ABSTRAK

RANCANG BANGUN PERANGKAT ROVER *AUTOPILOT* MENGGUNAKAN *FLIGHT CONTROLLER* DAN MIKROKONTROLER

Oleh

BAGUS MUNAWAR

Perkembangan teknologi otomasi dan robotika telah meningkatkan pemanfaatan *rover* sebagai kendaraan tanpa awak dalam berbagai bidang, seperti survei geospasial, pertanian, dan eksplorasi. Penelitian ini bertujuan merancang dan merealisasikan sistem kendali *autopilot* pada rover dengan mengintegrasikan *flight controller* Pixhawk 2.4.8 dan mikrokontroler Arduino uno untuk mengendalikan motor *Brushless* DC (BLDC) 550 Watt melalui *driver* motor. Sistem dilengkapi modul GPS sebagai navigasi, telemetri 433 MHz untuk komunikasi data dengan *ground control station*, serta perangkat lunak *mission planner* untuk perencanaan dan pemantauan misi berbasis *waypoint*. Hasil penelitian menunjukkan bahwa sistem rover autopilot berhasil direalisasikan dan mampu beroperasi dengan rata-rata konsumsi daya sebesar 279,57 Watt. Pengujian navigasi pada mode *autopilot* menghasilkan tingkat keberhasilan rata-rata 83,27% dengan error rata-rata 16,73%. Nilai error tertinggi, yaitu 27,08%, terjadi pada rute terakhir yang disebabkan oleh penurunan akurasi sinyal GPS serta selip antara rantai dan gear pada roda tracker. Sistem komunikasi telemetri bekerja secara stabil dengan nilai RSSI rata-rata -74,80 dBm. Berdasarkan hasil perhitungan torsi motor yang dihasilkan adalah sebesar 1,75 Nm, yang mampu menggerakkan beban total 85 kg dengan kecepatan maksimum 2,44 m/s. Hasil ini membuktikan bahwa sistem *rover autopilot* yang dirancang menggunakan *microcontroller* Arduino uno berfungsi efektif sebagai pengendali *intermediary* antara Pixhawk dan motor BLDC melalui *driver*. Integrasi komponen pada PCB mempermudah perakitan dan perbaikan.

Kata Kunci: Rover, Autopilot, Pixhawk, Arduino Uno, navigasi *waypoint*.

ABSTRACT

DESIGN AND CONSTRUCTION OF AN AUTOPILOT ROVER USING A FLIGHT CONTROLLER AND MICROCONTROLLER

By

BAGUS MUNAWAR

Advances in automation and robotics technology have increased the use of rovers as unmanned vehicles in various fields, such as geospatial surveying, agriculture, and exploration. This research aims to design and implement an autopilot control system on a rover by integrating a Pixhawk 2.4.8 flight controller and an Arduino Uno microcontroller to control a 550-watt brushless DC (BLDC) motor through a motor driver. The system is equipped with a GPS module for navigation, 433 MHz radio telemetry module for data communication with the ground control station, and mission planner software for waypoint-based mission planning and monitoring. The results of the study show that the autopilot rover system was successfully implemented and was able to operate with an average power consumption of 279.57 watts. Navigation testing in autopilot mode resulted in an average success rate of 83.27% with an average error of 16.73%. The highest error value, which was 27.08%, occurred on the last route due to a decrease in GPS signal accuracy and slippage between the chain and gear on the tracker wheel. The radio telemetry communication system worked stably with an average RSSI value of -74,80 dBm. Based on the motor torque calculation results, the torque produced was 1.75 Nm, which was able to move a total load of 85 kg at a maximum speed of 2.44 m/s. These results prove that the autopilot rover system designed by using the Arduino Uno microcontroller functions effectively as an intermediary controller between Pixhawk and the BLDC motor through the driver. The integration of components on the PCB facilitates assembly and repair.

Keyword: Rover, Autopilot, Pixhawk, Arduino Uno, navigasi *waypoint*.