

ABSTRAK

Pengendalian robot kapal pada perairan sering kali menghadapi tantangan karena metode konvensional seperti *remote control* memerlukan kedua tangan operator, sehingga kurang praktis di lapangan. Penelitian ini bertujuan merancang sistem kendali robot kapal berbasis perintah suara untuk navigasi yang lebih intuitif. Robot kapal merupakan prototipe *Unmanned Surface Vehicle* (USV) model monohull dengan penggerak *differential thrust* menggunakan dua motor DC. Sistem pengenalan suara menggunakan gabungan metode *Short-Time Fourier Transform* (STFT) untuk ekstraksi spektrogram dan *Convolutional Neural Network* (CNN) untuk klasifikasi perintah suara. Model CNN dilatih menggunakan dataset, enam *class* perintah suara ("maju", "mundur", "kanan", "kiri", "stop", dan kelas *unknown*), dengan total data mencapai 5796 sampel, akurasi pelatihan berhasil mencapai nilai 98%. Pada skema percobaan perintah suara secara *real-time* dari 5 partisipan yang berbeda, sistem dapat mencapai nilai akurasi sebesar 86% dalam kondisi lingkungan terkendali.

Kata Kunci: Robot Kapal, *Differential Thrust*, Pengenalan Perintah Suara, *Short-Time Fourier Transform* (STFT), *Convolution Neural Network* (CNN)

ABSTRACT

Controlling marine robots in water often presents challenges because conventional methods, such as remote control, require the operator to use both hands, making them impractical in the field. This study aims to design a voice-command-based marine robot control system for more intuitive navigation. The marine robot is a monohull Unmanned Surface Vehicle (USV) prototype with a differential-thrust propulsion system using two DC motors. The voice recognition system employs a combination of the Short-Time Fourier Transform (STFT) for spectrogram extraction and a Convolutional Neural Network (CNN) for voice command classification. The CNN model was trained on a dataset comprising six voice command classes (“maju,” “mundur,” “kanan,” “kiri,” “stop,” and an “unknown” class), with a total of 5,796 samples; the training accuracy reached 98%. In a real-time voice-command experiment involving 5 different participants, the system achieved 86% accuracy under controlled environmental conditions.

Keywords: Ship Robot, Differential Thrusts, Voice Command Recognition, Short-Time Fourier Transform (STFT), Convolution Neural Network (CNN)