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Multipurpose Hybrid Electric Vehicle for Agricultural Applications

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ABSTRACT: Agriculture is undoubtedly the backbone of all nations. The scientific contribution to agriculture enriches the economic growth of a country. This work has been done for grass cutting and trench laying using a two-wheeler-based hybrid electric vehicle for agricultural applications. This electric vehicle is employed to cut the unwanted grass and laying trench for feeding water in the cultivated lands. It is certain that this electric vehicle aids the farmers to be independent in terms of workforce, time and reduces the investment for cultivating the crops in agricultural lands. The electric vehicle is driven using both fuel and battery. Hence an internal combustion engine and a Brushless DC motor are employed to operate the hybrid vehicle. Prior to assembling the hybrid electric vehicle, the output response can be predetermined using open-source Advanced Vehicle Simulator software and Matlab.

KEYWORDS: ATMEGA8, Battery, BLDC Moto, Boost Converter, Voltage source Inverter, Dynamo, Solar Panel.

I. INTRODUCTION

In conventional days, a plug-in electric vehicle (PEV) is any motor vehicle that can be recharged from any external source of electricity, such as wall sockets. The electricity stored in the rechargeable battery packs drives or contributes to drive the wheels. Then it can be modified as a hybrid electric vehicle, which combines conventional power train with some form of electric propulsion. In agriculture fields like sugarcane, corn, tuber there is hard to cut the grass and trench laying using knives, spades, etc. Perhaps this manual work is quite laborious and time-saving. Electrical vehicles are still more efficient than a comparable amount of fossil-fuel vehicles. EVs provide quiet and smooth operation and consequently have less noise on vibration than internal combustion engines. When EVs are moving slowly, up to the speed when normal motion and rotation noises become audible in this system. The microcontroller controls the engine, a valve-based predefined program written in Embedded C.

II.BLOCK DIAGRAM

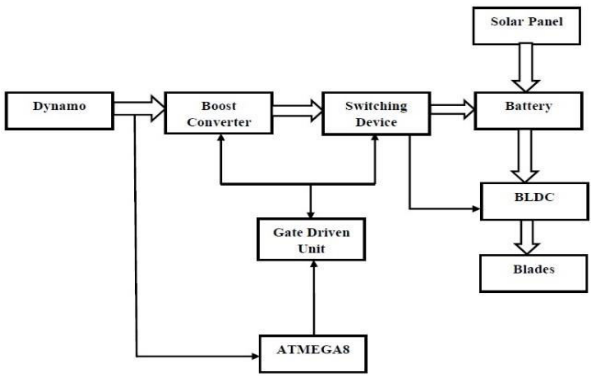

FIGURE1: Block Diagram

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The basic role of the dynamo in cars is that it takes the mechanical energy form the car as input and gives the output as electrical energy. The dynamo energizes the boost converter for step up the voltage.The battery ,motor, 6v dynamo are connected in the HEVs.The motor runs the vehicle .when the petrol is in the tank means it operate the vehicle with the help of the fuel. without fuel it also runs with the help of motor. The rods are placed in the vehicle for connecting the blades and it pressured towards ground with the help of suspension. The blades are changed for the required work and the pulley is joined with vehicle and it is connected with the blades.

II.WORKING

Solar panels have become much cheaper to use, compared to oil, diesel and liquified natural gas in parts of Asia. Solar energy will soon become the main source of energy. A boost converter is one of the simplest types of switch mode converter. As the name suggests, it takes an input voltage and boosts or increases it. A brushless DC electric motor (BLDC), also known as electronically commutated motor (ECM) and synchronous DC motors, are synchronous motors powered by direct current electricity via an inverter switching power supply which produces electricity in the form of alternating current (AC) to drive each phase of the motor via a closed loop controller. The ATMEGA8 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinot. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer.

III. PROPOSED SYSTEM

The ac voltage, typically 220V RMS, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units. As we seen above, the major disadvantage in electrical cars is that the electricity in the car gets discharge, when it is on the running condition. After it finishes it work, it should be stopped or parked in the place where the current should be easily taken, because the car should be charged for further running and also when the car taken for emergency purpose during that time the charge is not full, the car does not knows the emergency.

IV. SIMULATION

MATLAB combines a desktop environment tuned for iterative analysis and design processes with a programming language that expresses matrix and array mathematics directly. It includes the Live Editor for creating scripts that combine code, output, and formatted text in an executable notebook.

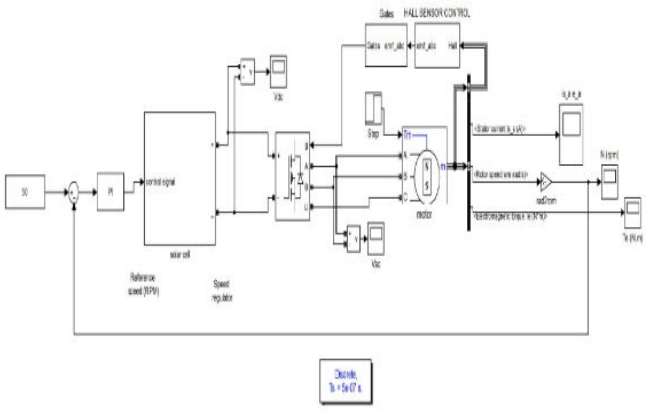

FIGURE 2: Simulation of Proposed Method

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V.SIMULATION RESULTS

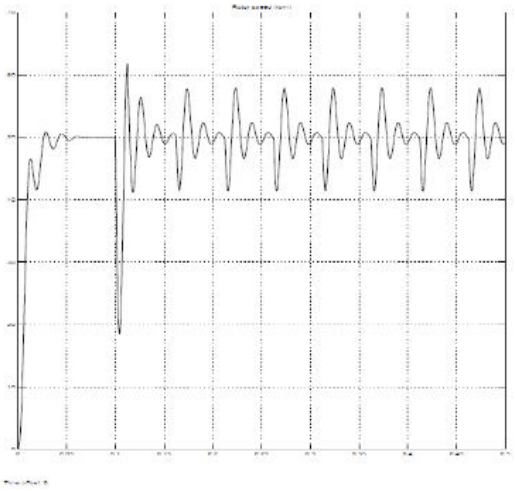

FIGURE 3: Rotor Speed

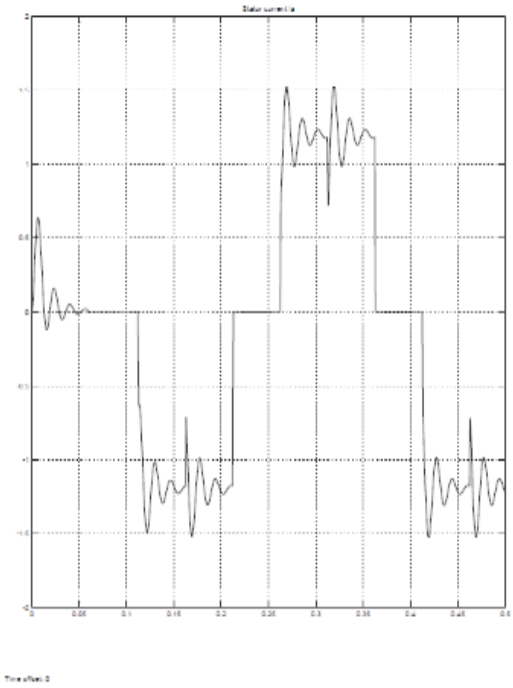

FIGURE 4: Stator Current

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VI. HARDWARE IMPLEMENTATION

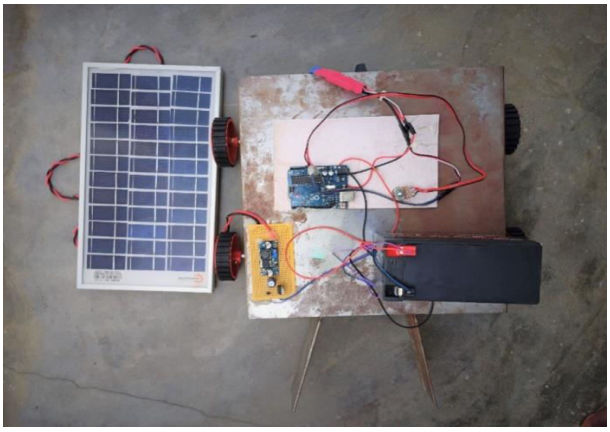

FIGURE 5: Hardware Implementation

The fully automated solar grass cutter is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any human interaction. The system uses 12V batteries to power the vehicle movement motors as well as the grass cutter motor. We also use a solar panel to charge the battery so that there is no need of charging it externally. The grass cutter and vehicle motors are interfaced to an ATMEGA family microcontroller that controls the working of all the motors. The rate of electric vehicle is controlled by controller, which guarantees the electric vehicle security, which is done by ATMEGA08 Controller. In order to provide an efficient acceleration of an electric vehicle, we use BLDC motor.

The results confirm that petrol and diesel can be exists for current scenario, so future scope depends only on electric bike. The solar panel gives power to boost converter .The boost converter is used for the step up the voltage and it the power goes to the battery. The battery gives power to the Arduino and the board gives output to regulator for controlling the speed of the motor. The BLDC motor runs at the speed given by the regulator. It is connected to the vehicle .Today available e-bike are use 3-4 no's of 12v batteries. But in this paper we use only one 12v battery, so battery cost is reduced.Vehicle in man operated and it is easy to use by all. The need is it used in the required place. It can be controlled by speed, so it is used in require place in fields. Now a days the machines are used for that purpose only. This project helps to make the vehicle for transportation and it also used for agriculture applications. The components are cheap and available.

VII. CONCLUSION

This project is more suitable for all categories of agriculturists which feature, minimum fuel cost and air pollution and less wear and tear. The vehicle's life-cycle costs and economic indices during its life span were assessed compared to those of a standard internal combustion engine vehicle (ICEV). Hence, this multi-functional hybrid electric vehicle will ease farmer's labor issues and expenditure during pesticide spraying and peak harvesting. This work can be further extended by developing an Arduino-based processor. The electric motor for the blade should have both high speed and torque by using a conventional DC series motor.

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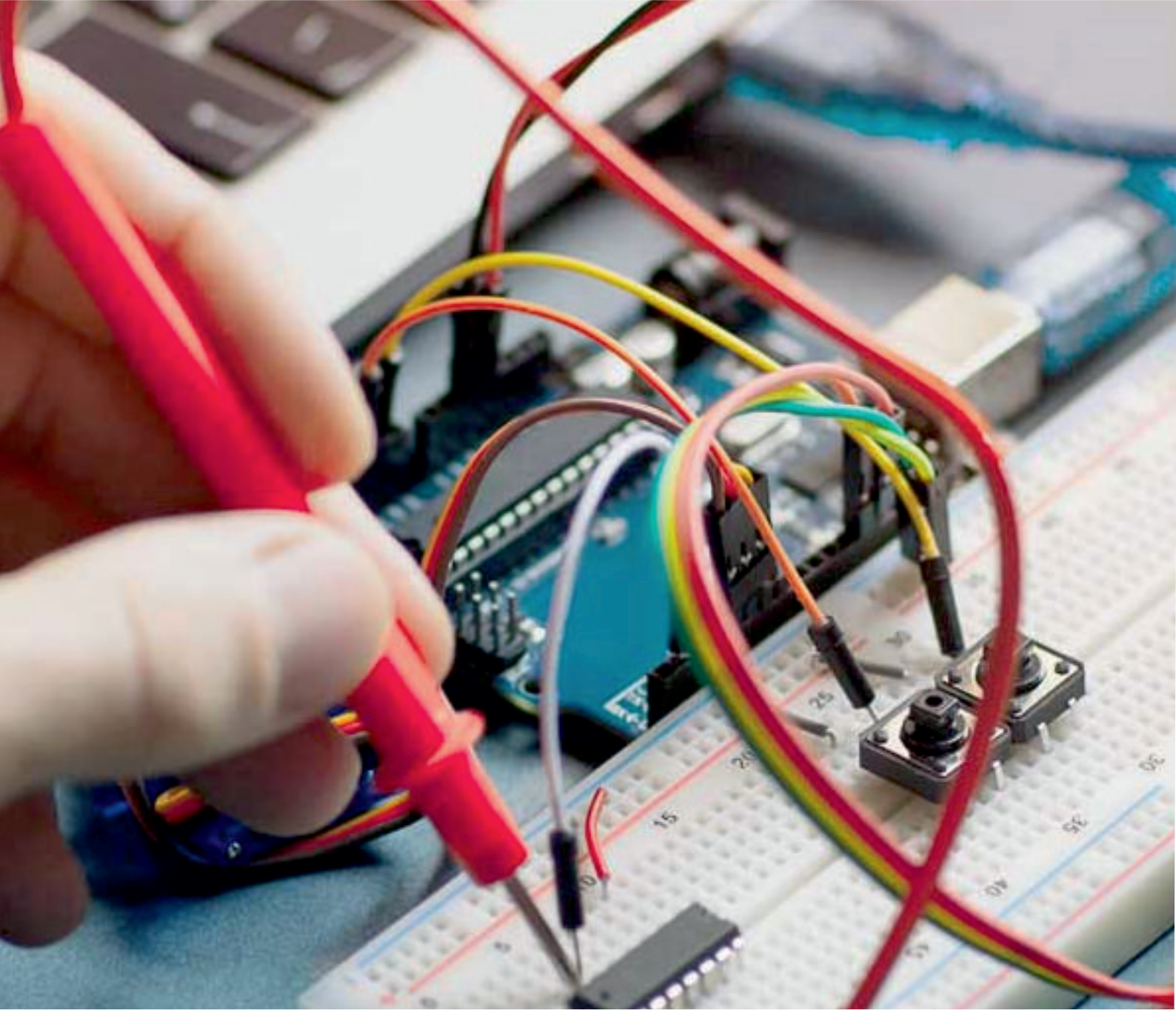

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