Buck - Boost converter using arduino

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***Abstract*: DC to DC Buck and boost converter play a vital role in this project. The buck converter gives the step down ripple free voltage. The boost converter gives the step up voltage. The voltage depends on the output load totally. The output voltage can be depends on the buck converter and boost converter. The arduino uno used here to give the PWM to the converters. The voltage sensor used here to give the output testing of the voltage range. The voltage gives the input is fixed and the output is depends on voltage. The voltage sensor is used here to reference for the input output and the arduino uno.**

***Index Terms*: Arduino, voltage sensor, relay, buck and boost converter, DC motor (load).**

I. INTRODUCTION

DC Motor has a good speed control response, wide speed which need high control requirement, such as rolling mill, double handed tankers and high precision digital tools. One of the most common methods to drive a DC motor is by using PWM signal with respect to the motor input voltage.

The converter plays an important role in the state of art of the renewable energy extraction process. The dc to dc converter required for low power portable electronics application. The purpose control techniques can regulate the output voltage for variable input voltage, which is higher, lower or equal to output voltage. The output voltage of dc to dc buck and boost converter can be design by structured singular value in continuous current mode of conduction of dc motor. Renewable energy sources has experience very fast speed. The arduino is one of the major components in the project.

It is widely used in speed control systems. Voltage and current also control relay or transistors to switch power source.

Buck and Boost converters are a type of power conversion topology. Buck converters are used to step down the high voltage dc to low voltage dc. And boost converters do just opposite i.e. changing low voltage. Same thing is done by transformers but they can't convert DC voltage and they are not much efficient.
Both type of converters first convert DC voltage to high frequency AC and then again rectifies it to pulsed DC or continuous DC based upon mode of operation. There are Arduino is the heart and brain of this project. It produces the high frequency PWM for Mosfet switching and also contols the voltage and current.
Generally the PWM frequency of arduino pins are teo low. It's around less than 1KHz. Which is not suitable for DC-DC converter operation. Meanwhile Atmega328 is able to provide 62.5KHz PWM on pin 5 & 6 , 32KHz on other pins with the 16MHz clock. To achieve this we hack into arduino PWM.

II. WORKING PRINCIPLE

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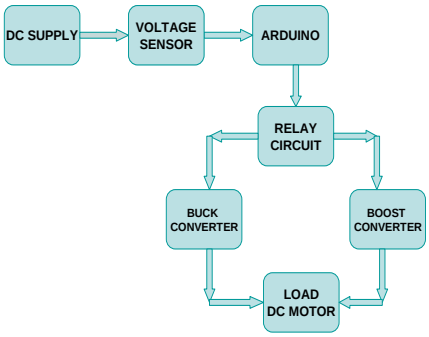


Fig.01. Block Diagram of Buck and Boost Converter Using Arduino

III. BUCK AND BOOST CONVERTER

The major aims in the converters design are to achieve a higher power packing density and good conversion efficiency. In order to obtain an increase in the power packing density. The switching frequenct has to be increased this leads to the reduction in the size of the reactive components off condition can be shown in figure.

BUCK CONVERTER:-

DC-DC converters are also known as Choppers. Here we will have a look at the Step Down Chopper or Buck converter which reduces the input dc voltage.

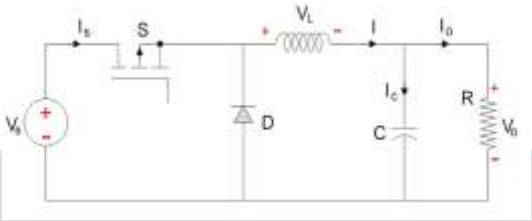


Fig.2. schematic diagram Buck Converter

WAVEFORM OF BUCK CONVERTER:-

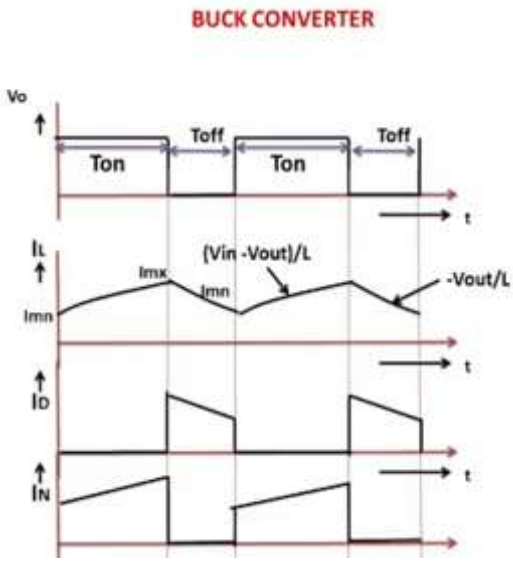


Fig.3 waveform of buck converter

BOOST CONVERTER:-

DC-DC converters are also known as Choppers. Here we will have a look at the Step Up Chopper or Boost converter which increases the input DC voltage to a specified DC output voltage. A typical Boost converter is shown below.

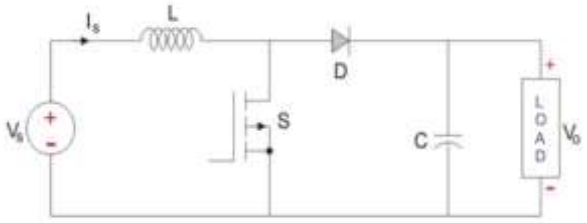


Fig.4 Schematic diagram of boost converter
(a)

WAVEFORM OF BOOST CONVERTER:-

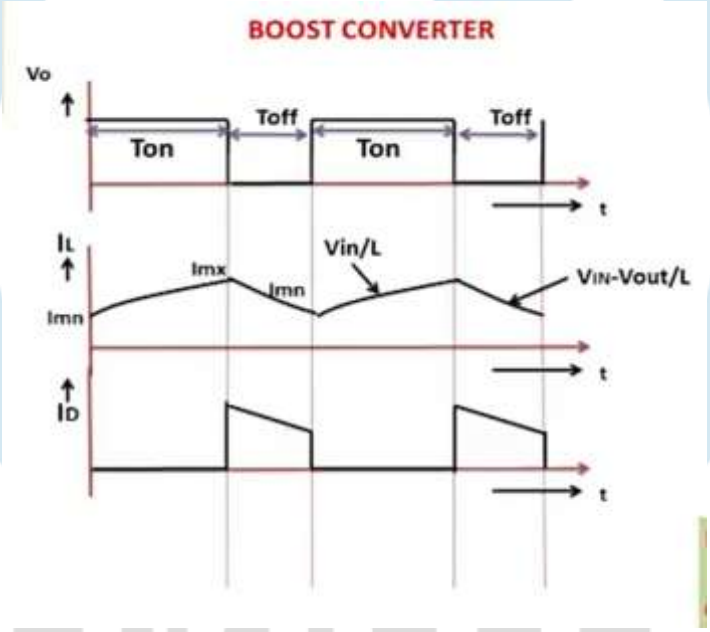


Fig.5 waveform of buck converter

IV. **ARDUINO**:-

Arduino is a Heart and Brain of this project.it produces the high frequency PWM for Mosfet switching and also controls the voltage and current. Arduino is nothing but a microcontroller board which run on 5v supply, which can be powered by USB or External power supply. Arduino is used for building digital devices and interact with objects that can sense and control object in the physical world.The biggest advantage is open source hardware and software. To control arduino, you hrequire software ARDUINO IDE. You just have to write code in arduino IDE and upload in the arduino controller to control it.

Arduino boards are able to read inputs: Light on a sensor, a finger on a button or a twitter message – and turn it into an output activating a motor, turning on a LED publishing something online

Arduino is a huge option for your initial arduino. It consist of 14 digital input output pins, where 6 pins is used as a PWM (pulse width modulation) outputs, 6 analog inputs, a reset button, a power jack, a USB connection and more.

It include everything required to hold up the microcontroller simply attached it to a pc with the help of a USB cable and give the supply to get started with a ac to dc adopter or battery. o dc adopter or battery.

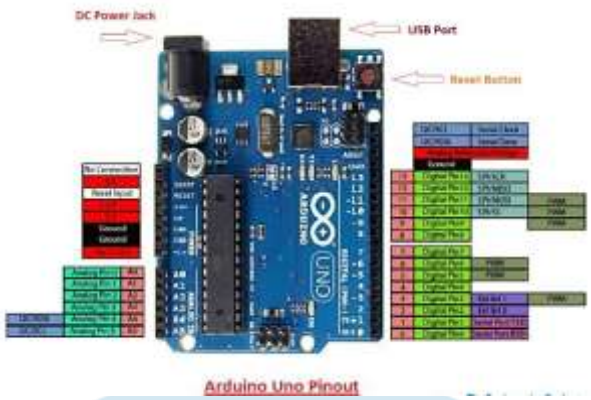


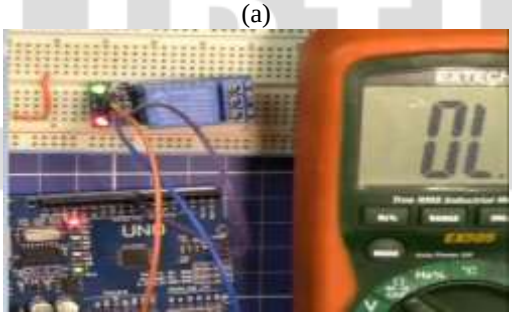
Fig.(6) Arduino uno board

V. **DC MOTOR** :-A DC Motor is an electrical machine that converts dc electrical power into mechanical power. Here dc motor is used as a load.

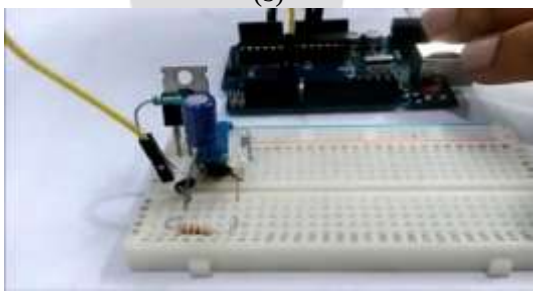
Fig.7. DC Motor

VI. **EXPERIMENT AND RESULT**

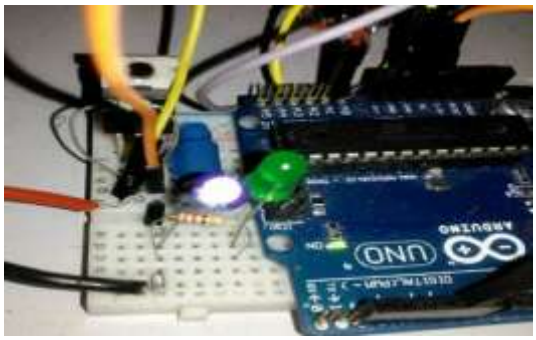
(a)



(b)



(c)



(d)

Fig. 8 (a) voltage sensor (b) relay testing (c) buck converter (d) boost converter

Fig.9 Interfacing with DC Motor

VII. **DISCUSSION** :-

The dc motor will run on all the varying voltage. The buck converter gives the low voltage and boost converter gives the high voltage to run the motor. The voltage sensor is used to identify the comparison between the both the voltage through the arduino uno board. The comparative analysis is occurred between the buck and boost converter.

VIII. **CONCLUSION**:-

The buck converter operates when the load(motor) needs less amount of the voltage and boost converter operates when load (motor) required high amount of voltage. The speed of the motor can be controlled by using a potentiometer in the circuit. The change in speed of load needs to change in voltage. A comparison between both dc to dc buck and boost converter. They both gives the 94.7% and 90% efficiency respectively.

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