

ABSTRAK

Henti jantung merupakan kondisi kegawatdaruratan medis yang menyebabkan terhentinya sirkulasi darah sehingga suplai oksigen ke otak dan organ vital lainnya ikut terhenti. Salah satu tindakan yang dapat dilakukan untuk mempertahankan sirkulasi darah adalah Resusitasi Jantung Paru (RJP). Namun, pelaksanaan RJP secara manual memiliki keterbatasan karena kualitas kompresi dapat menurun akibat kelelahan penolong, sehingga kedalaman kompresi menjadi tidak konsisten.

Penelitian ini bertujuan untuk merancang dan membangun prototipe alat Resusitasi Jantung Paru (RJP) otomatis berbasis Arduino Uno dengan sistem monitoring kedalaman kompresi menggunakan sensor ultrasonik. Sistem menggunakan potensiometer rotary sebagai pengatur nilai referensi (setpoint) kedalaman kompresi, *motor stepper* NEMA 17 yang dikendalikan oleh driver TB6600 sebagai aktuator, serta mekanisme lead screw untuk menghasilkan gerakan kompresi. Sensor ultrasonik digunakan untuk membaca kedalaman kompresi secara real-time, sedangkan LCD 16×2 I2C digunakan untuk menampilkan nilai setpoint, kedalaman aktual, dan status sistem.

Metode penelitian meliputi tahap perancangan perangkat keras, perancangan perangkat lunak, pembuatan sistem, serta pengujian setiap komponen dan sistem secara keseluruhan. Pengujian dilakukan pada sensor ultrasonik, potensiometer rotary, push button, LED indikator, motor stepper NEMA 17, driver TB6600, dan pengujian integrasi sistem.

Hasil penelitian menunjukkan bahwa seluruh komponen dapat berfungsi sesuai dengan perancangan. *Potensiometer rotary* mampu mengatur nilai setpoint, sensor ultrasonik dapat membaca kedalaman kompresi secara real-time, dan motor stepper NEMA 17 mampu menghasilkan gerakan kompresi melalui mekanisme *lead screw*. Selain itu, LCD mampu menampilkan informasi sistem secara *real-time*. Berdasarkan hasil pengujian, prototipe alat RJP otomatis berhasil bekerja sesuai dengan tujuan penelitian dan mampu melakukan monitoring kedalaman kompresi secara real-time.

Kata kunci: Resusitasi Jantung Paru, Arduino Uno, kedalaman kompresi dada, sensor ultrasonik, motor stepper.

ABSTRACT

Cardiac arrest is a medical emergency condition that causes the sudden cessation of blood circulation, resulting in the interruption of oxygen supply to the brain and other vital organs. One of the primary interventions to maintain blood circulation is Cardiopulmonary Resuscitation (CPR). However, manual CPR has several limitations because the quality of chest compressions may decrease due to rescuer fatigue, leading to inconsistent compression depth.

This study aims to design and develop an automatic Cardiopulmonary Resuscitation (CPR) prototype based on an Arduino Uno with a compression depth monitoring system using an ultrasonic sensor. The system utilizes a rotary potentiometer to set the compression depth reference value (setpoint), a NEMA 17 stepper motor controlled by a TB6600 driver as the actuator, and a lead screw mechanism to generate compression movements. An ultrasonic sensor is used to measure the compression depth in real time, while a 16×2 I2C LCD is used to display the setpoint value, actual compression depth, and system status.

The research methodology includes hardware design, software development, system implementation, and testing of individual components as well as the overall system. The tests were conducted on the ultrasonic sensor, rotary potentiometer, push buttons, indicator LED, NEMA 17 stepper motor, TB6600 driver, and the integrated system.

The results show that all components functioned according to the design specifications. The rotary potentiometer successfully adjusted the setpoint value, the ultrasonic sensor accurately monitored the compression depth in real time, and the NEMA 17 stepper motor generated compression movements through the lead screw mechanism. Furthermore, the LCD successfully displayed system information in real time. Based on the test results, the automatic CPR prototype operated as intended and was capable of monitoring compression depth in real time.

Keywords: Cardiopulmonary Resuscitation, Arduino Uno, chest compression depth, ultrasonic sensor, stepper motor.