Chapter-1

Speed Synchronization of Multiple BLDC motor drive using Arduino

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Synchronization of motors refers to the coordination of the speed and phase of multiple motors that are working together in a system. In applications where multiple motors need to work together, such as in a production line or a conveyor system, it is important that the motors are synchronized to prevent issues such as jerky motion, uneven wear, or damage to the equipment.

This aims to synchronize the speeds of multiple brushless DC (BLDC) motors using an Arduino microcontroller. In this project, the BLDC motors are controlled using electronic speed controllers (ESCs) and the speed of the motors is measured using the Hall effect sensors connected to the motors.

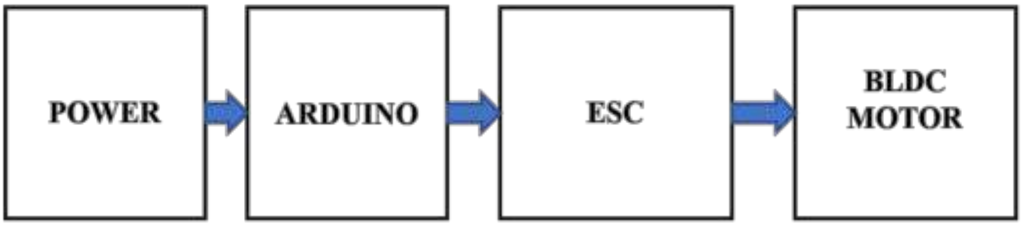

Fig.1: Block Diagram

The BLDC motor driver takes a PWM signal and controls the speed and direction of the motor. The driver also has Hall effect sensors to detect the position of the rotor. The Arduino board receives inputs from the Hall effect sensors and uses them to synchronize the speed of the motor. It also has analog inputs to read the motor's current and voltage, and I2C communication to interface with other sensors or controllers.

Finally, the data from the Arduino can be sent to a PC or display using serial or SPI communication. This allows for real-time monitoring and control of the motor's performance.

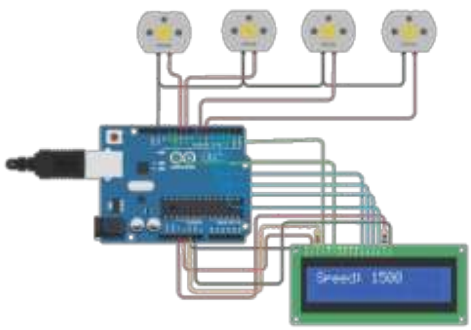

Fig.2: Simulation Figure

1. Industrial automation: The synchronization of multiple BLDC motors can improve the efficiency and productivity of manufacturing and assembly lines.
2. Robotics: Synchronization of multiple BLDC motors in robotic applications can provide precise and coordinated movement.

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3. Electric vehicles: Multiple BLDC motors can be used in electric vehicles for improved performance, efficiency, and control.
4. Aerospace: The synchronization of multiple BLDC motors in aerospace applications can improve the stability and control of aircraft and spacecraft.
5. Renewable energy: Synchronization of BLDC motors in wind turbines and solar tracking systems can optimize energy generation and efficiency.

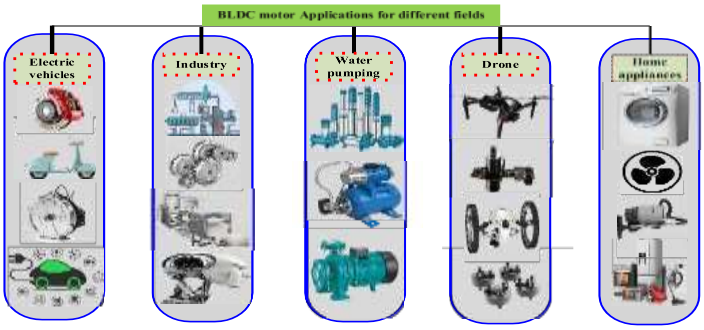

Fig.3: Applications of BLDC Motors

The speed synchronization of multiple BLDC motor drives using Arduino is a complex but important topic in the field of robotics, automation, and control systems. The use of BLDC motors has increased rapidly in recent years due to their high efficiency, low maintenance requirements, and high torque-to-weight ratio. However, when multiple motors are used in a system, it is critical to synchronize their speed and phase to ensure that they work together effectively and efficiently.

The use of Arduino microcontrollers has simplified the implementation of speed synchronization algorithms in BLDC motor systems. By using feedback sensors and electronic controls, the speed and phase of multiple motors can be coordinated to achieve synchronized motion. However, the implementation of these algorithms requires careful design and testing to ensure that the motors operate smoothly and safely.

In summary, the speed synchronization of multiple BLDC motor drives using Arduino is an important area of research that has practical applications in various industries. With the continued advancement of technology and the development of new control algorithms, it is expected that the use of synchronized BLDC motor systems will become even more widespread in the future. Implementation of advanced control algorithms such as PID, fuzzy logic, and adaptive control to further enhance the speed synchronization of the BLDC motors. Integration with wireless communication technologies such as Bluetooth and Wi-Fi to enable remote monitoring and control of the BLDC motors. Addition of sensors such as temperature and vibration sensors to monitor the health of the motors and predict potential failures. Use of more advanced motor drive technologies such as field- oriented control (FOC) to improve the efficiency and performance of the BLDC motors. Integration with cloud-based platforms to enable real-time monitoring and analytics of the motor drive system, enabling predictive maintenance and optimization.

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Chapter-2

SOC Analysis of EV Batter System

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In this chapter, the components of the BEV system were addressed in this study's abstract, and a simulation of a BEV model using the MATLAB-Simulink platform was performed. Since they have demonstrated a significant potential to reduce the consumption of petroleum-based and other high CO2-emitting transportation fuels, electric vehicles (EVs) are anticipated to be an alternative energy mode of transportation in the future. The pertinent electrical system parts and their matching equations for validation were also found. Additionally, every simulation outcome was considered. A complex and interdisciplinary subject, the sociological study of battery electric vehicles (BEVs) calls for the integration of diverse social, economic, environmental, and technological elements. The purpose of this abstract is to give a concise outline of the major themes and problems surrounding the social study of BEVs. The sociological examination of BEVs must thus take a variety of aspects into account, such as consumer behavior, public regulations, technical innovation, and the larger social and cultural environment in which BEVs are introduced. Including viewpoints from the disciplines of engineering, sociology, psychology, economics, and environmental science in this study is equally important.

Fig.1: Block Diagram

The methodology of SOC analysis of battery EV in MATLAB involves simulating the operation of the BEV using a battery model and driving cycle data, calculating the SOC of the battery at each time step, and analyzing the SOC data to determine the battery performance and optimize its operation.

The battery electric car components were designed using MATLAB-Simulink, which was also utilized to integrate the entire system. Additionally, the battery electric vehicle and its accompanying equation were simulated using MATLAB-Simulink for verification

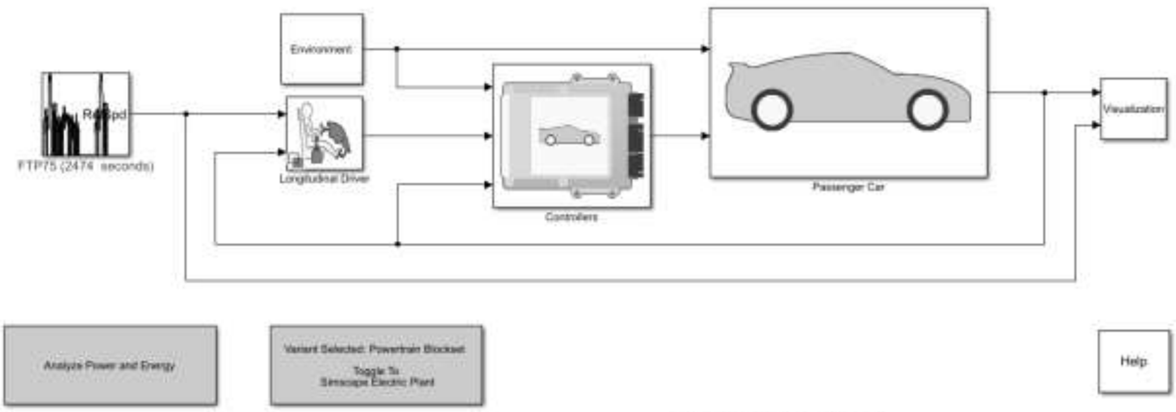

Fig 2: Circuit Diagram

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