

## **ABSTRACT**

The advancement in control technology has witnessed significant progress, and automatic control plays a vital role in the field of instrumentation. Proportional, Integral, and Derivative (PID) control is one of the primary control methods widely used for industrial process control. Liquid Level System control is one of the process variables that allows for easy observation of its control behavior, especially when controlling the water level in the Coupled Tank system. While the Coupled Tank system provides valuable experiments for students to understand basic control concepts, the available demonstration tools in the Basic Control System Laboratory (SKD) are limited and lack interactivity. This limitation poses a major problem that needs to be addressed to enhance the effectiveness and efficiency of the basic control system practical sessions.

To address this issue, we propose the development of a water level control system using the Coupled Tank apparatus as a practical learning medium for basic control system practical sessions. The system is designed with three main subsystems: dynamic PID control, hardware and electronics, and the application and GUI (CTS App). The development process follows the engineering design process method to ensure systematic and structured design. Moreover, PID tuning is conducted to achieve optimal values, allowing the system to accurately follow the desired water level.

The results of the specification testing demonstrate that the system can provide close-loop responses according to the PID controller characteristics. Economic specifications were also considered during testing, successfully minimizing the production costs of the apparatus within the set limit. Furthermore, the developed Coupled Tank apparatus has provided an efficient and effective user experience in understanding PID controllers and basic control systems. With the inclusion of this interactive demonstration tool, we expect the basic control system practical sessions to become more engaging and positively impact students' comprehension of fundamental control concepts.

Kata kunci : PID Controller, Coupled Tank, Liquid Level System, GUI