Design of a Speed Measurement System for a DC Motor in an Electric Car

Phạm Đức Toàn
Thai Nguyen University of Information and Communication Technology
Thai Nguyen University, Thai Nguyen, Vietnam
dtc16hd5103010005@ictu.edu.vn

***Abstract*—This undergraduate thesis designs and constructs a speed-measurement unit for a DC motor in an electric car. An Arduino Nano reads a motor speed sensor and presents the measured value to the user. The report documents component selection, circuit assembly, programming, and testing of the prototype. Its conclusion describes the system as relatively stable and states that it met approximately 85% of the project's intended requirements, based on the author's own assessment. The author identifies limited suitability for larger-scale use and proposes further refinement of the hardware and software.**

***Index Terms*—Arduino Nano, encoder, motor, speed measurement, PWM, electric car**

I. Introduction

The thesis provides an overview of electric cars and 1D electric motors, explaining their components and operation principles. It covers pulse-width modulation (PWM) techniques, which are crucial for controlling the motor's speed. The author discusses the importance of accurate speed measurement in electric vehicles, as it is essential for efficient operation and performance. The introduction also outlines the objectives of the project, which include designing and implementing a system that can measure and display the speed of a DC motor in an electric car [1]. Related earlier ICTU undergraduate theses provide context for this English summary [6]. Published articles on the methods and subject of this project provide context for this English summary [7].

II. Methods

The author designed and implemented a system using an Arduino Nano microcontroller, an LCD display, an encoder, and a motor driver module. The system measures the motor's speed and displays it on an LCD screen. The design process involved selecting appropriate components, such as the Arduino Nano, LCD display, encoder, and motor driver module. The author also developed a software program to process the encoder's output and calculate the motor's speed. The system was tested and evaluated to ensure its functionality and accuracy [1].

III. Results

The system was successfully implemented, and the author was able to measure and display the motor's speed. However, the author estimated that the model met about 85% of the project requirements, indicating areas for improvement. The author documented the challenges faced during the design and implementation process, including difficulties in selecting components and designing the system. The system's performance was tested, and the author noted that it was stable but required further optimization to achieve higher accuracy and reliability. The report presents a speed-measurement circuit and display for the DC motor; the stated percentage is the author's project self-assessment [1].

Supervisor: Trần Tuấn Việt, Thai Nguyen University of Information and Communication Technology (ttviet@ictu.edu.vn).

IV. Discussion

The author discusses the challenges faced during the design and implementation process, including difficulties in selecting components and designing the system. Despite these challenges, the author learned valuable new knowledge and improved their existing knowledge. The author suggests future work to improve the system's accuracy and efficiency. The discussion also highlights the importance of accurate speed measurement in electric vehicles, as it is essential for efficient operation and performance [1].

V. Conclusion

The thesis concludes that the designed system is effective for measuring the speed of a DC motor in an electric car, though it still requires further optimization. The author suggests future work to improve the system's accuracy and efficiency. The project provided the author with valuable experience in designing and implementing a system for speed measurement in electric vehicles, and the author learned new skills and knowledge through this process [1].

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