

## ABSTRACT

In this modern era, technology is developing rapidly where one of the affected is the robot industry. Robots have entered various aspects of human life, such as industry, medicine, service, toys/pets, and education. Furthermore, robots are used to compete with humans. The presence of a robot that is able to compete is certainly an interesting thing to explore further. The presence of robots that are able to work in the same scope as humans will be needed.

In this final project, an air hockey robot control is designed that can compete with human. Robot motion control will be applied to move the integrated paddle on the air hockey robot with the PID control method. The implementation is specified to the X-plane motion system only. Camera will be used as a sensor, the result will be processed with image processing to detect the position of puck and robot. The robot system will track the puck's movement with PID control and predict the puck's destination with a predictor algorithm.

The designed image processing system has the highest performance of 0.0125 seconds per frame. The PD-controlled air hockey robot with a value of  $K_p = 0.135$ ,  $K_d = 0.0000000008$  is able to respond with a rise time of 0.35 seconds, an overshoot of 2.95%, a settling time of 0.5 seconds and a steady state error of 0.58%. The highest level of accuracy occurs for the test without bounce with an average error of 3.44%.

**Keywords:** *air hockey robot, PID control, image processing, blob detection, tracking.*