3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

Number of papers published in national/ international conference proceedings

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Numerical Simulation for Solar Hybrid Photovoltaic Thermal Air Collector

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Abstract

Solar energy is one of the renewable energy sources which have potential for future energy applications. The current well-liked technology converts solar energy into electricity and heat individually. In this paper, an effort is made to simulate and evaluate the overall performance of a hybrid photovoltaic thermal (PV/T) air collector using computational fluid dynamics (CFD) software. The numerical analysis of the flow and heat transfer in hybrid PV/T systems is computationally quite complicated and the number of research works on this topic is quite low. Based on numerical analysis, the performance of a solar hybrid PV/T air collector has been studied. The numerical simulation was done in commercial software ANSYS FLUENT 14.5.0. The electrical energy conversion in solar cell was calculated with user defined function. The numerical results are validated with experimental results from literature. The results show a good agreement between experimental and simulated result for outlet air temperature and PV cell temperature. Using validated model, effect of mass flow rate and duct depth on the performance of solar hybrid PV/T collector has been studied and optimum values are identified. In order to increase the overall performance of a solar hybrid PV/T air collector, a novel design is proposed here. The result shows in the proposed design gives 20% enhancement in overall performance compared to conventional solar hybrid PV/T air collector.

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Keywords: PV/T air collector; solar radiation; CFD simulation.

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2016 International Conference on Circuit, Power and Computing Technologies [ICCPCT]

Text Classification Using KM-ELM Classifier

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***Abstract*—Classification systems adapts many machine learning techniques for quality performance in data classification. The neural networks has some unique characteristics and features which can handle high dimensional features and documents with noise and contradictory data. Classification is important to classify the input text into different domains appropriately. This paper give out a move towards classification of text that combines two machine learning techniques, K-Means and extreme learning machines. First the clustering and feature selection will perform using K-Means algorithm and then this attribute will be the training set for the extreme learning machine. Extreme learning machines nothing but a feed forward neural network without any tuning and has a single hidden layer. The experimental results on different datasets have shown that the combination of machine learning techniques shows a performance improvement.**

Keywords*— *Text classification, KM, ELM, KM-ELM

I. INTRODUCTION

Text classification studies have been carried out for many decades. The categorization will done by using multiple samples and compare each features for the specified classification. A systematic approach is need to understand the correlation between the different features of the input document. The technological improvement is that neural networks shows a noticeable performance in document classification. Hence neural networks has an important role in classification [1].

There is a stable bond between feature selection and classification. If the feature selection is good then the classification will more accurate. There are several methods for feature selection. Among them chi-square test shows a better performance in better feature selection task [2]. In text classification classifier input will be the output of several preprocessing steps. If we use any machine learning technique for classification, then it will divide the dataset into two: training set and testing set [3].

Using the training set the classification algorithm will make a model and the accuracy of model will test using the test set. Here deploys a combination of supervised and unsupervised learning model.ie it is a combination of K-Means clustering algorithm and extreme learning machine techniques. K-Means will have a collection of clusters with attributes and this will fed into extreme learning machine as training set. Text mining is heavily applied in web page classification. Text classification performs in a large set of content identifiers. Text classification can be classified into two ways, knowledge engineering and machine learning [4]. Here machine learning techniques shows a better performance in text classification.

Extreme learning machines (ELM) are single layer feed forward neural networks without tuning in hidden layers. So it can easily classify the input samples [5]. If the input noise free or cleaned then ELM can shows an advanced performance and this is the idea behind this proposal. Neural networks are scalable and powerful in handling high dimensional data set. Here the input document will preprocess and attribute selection will take place. This is a combination of two attribute selection method, Information gain and chi-square. Then a basic clustering will take place and this will fed into ELM for training [6]. This model is compare with SVM, ELM, KNN and using new model it is easy to find new patterns and achieves high accuracy.

The remaining portion is well ordered as follows; Section 2 provides background knowledge; Section 3 provides proposed work; Section 4 gives an outline of the proposed model and comparison with other classifiers, finally section 5 concludes the paper with future scope.

II. METHODOLOGY

For text classification requires an algorithm and an algorithm is a step by step procedure used to solve the problem. It will transform a set of inputs to outputs. Some tasks we do not have an algorithm like applications in which its behavior changes frequently. We can't identify the process completely but we can construct approximation thereby we can detect some patterns and regularities. This is the niche of machine learning. Such patterns can use to make prediction on a dataset. The predicted result will expected to correct by the patterns generating from past or sample collected data [7].

Applications of machine learning methods to large data sets is called data mining. In data mining large set of data will process and create a simple model with efficient use and high predictive accuracy. Machine learning will programming computers to optimize the performance criteria using some training data [8]. There is a model which defined up to some parameters and learning is the execution of the learning program to optimize the parameters using the training data. The model may be for predicting future or to extract knowledge from data or both.

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Real-Time Nonintrusive Monitoring and Detection of Eye Blinking in view of Accident Prevention due to Drowsiness

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***Abstract*—Driver fatigue is the major cause of accidents in the world. Detecting the drowsiness of the driver is the surest ways of measuring the driver fatigue. The purpose of this paper is to develop a drowsiness detection system. This system works by analyzing the eye movement of the driver and alerting the driver by activating the buzzer when he/she is drowsy. The system so implemented is a nonintrusive real-time monitoring system for eye detection. During monitoring, the system is able to decide whether the eyes were opened or closed. When the eyes were detected closed for too long, a signal was issued to warn the driver. In addition, the system also have an option for making vibration when drowsiness was detected. The aim is on improving the safety of the driver without being obtrusive. Visual cues were obtained through eye blink rate by using a camera, which typically characterize the level of alertness of a person. These were extracted in real-time and systematically joined to check the fatigue level of the driver. The system can monitor the driver's eyes to detect short periods of sleep lasting 3 to 4 seconds. The system implemented in this approach runs at 8-15 frames per second. The application was implemented using Open CV in Raspberry Pi environment with a single camera view. This system was used to detect the drowsiness of the driver and thereby reducing the road accidents.**
Keywords—Face detection, Eye blink, Image Processing

I. INTRODUCTION

The never-ending history of traffic accidents all over the world is due to deterioration of driver's vigilance level. Drivers with lack of vigilance level suffers from a marked decline in their perception, recognition and vehicle controllable ability, therefore pose a serious danger to their own lives and lives of other people. For this reason, developing systems that monitors the driver's level of drowsiness and alerting the driver of any insecure driving condition is essential. Vehicle accidents are most common if the driving is inadequate. This happens when the driver is drowsy or if he/she is alcoholic. Driver drowsiness was recognized as an important reason in the vehicle accidents. It is demonstrated that driving performance reduces with increase in drowsiness. But the life lost once cannot be re-winded. Advanced technology offers some hope to avoid these type of accidents up to some extent. Sleep related accidents are more severe, because of the higher speeds involved and as the driver is unable to take any action to avoid accident, or even stamp the brake, prior to the collision. Horn describes sleep related accidents where the driver runs off the road or crash with another vehicle. Accidents are also caused when street lights are out especially on highways. So, when the driver fails to change the brightness level of the light when another car comes from the opposite side it plays a major role for accidents. It is caused due to the opposite driver to miss the judgments and gives rise to accident. Accidents are also caused due to the invaders coming suddenly in either side of the vehicle due to which the driver miss the judgments and meets with an accident.

A survey done by National Highway Traffic Safety Administration estimated that there were 56,000 sleep related road crashes in the U.S.A in 1996 [1]. Another survey done in 2007 says that 18% of accidents involved fatigue as the main factor [2]. In Britain up to 20% of serious road accidents were caused due to fatigue. Similarly, survey done by the Road and Traffic Authority states that in the year 2007, fatigue contributed to 20% of accidents caused on road [3].

In the proposed concept, the driver face is continuously recorded using a camera, to detect the hypo-vigilance level. Then the closed eye gesture was detected for drowsy detection. The eye blink frequency exceeding the normal rate is the fatigued state. The micro sleep that is lasts for 3 to 4 seconds are the good indicator of the fatigued state. This closed eye gesture was implemented using Open CV. It will alert the driver about his/her fatigue using a buzzer and vibration.

Image processing is the processing of images using mathematical operations. It uses any form of signal processing

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Comparision between SLM-Companding and Precoding-Companding Techniques in OFDM Systems

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***Abstract*— OFDM is a multicarrier modulation technique which is used in communication systems like Wireless Personal Area Network (WPAN), Wireless Local Area Network (WLAN), Wireless Metropolitan Area Network (WMAN), Wi -Max, DVB-T etc for the high rate transmission over wireless radio channels. It is commonly known as a transmission technique of high spectral efficiency and robustness against frequency selective fading. The advantages of OFDM include simple digital realization, compatibility with multipath fading channel, less complex receivers and improve the bandwidth efficiency. At the same time, it also increases system capacity providing reliable transmission .But the main problem of OFDM systems is Peak to average power ratio due to its envelope fluctuation. The objective of this project this to provide a broader understanding in peak-to-average power ratio (PAPR) problem in orthogonal frequency division multiplexing (OFDM) systems. This paper showcases main three reduction techniques, precoding and SLM in combination with nonlinear companding in detail considering advantages and disadvantages of each technique.**

Keywords*— *OFDM, MCM, PAPR, SLM

I. INTRODUCTION

OFDM is one the modern multicarrier digital communication technique that has been widely used in many wireless communication standards such as Digital Video Broadcasting (DVB) and mobile worldwide interoperability. Being an important member of the multicarrier modulation (MC) techniques, Orthogonal Frequency Division Multiplexing (OFDM), is also called Discrete Multitone Modulation (DMT). It is based upon the principle of frequency division multiplexing (FDM) where each frequency channel is modulated with simpler modulation scheme.

Principle behind OFDM is the splitting of a high-rate data stream into a number of lower rate data streams that are transmitted simultaneously over a number of subcarriers. These subcarriers are overlapped with each other and are orthogonal .If the integral of the product of two signals is zero over a time period, then these two signals are said to be orthogonal to each other. Two sinusoids with frequencies that are integer multiples of a common frequency can satisfy this criterion. The use of orthogonal subcarriers would allow the subcarriers spectra to overlap, thus increasing the spectral efficiency. As long as orthogonality is maintained, it is still possible to recover the individual subcarriers signals at the receiver despite their overlapping spectrum.

A major obstacle is that the OFDM signal exhibits a very high Peak to Average Power Ratio (PAPR). This problem arises in a MC system [6] when the different sub-carriers are out of phase with each other. An OFDM signal consists of a number of independently modulated sub-carriers, when added up coherently a large PAPR is resulted. Due to this RF power amplifier, Digital to analog converters in the transmitter should be operated in a very large linear region. Otherwise these peaks cause inter modulation distortion due to saturation of power amplifier or may cause clipping of the signal in a digital to analog converter. A solution for this is to extend the linearity range of power amplifiers, but this is expensive.

Number of independent sub-carriers plays an intermediate role between the PAPR and bandwidth efficiency. When the number of sub-carriers increases the PAPR and bandwidth efficiency also increases. So the reduction of PAPR is very crucial as it affects the efficiency of the system. PAPR reduction techniques changes according to the requirement of the system and are dependent on various factors such as PAPR Spectral efficiency, reduction capacity, increase in transmit signal power, complexity and bit-error rate at the receiver. In general PAPR reduction techniques can be classified mainly into two signal scrambling and signal distortion techniques. Signal scrambling techniques includes SLM,PTS,TI, Interleaving Technique and signal distortion techniques includes Peak windowing, Envelope scaling ,Clipping and filtering etc. One of the best and simplest PAPR

2016 International Conference on Circuit, Power and Computing Technologies [ICCPCT]

A *Novel Security Enabled Speed Monitoring System for Two Wheelers using Wireless Technology*

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Abstract —**Nowadays accidents and vehicle theft cases of two-wheelers are increasing at an alarming rate. In present systems, the speed is monitored by using cameras, speed governors etc. These systems have geographical, visibility and applicability restrictions. These systems can't be used completely for two-wheeler because it will affect the stability of the vehicle and cause accidents. Here we are proposing a Novel Security Enabled Speed Monitoring System for Two Wheeler using Wireless Technology. In the proposed system, we are incorporating both security and speed monitoring in a single system, using wireless technologies like RFID, GPS, ZIGBEE, and GPRS. The RFID tag provided to the owner will help to check the authenticity of the driver, using the vehicle. In case of any unauthorized attempt to drive the vehicle, the GPS and GPRS systems can be used to gather the current information about the vehicle and to inform the owner. When the vehicle is moving without verifying the RFID, the Hall Effect sensor in the vehicle will detect it and alert the owner. A ZIGBEE transmitter is placed in each speed zone(National Highways, State Highways, Schools, Hospitals etc). If the speed is increased above a predefined level of that zone, it will warn the driver. If the speed is further increased, the information regarding the position, Vehicle No, Speed, and Time etc. will be stored into an authorized database using GPRS. Thus the proposed system helps to reduce the road accidents by proper monitoring of the vehicle by the authority along with an additional security to the vehicle from being stolen. In the proposed system the speed is continuously monitored without any restriction and thereby, can reduce two-wheeler accidents. Security is also incorporated in this system. Same hardware can be used for both speed monitoring and security thereby, can reduce the complexity.**

Keywords—GPS, GPRS, ZIGBEE, RFID

I. INTRODUCTION

Automobiles are the progressive symbol of modern society. This was possible by the invention of wheels and it is a real boon to the public. The numbers of vehicles are increasing at an alarming rate which in turn makes the human life very easy, at the same time road accidents also increases. Road accidents are the leading cause of death globally. Every year approximately 1.2million people are killed due to road accidents and 50million are injured. If present scenario continues, then road traffic injuries will be the leading contributor to annual death and injury. Accidents are quite common on Indian roads and are at the peak due to increased number of vehicles. The main reasons for accidents are over-speed, lack of care and violation of traffic rules.

Every 30sec someone is killed in a road accident. Speed is the cause of most number of traffic accidents. With the invention of new technologies, there has been an increased demand for driver's safety. In a country like India (the second largest in count to use two-wheelers), the number of two-wheelers on the road is more than four-wheelers and eight-wheelers. It has been estimated by WHO (World Health Organization) that there is an increase in the number of deaths due to accidents by two-wheelers than four-wheelers. The range and severity of injuries caused by road accidents are enormous.

Vehicle stealing has become frequent in parking lots. Bike-theft is a major problem; several underlying problems have led to this increase in bike-theft. Some of the reasons for these are sheer human absentmindedness, lack of bike parking structures, vulnerabilities of current locking devices.

There are very few studies concerning the safety and security of vehicles. The rapid development of electronics provides secure environment to the human life. This development in the field of electronics is used to reduce vehicle-theft cases and provide speed control which will reduce the rate of deaths.

II . LITERATURE SURVEY

Vehicle security and speed monitoring system has acquired great importance over the years due to the increasing vehicle-theft and accident cases reported all over the world. According to the report published by National Crime Records Bureau (NCRB), in the year 2011 alone 1,22,367 two-wheeler vehicles were stolen and only 32,826 vehicles were recovered[3]. According to the statistics provided by the Road Safety Cell, Ministry of Road Transport and Highways, Government of India, there were 3.90 lakh accidents in the year 2000; 78,911 were killed and 3,99,265 were injured[4]. Accidents are quite common on Indian roads and are increasing due to increase in number of vehicles. In India,

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A Review on PFC Cuk Converter Fed BLDC Motor Drive Using Artificial Neural Network

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Abstract— **In this paper a Power Factor Correction Cuk converter fed Brushless DC Motor Drive using a Artificial Neural Network is used. The Speed of the Brushless dc motor is controlled by varying the output of the DC capacitor. A Diode Bridge Rectifier followed by a Cuk converter is fed into a Brushless DC Motor to attain the maximum Power Factor. Here we are evaluating the three modes of operation in discontinuous mode and choosing the best method to achieve maximum Power Factor and to minimize the Total Harmonic Distortion. We are comparing the conventional PWM scheme to the proposed Artificial neural network. Here simulation results reveal that the ANN controllers are very effective and efficient compared to the PI and Fuzzy controllers, because the steady state error in case of ANN control is less and the stabilization if the system is better in it. Also in the ANN methodology the time taken for computation is less since there is no mathematical model.The performance of the proposed system is simulated in a MATLAB/Simulink environment and a hardware prototype of the proposed drive is developed to validate its performance.**

Keywords—Brushless dc motor, Discontinuos input inductor mode , Discontinuous output inductor mode, Discontinuous intermediate capacitor mode ,Cuk converter,Power Factor Correction,Total Harmonic Distortion, Artificial Neural Network,Pulse width modulation

I. Introduction

Brushless Dc Motor is recommended for many low cost applications such as household application, industrial, radio controlled cars, positioning and aero modelling, Heating and ventilation etc. ,because of its certain characteristics including high efficiency, high torque to weight ratio, more torque per watt , increased reliability, reduced noise, longer life, elimination of ionizing sparks from the commutator etc. The two main factors that determines the power quality of a motor are the Power Factor (PF) and the total harmonic Distortion (THD). The Power Factor determines the amount of useful power being consumed by an electrical system. The term THD is defined as the ratio of the harmonic components of voltage (or current) to the voltage (or current) of the fundamental. The Power Factor Correction (PFC) is the best method of improving the PF by making the input to the power supply purely resistive or else due to the presence of nonlinear loads the input will contain phase displacement which causes harmonic distortion and thus the power factor gets degraded.

The main aim of all papers is to improve the power quality according to the standards recommended ,But in the conventional schemes for example diode bridge fed Brushless Dc Motors due to the presence of huge capacitor value it draws a non sinusoidal current from the ac mains which increased the THD to 65% and power factor to 0.8.The other conventional schemes by using many of the converters fed BLDC motors like Sepic ,Buck, Boost ,Buck Boost etc. by using high frequency pulse width modulation increases the switching losses. Bridgeless configuration of these converters were also existed ,even though they reduces the switching losses ,the no of active and passive components were more which increases the complexity in designing the circuit and the overall cost. The Power Factor in these cases is very less and a high value of THD which reduces the power quality. In this paper we are using a Cuk converter for PFC correction to the maximum value and to attain a low value of THD using Artificial neural network.

There are some draw backs in using conventional Power Factor Correction Methods, By using a Boost converter in Discontinuous Current Mode leads to a high ripple output current. The Buck converter input voltage does not follow the output voltage in DCM mode and the output voltage is reduced to half which reduces the efficiency.In our proposed system front-end Cuk converter is used in both continuous and discontinuous mode because of its certain advantages like easy

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A New Three Phase Step up Multilevel Inverter Topology for Renewable Energy Applications

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***Abstract*— Inverters are used in wide area of interests including household and industries. But in many microgrid applications, industrial applications and aircraft applications, where a renewable energy sources such as photovoltaic , wind, fuel cells etc are used, the classical three level inverters cannot be used due to polluted sinusoidal output. To overcome this difficulty multilevel inverters are used. The output of multi level inverters almost follows the sinusoidal waveform. The more the number of levels, the more faithful is the sinusoidal wave. This paper proposes a new three phase step up multilevel inverter. MATLAB simulation of a typical nine level inverter is done and result analysis is presented. Only a single voltage source is used as input. The number of output levels is determined by the number of switched capacitor cells. Also, different levels can be achieved by cascading repeated blocks. Problems of numerous active switches and thereby the need of complex gating circuitry are avoided in this topology.**

Keywords*— *Multilevel Inverter, SHE, switched capacitors

I. Introduction

Renewable energy sources are getting much attention in this century. Passing years mark with the evolution of more and more electric sources. In most of the cases these are renewable non conventional energy sources such as solar, wind, tidal, geothermal etc. The idea lies in the fact that these sources are to be made suitable to the load demands. The output of these sources is dc and should be converted to ac before feeding majority of loads. The use of simple conventional inverter, two level, produces a square wave which is not suitable for most of the intricate applications. In such cases, a pure sinusoidal wave is desired. Here comes the importance of multilevel inverters. A multilevel inverter produces output waveforms in step and resembles a near sine wave. Increased number of levels means more resemblance to the sine wave and pollution is minimized.

Multilevel inverters are defined as a collection of power semiconductor switches and capacitors which can produce a stepped sine wave as output [2]. The term multi level starts with the three level inverter introduced by Nabae *et al.* Multi level inverters are basically classified into three. They are diode clamped multilevel inverters, flying capacitor multilevel inverters and cascaded multi level inverters. The basic schematic diagram of multilevel inverters is shown in the Fig. 1[2].

The advantages of multilevel inverters are output voltages with extremely low distortion, low dv/dt stress etc. [1].

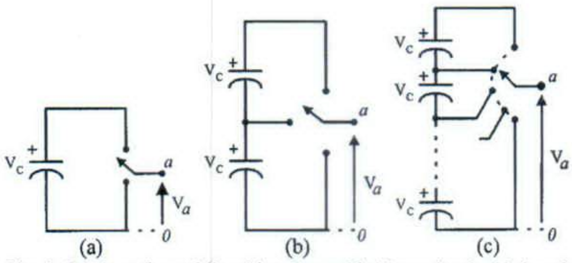

Fig. 1. One leg of a multilevel inverter with (a) two levels (b) three levels (c) n levels

Reference [2] discusses about different types of multilevel inverters and its controlling strategies. Fig. 2. Shows the basic modulation strategies used in multilevel inverters[2].

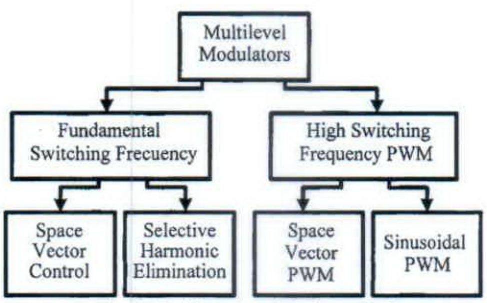

Fig. 2. Multilevel modulation techniques

Operation of diode clamped multilevel inverters are extensively explained in [4]. The disadvantages of diode clamped multilevel inverters include high switching losses and

Interleaved Buck Converter With Continuous Supply Current Using OCC Technique

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***Abstract*— In the conventional buck converter the supply current is discontinuous which may produce electromagnetic interference (EMI). In order to minimize the EMI problems an interleaved buck converter with continuous supply current has been introduced. Also due to the advantage of improved step-down conversion ratio, the interleaved buck converter can be used for high step-down and high frequency applications. The main features of the converter also include lower switch stress and lower output current ripple. The topology consists of two input capacitors which help in the reduction of the voltage stress across the switches. One-cycle control (OCC) technique is used to provide the switching pulses for the switches. The simulation has been carried out using MATLAB software in order to evaluate the overall performance of the converter.**

Keywords—Buck converter; interleaved structure; improved step-down conversion ratio; one-cycle control.

I. Introduction

The power supply for devices such as battery chargers, LED drivers, solar power regulators, microprocessors and so on, is usually obtained using the step-down power conversion technique. The main requirement of such applications include low current ripple. This is usually achieved by increasing the switching frequency. However, the increase in switching frequency can lead to increase in the semi-conductor losses. The buck converter is widely used for step-down dc-dc conversion when there is no isolation requirement. The main drawback of the conventional buck converter is the discontinuous input current, which may cause electromagnetic interference (EMI) in the system. If the current is made continuous it can lead to reduction in the EMI and also reduction in the capacitor current stress.

The size of the passive components used in the buck converter can be reduced by increasing the switching frequency, but may lead to increased switching losses. Therefore, in order to reduce the size of the passive components used, the converter can be interleaved. Interleaved topologies also provide the advantage of lower ripple in the output current. The conventional interleaved buck topology has been shown in Fig.1. Similar to the conventional buck converter, the conventional interleaved buck converter (IBC) also suffers from input voltage semi-conductor switch stress and discontinuous supply current. In [2], an IBC operating with zero current transition has been discussed. It has also been noted that the diode reverse recovery loss has also been reduced in the topology. In [3], the switches in the IBC are connected in series and also a coupling capacitor is provided in the power path to reduce the voltage stress across the switches. In spite of the interleaved structure of the converter, the input r.m.s. current of the circuit is high. A novel transformer-less interleaved converter with low switch voltage stress is discussed in [4] which consist of two input capacitors which are series charged and parallel discharged. The voltage divider circuit present in the converter reduces the voltage stress. The main drawback of the circuit is the high number of components which makes the converter complicated for higher number of phases.

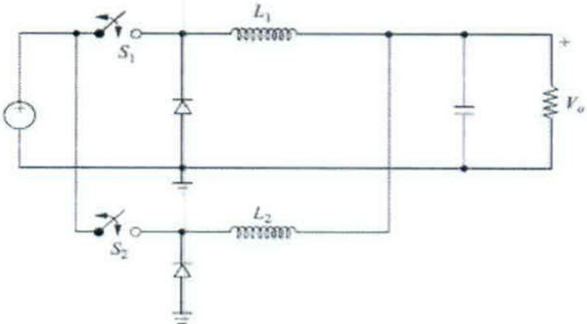

Fig. 1. Conventional IBC

Interleaved buck converters are used as a high brightness LED electronic driver. Such an application of IBC is seen in [5]. Conventional buck converters require a high value inductance to lessen the current ripple. The dimming frequency is decreased due to the high value of inductance used and the higher switching frequency, but it results in audible noise. Thus, IBC are used to replace the converters in such applications. In the case of fuel cell plate and lead-acid battery, the lifetime of the battery depends on the ripple current drawn [6], [7]. Therefore, IBCs are more preferred for such applications.

Coupled inductors and/or tapped inductors can be used to improve the efficiency of the interleaved converters. In [8], an interleaved buck converter using a coupled inductor is

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High gain single switch boost converter for sustainable energy applications using switched capacitor and coupled inductor

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***Abstract* — This paper proposes a high voltage gain single switch boost converter for sustainable energy applications using coupled inductor cells and switched capacitor. The circuit consisting of coupled inductor, switched capacitor and voltage multiplier cell. Using the energy stored in the coupled inductor, switched capacitor charges during off period. The performance of the converter will increase due to this. The steady state analyses and operation principle are discussed thoroughly. Simulation is done using MATLAB with 40V input voltage, 300W output power and 400V output voltage.**

Keywords— Dc/Dc converter Boost converter, Coupled inductor, PWM control strategy, Switched capacitor

I. Introduction

The future is looking towards sustainable power sources all of which will need to be converted to one form or another. In order to make this possible, a highly efficient low cost product has to be designed. The switched mode dc/dc converters topologies includes buck, boost, buck-boost, zeta, cuk, and sepic converter. These converters are used in several electronic applications due to their numerous advantages such as high efficiency, easy design, better performance, simple structure and simple control circuit. Step-up converters are used in order to convert the low voltage to high voltage. The boost converters are widely used in several industrial applications. Photovoltaic systems, fuel cell systems, electric vehicles, and high intensity discharge lamps are the applications. Photovoltaic cells can be in connected series in order to obtain a high dc voltage. Though PV cells can be made into array by series connection to produce high voltage but there exists serious problems like shadowing effects, short circuit which highly decreasing its efficiency. In order to overcome such negative effects this micro source energy is utilized by the high step up converter to produce high voltage. Thus high step up dc-dc converters are used as leading end converters to change from low voltage to high voltage which are needed to have a large conversion ratio, high efficiency and small volume [1],[2].

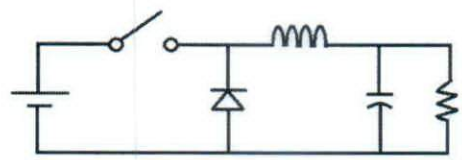

Fig.1.conventional boost converter

For high step-up conversion applications, the conventional boot converters are not suitable [3] because for high step-up conversion the duty cycle of the converter will be high and which results in narrow turn off time. Due to this the peak current will be high and there is conduction and switching losses [4] .Fig (1) shows the conventional boost converter. Serious reverse recovery problems and electromagnetic interferences will be there due to extreme duty ratio. Impacts of SiC (silicon carbide) MOSFETS on converter, even though fast switching is there the switching and conduction losses are reduced. Si diodes have ideal, but sill SiC devices processes ringing current at turn off time which will be high relatively to other devices . In [5] SiC are comparing with Si.

Transformer based converters or isolated converters such as push-pull converter, flyback converter, forward converter and so on, are able to achieve improved voltage gain by altering the turns ratio of the transformers. But it has the drawback of high voltage spike across the main switch and power loss due to leakage inductance of the transformer [7] and do not meet the safety standard needs [8]. A novel single switch high step-up converter is presented in [9]. The coupled inductor acts as both flyback and forward converter, thus it can discharge two capacitors in series and charge in parallel.

In [10], a high gain transformer less converter is described. It consists of a hybrid mixture of two-level dc/dc converters.

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Transformer-less DIDO DC-DC Converter for EV's

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***Abstract*— A transformer-less dual input dual output (DIDO) dc converter is proposed in this paper. This converter finds its application in fields of hybrid power system and hybridization of energy sources for electric vehicles. Supply of the output loads, charging and discharging of the battery / energy storage system can be made from the fuel cells (FC) or photo-voltaic (PV) which are provided as the primary source. Four switches controls the converter operation with design duties provided. Multiple output voltage levels are obtained to deliver power for electric motor and lighting loads in association with Electric Vehicle (EV) applications. The converter is simulated using MATLAB/Simulink. Simulation results validates the operability of the converter.**

Keywords*— *DIDO, EV, hybrid energy sources

I. Introduction

Renewable energy sources are gaining prominence nowadays due to their numerous advantages like ecofriendly, sustainability etc. Rapidly increasing population and energy consumption in the world, increasing oil and natural gas prices, and the depletion of fossil fuels are justifiable reasons for use of renewable sources. In Electric Vehicles and for hybrid power systems multiple energy sources are combined to feed the power requirements of the load. [1]

EVs are proving to be a potential and attractive solution for transportation as it is environmental friendly. In EVs, fuel cells are stacked together to form a clean energy source. FCs convert chemical energy to electrical energy. Fuel cells are emerging as a promising supplementary power sources due to their merits of cleanness, high efficiency, and high reliability. FCs being a continuous generator of energy, as long as the FCs are maintained continuous load is supplied. Major limitation of these FCs arise as they have slow power transfer rate, high cost per watt output, slow transient response etc. Therefore in EVs FCs are coupled with Energy Storage Systems like battery or ultra-capacitors for start-up and transient operations associated with EVs. By hybridization of energy sources above mentioned problems are solved. [5][8][16]

Multiport converters are generally used for hybridization of energy sources as it provides greater flexibility, cost efficiency, and energy efficiency compared to the conventional converters. [10]. Multi input converters have two main types, isolated multi input converters and non- isolated multi input converters. In isolated systems, converters will have high frequency transformers for electrical isolation and impedance matching between two sides. In addition to that a rectifier and inverter section is present in order to control the power flow via the converter. The power flow between the primary and secondary is controlled by phase angle shift of the transformer. Various isolated converter types are explained in [7] - [12]. The use of high frequency transformers increases the overall size and bulkiness of the converter, in addition to that the power semiconductors switches for rectification and inversion adds to the power losses. Overall cost of converter also increases. Due to the above mentioned reasons, for EV applications a transformer-less converter is more preferred.

It is important for an electric vehicle the torque ripple of the motor to be low. As the torque ripple is related to voltage harmonics in the ac motor. So by connecting the converter to MLI, reduction of harmonics thereby torque ripple can be achieved.

In [14] a single inductor multi input multi output converter is proposed. The number of switches and impracticability of the energy flow control are the main drawbacks of the paper.

In this paper, a single inductor transformer-less dual input dual output converter is proposed with minimum number of switches. This converter also controls the power flow between the sources with each other as well as the load. The converter provides dc voltage levels for both lighting and motoring operation of the EV. This paper is organized as follows. Converter structure and operation in section II. Design and MATLAB simulation along with results are explained in sections III and IV. Section V concludes the paper.

II. Converter Structure and Operation

The paper proposes a dual input dual output dc boost converter which is a combination of both dual input and dual output converters, such that single inductor topology is derived. A transformer-less scheme with varied output voltage levels are obtained.

A. Converter Structure

For a DIDO converter, following specifications are taken.

i. $V_{in1} < V_{in2}$

ii. 4 switches, 2 capacitors, one inductor

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Soft Switching Sepic Boost Converter with High Voltage Gain

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***Abstract*— The paper presents a high gain dc-dc converter which is derived from a traditional SEPIC (single-ended primary-inductor) converter. The distributed generation based system with renewable energy resources have rapidly developed in recent years. These distributed generation systems are powered by sources such as fuel cell, photovoltaic (PV) systems and batteries. This consists of two conversion stages, in the first stage the low level voltage from the PV cell is converted to high level voltage by using a dc-dc converter. In the second stage the high level dc voltage is converted into AC voltage by using inverter. The electrical energy demand requirements can be achieved by increasing the gain of the converter. The proposed converter high gain achieved by replacing the coupled inductor instead of inductor in the basic sepic converter. Further increase of gain is achieved by using charge pump capacitor cell. The main advantage of the sepic converter is continuous input current, which can be helpful in accurate PowerPoint tracking of solar cell. The inductorless regenerative snubber that reduces switching losses and helps to attain soft switching (zero voltage and zero current switching) conditions.**

Keywords*— sepic conveter, pv cell, coupled inductor, charge pump capacitor cell, snubber.

I. INTRODUCTION

In recent year the energy scarcity and atmospheric pollution that led to more researches on the renewable energy sources such as the Photovoltaic cells and fuel cells. The renewable energy systems generate low voltage output, therefore high step-up dc /dc converters are widely used in many renewable energy applications. Among renewable energy systems, photovoltaic systems are important role in future energy production. Such systems that produces electrical energy from light energy, and convert low level voltage into high level voltage via a step-up converter, which can convert energy into electricity using a grid-by-grid inverter.[1]. Classical isolated boost converters like flyback or current-fed push-pull converters are easily achieve high voltage gain. But the main drawback of these isolated dc-dc converters are large size , the energy of the transformer leakage inductance can produce high switching stress, increasing switching losses, and large electro-magnetic interference. Therefore non-isolated converter topologies are widely used in many applications.

The conventional boost converters such as boost, buck-boost, cuk, sepic and zeta converters can be used for this purpose, but to attain high voltage gain the duty cycle of the converter must be very high i.e around 0.9. This is not possible due to the reverse recovery problem of the diode. The diode reverse recovery current can reduce the efficiency of the converter when it's operating with high current voltage levels. Many topologies has been proposed to overcome this drawbacks. In classical non-isolated dc-dc converter voltage multiplier technique is applied in order to get high step-up gain or high voltage gain [3]. The basic structure of the single phase voltage multiplier cell is composed of capacitors, diodes and a resonant inductor. The voltage multiplier cell also operates without the resonant inductor. It is possible to add more multiplier cells in order to achieve high voltage gain. The voltage multiplier cell increases the static gain of the classical boost converter by a factor of (M+1). Where M is the number of multiplier cells. The main drawback of this technique is usage of large number of components that increases the conduction losses.

Switched capacitor and switched inductor structures introduced for obtaining transformerless hybrid dc-dc PWM converters [4]. These switched inductor and capacitor structures are introduced in classical converters which can provide steep conversion ratio. When the active switch of the converter is on, capacitors in the capacitor switching blocks are discharged in series or the inductors in the inductor switching blocks are charged in parallel. When switch is turned off, capacitors in C–switching blocks are charged parallel or the inductor in the L-switching blocks are discharged series . Main disadvantages of this technique is usage of large number of components, cost and control complexity.

Voltage lift technique has been proposed in sepic converters [5]. Voltage lift technique is different from switched capacitor and switched inductor techniques. Both inductors and capacitors plays important role in voltage lift technique. The main advantages of this converter compared to

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PWM control of soft-switched single switch Isolated DC-DC Converter

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***Abstract*— The high switching frequencies in power converters increases the switching losses, and electromagnetic interferences. These losses can be overcome by employing soft switching techniques. The paper introduces a soft switched single switch isolated DC-DC Converter where Switching losses, current and voltage stress can be reduced. The presented converter can be Zero current Switching (ZCS) turn on and Zero-Voltage Switching (ZVS) turn off of diodes and switches, regardless of load variation. The simulation of the circuit with 28V input, 380V/0.65A output is validated using MATLAB.**

Keywords—Isolated step up dc-dc converter;single switch;soft switchin,Pulse Width Modulation.

I. Introduction

Isolated step up dc-dc converters are used in many applications, such as photovoltaic module–integrated converter (MIC) system[1], portable fuel cell systems, and vehicle inverters where high efficiency, high power density, and low,cost are required [2]. Isolated DC-DC Converters are used to provide galvanic isolation to regulate the output in telecom DC/DC converters. The non isolated switching regulators are mainly classified as Buck, Boost, and Buck Boost. Isolated DC DC Converters are derived from these non isolated DC-DC Converters by adding an isolating transformer and various other components.

The isolated boost converter topology was conceived by Davidson on June 15, 1982 at Varian Canada micro wave division[3]. Isolated boost converters have some inherent advantages when used in fuel cell applications. With storage inductor placed at the input side, ripple current is inherently low. The drawback of boost topologies is need for the clamping of voltage spikes on primary switches caused by parasitic inductors. Thus various topologies have been analyzed to overcome these drawbacks. The Fly back current fed push pull DC-DC converter [4]shown in fig 1 is composed of a push pull transformer and a two winding transformer. These converters have several advantages over conventional current fed push pull transformers. In this topology [5] , there is no output inductor and has only a single input which makes the topology best suited for multiple output power supply.

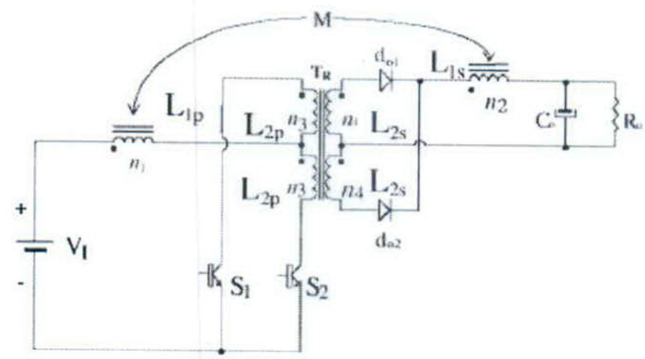

Fig 1 new flyback-current-fed push–pull dc–dc converter

In order to miniaturize a converter it is preferred to use high switching frequency. Increasing the switching frequencies helps to reduce the volume of power supplies. In medium power applications where isolation is required, which can be achieved by transformers, fly-back [6] and forward converters [7].

Current fed push pull DC-DC Converters [8] features good regulation. The main drawbacks of this topology are severe voltage over shoot, and the practical implementation of the circuits becomes unfeasible. The two possible techniques to solve such problems are passive clamping and active clamping techniques. The passive clamping techniques reduces the voltage over shoot problem, however diminishes the converter's efficiency, since energy is wasted through the clamping resistor. The active clamping techniques [9] promote the complete devolution of the energy stored in the leakage inductances. However, they may not expected to achieve high efficiency and low cost since they need at least four switches and gate driver circuits.

In ZVT converters [10], during turn-off, a snubber circuit is added across the switch to achieve turn off at Zero Voltage. The snubbers are of mainly two types, namely dissipative snubber and Non dissipative snubbers[11]. Dissipative snubber composed of resistors, capacitors and diode. These snubbers can be easily designed and adopted. But they can degrade the overall efficiency of the converter Whereas Non

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Closed loop control of an Improved Dual switch Converter With Passive Lossless Clamping For High Step-Up Voltage Gain

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***Abstract*— The conventional dc-dc boost converters are unable to provide high step up voltage gain. The transformer less dc-dc converters are used to achieve high step up voltage gain without an extremely large duty ratio. In this paper, the closed loop control of dual switch converter with passive lossless clamping for high step up voltage gain has been investigated. The improved dual switch converter can achieve high voltage gain with a condition that the parameters are inconsistent. It has advantages of low voltage and current stress on the switches compared to the transformer less dc-dc converters. The proposed converter also provides the solution to balance the voltage on the switches and to suppress the resonance. This is possible due to the presence of passive lossless clamping. With the passive lossless clamping circuits, low voltage switches with small Rds (on) can be utilized, and hence the efficiency of the converter can be increased. The simulation of the circuit with 30 V input, 100V/1A output is done using MATLAB. The simulation results indicate an improved voltage waveform with high step up voltage gain.**

***Keywords*— highstep-upvoltagegain, passivelossless clamping, parameters are inconsistent,resonance.**

I. Introduction

The voltage conversion ratio of a traditional boost converter is limited. various technologies have been developed to provide a high step-up voltage gain. The traditional boost converter is hard to provide a large voltage conversion ratio. A large duty cycle is introduced that brings high conduction loss, and the peak current may impact the capacitors. The dc-dc converters with high step up voltage gain is widely used in many applications such as lasers, fuel cell energy conversion systems, X-ray systems, solar cell energy conversion systems, and high intensity-discharge lamp ballasts for automobile headlamps. Theoretically, a dc–dc boost converter can achieve a high step up voltage gain with an extremely high duty ratio [1]–[3].However, in practice, the step-up voltage gain is limited due to the effect of power switches, rectifier diodes, and the equivalent series resistance (ESR) of inductors and capacitors.

The conventional boost converter is used to provide a voltage conversion ratio with low voltage gain. It is hard to provide a large voltage conversion ratio, due to a large duty cycle that brings high conduction loss, and the large peak current may impact the capacitors seriously. Various topologies have been developed to provide a high step up voltage gain without an large duty ratio [4]. The isolated converters will boost the voltage by increasing the turns ratio of the high frequency transformer [5]-[6]. However, it may cause increased weight, volume, high switching losses, high electromagnetic interference. And also the leakage inductance should be carefully handled [7]-[9]. Otherwise, there will be a voltage spike across the power switches. The transformer less dc/dc converters are used instead of the isolated converters. The coupled inductors are used to achieve high voltage gain in the transformer less dc/dc converters. By increasing the turn's ratio, high voltage can be easily achieved [10]-[13]. Unfortunately, the leakage inductance of the coupled inductors is also inevitable. And also it may cause high voltage spike, that will increase the voltage stress [14],[15].

The non coupled inductor type transformer less converters are used such as the switched-capacitor-inductor converters. A small resonant inductor is used in these converters to limit the current peak caused by the switched capacitors. Here the voltage stress on the switch is smaller than the voltage stress on the switch in conventional boost converter [16]-[18]. The switched inductor multilevel boost converter [19]-[21] is having a single stage dc-dc boost converter topology with very large voltage conversion ratio based on the pwm technique. A high switching frequency is employed to decrease the size of these components. But the voltage stress on power switches is relatively high. The switched capacitor boost converter [22]-[24] can provide a high voltage conversion ratio, where as the multiple diode-capacitor units are utilized with low power density. The cascade boost converter can provide a high step-

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Double Integrated Buck Offline Power Supply for Solid-State Lighting Applications

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Abstract*— A Double integrated buck converter finds application in fields of solid state lighting. buck Converter is widely used for, step down dc-dc conversion when there is no isolation requirement. The narrow duty cycle of the buck converter limits its application for high step down applications. The double integrated buck converter overcomes its limitaion. This converter also provides high power factor and output current regulation. A Double integrated buck converter uses for the offline power supply for LED lighting based on the integration of a buck power factor corrector (PFC) and the tapped buck dc/dc converter having high step down capability and good output current regulation. Due to the high reliability, the simple structure, and the low component count, the proposed topology effectively results to be very suitable for medium-power solid-state lighting applications.The simulation of the circuit with 230V input, 30V/500mA output is done using PSIM. Output levels are obtained as per the design values for converter operations.

***Keywords*— DIB converter, Discontinuous Conduction Mode (DCM), LED Lamps,power factor correction, Tapped inductor**

I. Introduction

Now a days, high brightness light emitting diodes are attracted the interest of both industrial and academic research community. The LED technology so attractive because of its robustness, high efficiency, small size, easy dimming capability,low cost, long lifetime, and very short switch-on/switch-off times.Even if all such qualities give to solid state lighting a advantage over all the other kinds of lighting technologies[1]-[3].The main goal is to find out simple switched mode power converter topologies, characterized by reduced component count and low current/voltage stresses.

PFC converters usually divided into two categories: the two-stage and single-stage approaches. The two-stage approach actually includes two power-conversion stages. The first stage is a PFC stage, and the second stage is a dc/dc converter or dc/ac converter regulate the output voltage. This approach has good performance for power factor (PF) and fast output-voltage regulation. The main disadvantage is the high cost. [14]
The first kind of approach investigated is based on the use of a simple structure relying on a single power conversion stage, ensuring: compliance with the standards limiting the input current harmonics and regulation of the load current. In order to reduce the cost, the single-stage approach [5]–[9].This topology integrates the PFC stage with a dc/dc converter into one stage. These integrated single-stage PFC converters usually use a boost converter inorder to achieve PFC.This kind of solution is used for low power LED applications.

Another approach considered, is based on integrated topologies [10].In the integrated topologies the two power convertion stages controlled by one swich. In the resulting converter, power factor and LED current regulation are performed by the combined semistages in which both input power and output current managed by the same switch. Compared with a conventional two-stages configuration, lower circuit complexity and cost can be achieved through integration. Galvanic isolation can be provided or not depending on the topologies selected for integration. If non-isolated topologies are considered for both semi-stages, the user safety has to be guaranteed by assuring mechanical isolation throughout the LED lamp case.[10]

In [11] describes new family of single stage isolated power-factor correctors features fast regulation of the output voltage.[12]-[13] By using a tapped inductor to get low or high voltage transfer rations and low component cost.[12] present tapped inductor technology based on DC-DC converter which is the combination of both buck and boost converter connected via tapped inductor.The stepdown and stepup can be achieved by proper control scheme.The particular paper presents the comparative study of conventional converters and tapped inductor topology. In [13] deals with a classification scheme based on the tapped inductor switched mode power supplies. This scheme ensuring that no tapped inductor converter circuit is neglected when a tapped-inductor circuit is to be chosen for any particular application.

The conventional buck converter for instance, is very efficient when not too large a potential difference separates the output voltage from the input voltage (i.e., when the duty cycle D is high, and typically over 50%). However in industrial applications, it is not unusual that a 48 V input voltage needs stepping down to 3.3V(and even below) for the

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Developed Non-isolated High Step-up Converter with Low Voltage Stress

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***Abstract*— Many of these conventional DC–DC converters have the disadvantages of operating at high duty-cycle, high switch voltage stress and high diode peak current. The conventional boost high step-up converter can provide very high voltage gain without operating at high duty-cycle by employing a coupled inductor, a switched capacitor and an additional diode. Non-isolated high step up converter overcomes this drawback. This converter reduces voltage stress on switch and diode by using additional one capacitor and rearranging components in conventional single switch high step-up converter. At the same time, the switch voltage stress is reduced greatly, which is helpful to reduce the conduction losses by using low power rated components and efficiency will increase. Single switch is used in the non-isolated high step up converter, thus reduce the entire cost of the converter. This non-isolated high step-up converter is used in many applications such as renewable energy system using low voltage energy sources such as fuel cells, solar panels, photo voltaic cell. This converter has low voltage stress and high efficiency with low rated power components. The reverse-recovery energy of the output diode and the leakage inductance energy are recycled. The converter has high efficiency under entire load conditions due to the low conduction loss. The simulation of the circuit with 24 V input, 250V/125W output is done using PSIM.**

Keywords* — *Non-isolated; High step up; Flyback converter; Voltage stress; Boost converter.

I. INTRODUCTION

In present scenario, research and development in the field of renewable energy system [1],[2] using low voltage energy sources such as fuel cells, solar panels, photo voltaic cell. This is because of the high efficiency and high voltage gain. For these applications it needs voltage gain around ten or above. The basic boost converter used to obtain high voltage, but this cannot provide high gain with extremely high duty cycle. This is due to the switching losses and diode losses in the converter. To overcome this drawback introduces a transformer in converter thus form flyback converter, forward converter, push-pull converter, half bridge converter and full bridge converter. These converters have high gain by adjusting the turn's ratio of the transformer [3]-[11]. Among them, the flyback converter is used because of the simple structure and low cost. The basic flyback converter has single switch, diode and a transformer. The flyback converter is widely used in low power application such as portable computers, storage devices and mobile/battery charges [1]. Due to the presence leakage inductance of the transformer the primary switch and secondary diode experiences high voltage stress. Because of this drawback the flyback converter cannot use in high power applications [3].

To overcome these problems non-isolated high step-up converter is derived. Non-isolated high step-up dc-dc converters are widely used in the front end stage of the renewable energy applications and the dc back up energy system such as fuel cell, solar arrays, uninterrupted power supply and high-intensity discharge (HID) lamps for automobile head lamps [3].

High output voltage can also be generated by manipulating the charge transference of capacitor or inductor. Charge pumps, switched-capacitor converters and Luo converter with voltage-lift technique are typical examples [12]-[14]. Alternatively,switched-capacitor/switched-inductor structure,voltage doubler/multiplier cells inserted in the basic dc-dc converter circuit to further boost up the output voltage [15], [16]. Some of these converters involve the use of multiple switches and magnetic components with relatively complex circuits, which leads high cost and lower reliability.

The flyback converter suffers from several limitations that lower its efficiency and degrade its performance in high step-up applications. The leakage inductance generates huge turn-off voltage spike in the power switch, which results in high-voltage stress on the components and requires voltage snubber to clamp the switch voltage. The leakage inductance also induces ringing across the switch thus reduce the power efficiency and induce EMI effects [17]. But it used in practical applications due to the simplicity and low cost. Some research efforts have been spent on further improvements of the flyback topology. Active clamping and soft-switching functions have been added to the flyback converter to reduce the voltage stress across the switch and diodes [18]-[21]. Further research take place to reduce the conduction losses by using synchronous rectification [22],[23]. Then aimed to increase the efficiency and increase its application by connecting one or more flyback converter serially /parallel

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NON ISOLATED DC-DC CONVERTER USING ONE CYCLE CONTROL

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***Abstract*—DC-DC Converter is widely employed in many industry applications due to its efficiency and high gain. These converters are of two types:- Isolated Converter and Non Isolated Converter. Many of these conventional DC-DC converters have the disadvantages of operating at high duty-cycle, high switch voltage stress and high diode peak current. The conventional boost high step-up converter can provide very high voltage gain without operating at high duty-cycle by employing a coupled inductor, a switched capacitor and an additional diode. Non-isolated high step up converter overcomes this drawback. This converter reduces voltage stress on switch by using clamped-capacitor circuit which is helpful to reduce the conduction losses by using low power rated components and efficiency will increase. Single switch is used in the non-isolated high step up converter, thus reduce the entire cost of the converter. The energy stored in leakage inductance of coupled inductor is efficiently recycled to the output. The voltage doubler circuit is added for further extending the voltage gain. The control strategy is the one cycle control. By the application of this technique the performance of the converter is improved. This non-isolated high step-up converter is used in many applications such as renewable energy system using low voltage energy sources such as fuel cells, solar panels, photo voltaic cell. The leakage inductance energy of coupled inductor is recycled to the output. The simulation of the circuit with 30 V input, 380Vboutput is done using MATLAB.**

***Index Terms*—Boost converter, Coupled inductor, high voltage conversion ratio, one cycle control.**

I. INTRODUCTION (*HEADING 1*)

High step-up DC-DC converters are widely used in many applications such as the solar arrays, the fuel cell systems, dc back-up energy systems for UPS, renewable energy systems, high-intensity discharge lamps for automotives, hybrid vehicles and some medical equipments [1]-[16]. Thus, the high step-up DC-DC converters need high voltage gain, high efficiency and small volume. The DC-DC boost converter is normally used for voltage step-up applications, but to achieve high voltage gain the converter will be operated at extremely high duty ratio. The conventional boost converter is not the preferred because of the following reasons. High duty-cycle must be applied to obtain a high conversion ratio, which causes serious losses on the power devices due to their parasitic parameters. Because of high voltage stress across the switching devices, only devices with high on-resistances can be used, which generates high conduction losses. These factors will degrade the efficiency and limit the power level [17], [18]. To achieve high conversion ratio and avoid operating at extremely high-duty cycle many nonisolated converters have been researched. When the source ground and load ground are physically connected to each other i.e. electrically and magnetically then the circuit is said to be non-isolated one. Figure. 1 shows a basic nonisolated converter.

To avoid operating at high duty-cycles, the switched capacitor technology is introduced in [19], [20]. The voltage gain is increased and the voltage stresses of the semiconductor devices are reduced in these converters. But when the switches turn on, the current, which flows through the switches and the diodes, increases the current stress of the devices and causes large conduction losses.

A resonant inductor is placed in the switched capacitor circuits to limit the peak current and avoid the diode reverse-recovery problem [21], [22]. When the conversion ratio is large, many switched capacitor stages are required to achieve high voltage gain, which makes the circuit complex and increases the cost. Switched inductor boost converter is introduced by replacing the inductor of the boost converter with a switched inductor. As a result the conversion gain ratio increased. To achieve large conversion ratio, more switched inductor stages have to be added resulting in higher cost and complex circuit.

The basic structure to obtain high boost rate is a cascade converter, there are more than one power processing stage exists, the operation in continuous conduction mode may still lead to high efficiency [23]. The main drawbacks in this case are increased complexity due to two sets of active switches, magnetic and controllers. The controllers must be synchronized and stability is of great concern [24]. Due to high power levels and high output voltage the latter cascaded boost stage has severe reverse losses, with low efficiency and high electromagnetic interference levels. Examples of such converters are the single-switch quadratic boost converter and the two-switch three-level boost converter [25].

The quadratic boost converter using a single active switch is another modification for extending the voltage gain [26], [27] where the voltage conversion ratio is given as a quadratic

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