

ABSTRACT

Indonesia still uses many conventional ships that only rely on the skills of the captain in controlling the ship and are prone to human error risks such as navigation errors and fatigue. To overcome this problem, we developed a ship with an autonomous navigation security system and Artificial Intelligence (AI) capabilities to detect objects around, so that the ship can avoid objects autonomously and help the ship control process.

In this research, the author uses the Nvidia Jetson Nano microcomputer and IMX219 Camera to perform Artificial Intelligence (AI) processing with the YOLO (You Only Look Once) v5 method in object detection. Furthermore, using Arduino Mega 2560 as a controller for sensors and actuators so that the ship system can operate forward, turn and avoid objects independently according to the specified waypoint navigation.

The results show that the ship can move according to the navigation waypoint using GPS (Global Positioning System) and Compass with a margin of error ≤ 1.99 meters at the original distance, so that the ship can operate according to the specified route. Furthermore, the accuracy of the YOLOv5 training results in object detection shows Precision of 91.96%, Recall 77.69%, mAP_{0.5} 81.55%, and mAP_{0.5:0.95} 66.23%. These results are visualized through the YOLOV5 training graph which shows the ability to detect objects around the ship. Meanwhile, after the ship can operate according to the specified route and detect objects, the ship can then avoid objects autonomously with test results showing 90% success from a total of 10 trials. Thus, Autonomous Leisure Vessel (ALV) technology can reduce the risk of human error and improve operational efficiency by assisting the captain's efforts in controlling the ship.

Keywords: Autonomous Vessel, YOLOv5, Arduino Mega 2560, Artificial Intelligence, Jetson Nano