BLDC Motor Control System On An Electric Wheelbarrow

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ABSTRACT

The development of agricultural technology has encouraged the use of equipment that can improve work efficiency, particularly in crop transportation activities. Manual transportation on uneven agricultural terrain requires considerable physical effort; therefore, a more effective transportation aid is needed. This study aimed to design and implement a 500-Watt Brushless Direct Current (BLDC) motor control system for an electric wheelbarrow to achieve stable and responsive speed control performance.

The control system employed an Arduino Uno as the main controller, a throttle sensor as the speed input, and an MCP4725 DAC module to convert digital signals into analog signals that were transmitted to the BLDC motor controller. Signal processing was carried out using averaging, filtering, mapping, smoothing, and dead-zone methods to improve the stability of the system output. The research adopted an experimental approach consisting of system design, fabrication, integration, and performance testing.

The test results showed that the control system operated in accordance with the intended design. The throttle output voltage test produced an average error of 0.67%, indicating a satisfactory level of system accuracy. Power consumption testing revealed that motor power demand increased as the applied load increased. At a load of 30 kg, the power consumption was 168 Watts, while at a load of 120 kg it reached 418.6 Watts. This value remained below the motor's rated power of 500 Watts. Based on the results obtained, the BLDC motor control system for the electric wheelbarrow was successfully implemented and was capable of providing stable and responsive speed control to support agricultural transportation activities.

Keywords: *Control system, electric wheelbarrow, BLDC motor, Arduino Uno, MCP4725.*