

ABSTRACT

Table tennis is a sport that can be played in singles or doubles. In table tennis games and practice, often a lot of balls are scattered so that players and the official team need more energy more to pick up the ball directly. There are several tools that already exist to make it easier to pick up a table tennis ball. But All these tools are still used conventionally so sometimes it still requires a little energy to pick up the ball. So, a robot is needed to collect table tennis balls autonomously.

This final project designs a real-time object detection and tracking system using image processing on an autonomous table tennis ball collecting robot. The ball detection process is carried out in two stages, namely: pre-processing and contour detection methods. Pre-processing is done by changing the image of the ball that has RGB format into HSV format. The HSV image is then converted into a binary image using a thresholding technique to separate the ball from the background. The spherical image is refined by morphological operations to remove parts of the image that are not needed. After pre-processing, detect the shape of the ball with contour detection to determine the coordinates of the ball. The coordinates of the ball are needed for the movement of the motor servo that follows the displacement of the ball.

The object detection and tracking system on the table tennis ball collecting robot is able to detect the distance of the ball when the camera is stationary with the lowest accuracy of 97.631% and the highest accuracy of 99.607%. When the camera moves, it detects the distance of the ball with the lowest accuracy at 81,455% and the highest accuracy at 88.304%. In the movement of the camera to the detected ball, the servo motor is able to provide the lowest accuracy of 83.333% and the highest accuracy of 95%.

Keywords: *table tennis, autonomous robot, image processing, tracking, contour detection.*