

ABSTRACT

The development of automation control technology is growing rapidly, especially DC motors have become an important component in various applications due to their ability to regulate speed with precision. However, the speed produced by DC motors is not always stable. For this reason, this research designs an Arduino-based digital PID training tool as a solution that is able to control the speed of a DC motor directly and stably with the Ziegler Nichols software method PID controller to obtain optimal parameters in controlling the speed of a DC motor. The Ziegler-Nichols method successfully tunes the PID controller with optimal parameters $K_p = 11.7$, $K_i = 1$, and $K_d = 0.25$. Analysis of the system response shows rise time = 0.4866 s, Settling time = 2.5829 s, overshoot = 19.6194%, and steady state error = 0.0861%. This Ziegler Nichols method PID-controlled system provides fast response and good stability, with significant improvement in reducing steady state error and overshoot compared to a system without a controller or using the trial-and-error method.

Keywords: *Arduino, DC Motor, Digital PID, Ziegler Nichols*