show that the line follower robot successfully follows the path well with optimal PID parameters obtained from the Ziegler-Nichols tuning method, namely  $K_p = 120$ ,  $K_i = 0.8$ , and  $K_d = 4500$ . This research is expected to contribute to the development of line follower robots, particularly in terms of PID controllers, and serve as a reference for researchers and practitioners in the field of robotics to develop better controllers. The test results indicate that the use of a PID controller with the Ziegler-Nichols tuning method can enhance the stability and accuracy of the robot in following the predetermined path.*

**Keywords:** *Line follower robot, Arduino NANO, TCRT5000 sensor, Proportional Integral Derivative (PID), Ziegler-Nichols method*