UNDERSTANDING INTERNET OF THINGS: DESIGNING, APPLICATIONS, CHALLENGES AND SOLUTION

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SIPH

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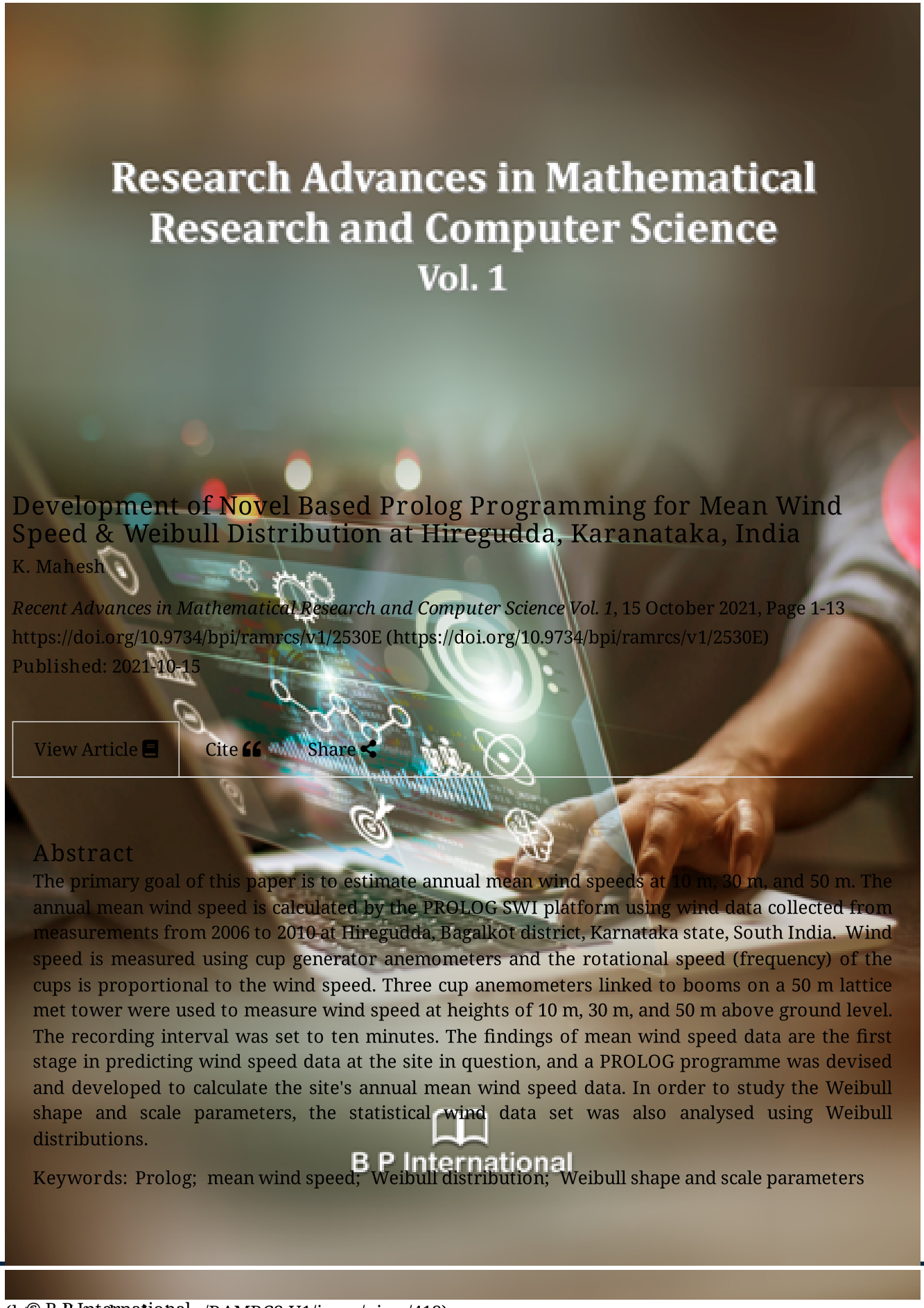

Development of Novel Based Prolog Programming for Mean Wind Speed & Weibull Distribution at Hiregudda, Karanataka, India

K. Mahesh

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Abstract

The primary goal of this paper is to estimate annual mean wind speeds at 10 m, 30 m, and 50 m. The annual mean wind speed is calculated by the PROLOG SWI platform using wind data collected from measurements from 2006 to 2010 at Hiregudda, Bagalkot district, Karnataka state, South India. Wind speed is measured using cup generator anemometers and the rotational speed (frequency) of the cups is proportional to the wind speed. Three cup anemometers linked to booms on a 50 m lattice met tower were used to measure wind speed at heights of 10 m, 30 m, and 50 m above ground level. The recording interval was set to ten minutes. The findings of mean wind speed data are the first stage in predicting wind speed data at the site in question, and a PROLOG programme was devised and developed to calculate the site's annual mean wind speed data. In order to study the Weibull shape and scale parameters, the statistical wind data set was also analysed using Weibull distributions.

Keywords: Prolog; mean wind speed; Weibull distribution; Weibull shape and scale parameters

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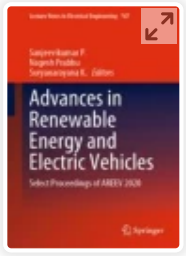

Advances in Renewable Energy and Electric Vehicles pp 55–64

Comparative Analysis of MPPT Techniques in Grid-Connected and Stand-alone PV System

B. B. Tara & H. L. Suresh

Conference paper | First Online: 21 August 2021

Part of the Lecture Notes in Electrical Engineering book series (LNEE,volume 767)

Abstract

Solar energy is recognized as most promising energy source. MPPT technique is the optimized technique to track the MPP and to extract the maximum power out of PV panel under all available condition. There are different MPPT techniques available for different applications, and these techniques are used to get the maximum output power regardless of the existing

conditions such as solar irradiance, and temperature. The paper discusses about various MPPT strategies in stand-alone and grid-connected PV system considering some features. There is a brief overview on various conventional methods and modern techniques, and all the methods are compared considering the significant key features.

Keywords

Maximum power point tracking (MPPT)

Photo voltaic (PV)

Adaptive neuro-fuzzy inference system (ANFIS)

Perturbation and observation (PO)

Artificial neural network (ANN)

Maximum power point (MPP)

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IoT and Analytics for Sensor Networks pp 207–223 | Cite as

Design and Simulation of MEMS Based Capacitive Accelerometer

S. Veena, Newton Rai, Amogh Manjunath Rao Morey, H. L. Suresh & Habibuddin Shaik

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Abstract

Accelerometer is an electromechanical device, which is used for physical measurement along the orthogonal coordinates. Micro Electro Mechanical Systems (MEMS) based capacitive accelerometers are embedded in many modern technological applications. This paper presents the comparison between two single axis MEMS based capacitive accelerometers, which have the natural frequencies of 7 and 2.2 kHz. This work includes design, simulation, analytical modelling, and finite element modelling of each MEMS comb type capacitive accelerometer with different operating frequencies. The accelerometer was designed using COMSOL Multiphysics and MATLAB simulator tool.

Keywords

Accelerometer MATLAB COMSOL

References

Proceedings of International Conference on Data Science and Applications
pp 297–308

A Comparative Study of Firefly and BAT Algorithm-Based Maximum Power Point Tracking for Partially Shaded Photovoltaic Systems

Rekha Radhakrishnan, P. Sumalatha & R. Subha

Conference paper | First Online: 23 November 2021

505 Accesses

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 288)

variations in environmental conditions. To obtain maximum power from the panel, several algorithms have been developed over the years. Conventional algorithms miss the maximum power point (MPP) when the photovoltaic (PV) system is operating under partially shaded conditions. Hence several intelligent algorithms have been adapted to track MPP of partially shaded PV systems. Algorithms mimicking the behavior of biological entities in nature exhibit good adaptability to changing surroundings. Bats use echolocation for locating their food is used in the development of an algorithm called bat algorithm. This paper presents a comparison on the MPP tracking performance of bat algorithm, firefly algorithm and conventional Pertub and Observe (P&O) algorithm under partial shading.

Keywords

Bat algorithm **Firefly algorithm** **MPPT**

Partial shading **PV system**

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An Efficient Machine Learning Approach to Recognize Dynamic Context and Action Recommendations for Attacks in Enterprise Network

K. B. Swetha and G. C. Banu Prakash

Abstract The size of the computer networks and the developed applications grow exponentially due to the rapid advancement of the modern technology. Meanwhile, a significant increase in the cyber-attacks to data networks has also been observed. Intrusion detection system (IDS) is the major layer of defense in case of data network and thus plays vital role in detection or forewarning of any kind of intrusion in the network. Intrusion detection is quite important in modern data networks. Using the network packets information, identify the DoS/DDoS attack using machine learning model which predicts the network packet accuracy before hitting the application. The goal is to use machine learning/deep reinforcement learning algorithm to detect anomaly in the incoming network traffic.

Keywords TCP-IP · DDoS attacks · Enterprise networks · Intrusion detection system (IDS) · k-nearest neighbor network · Deep reinforcement learning · Confusion model

1 Introduction

Development of an efficient framework using location and sensing parameters is essential. This framework should provide the services suitable to user context using machine learning algorithms. DDoS attacks are considered to be one of the major shares in network attacks. Distinction between legitimate and malicious users is always a challenging task in any typical enterprise network environment. The testing and implementation of DDoS approaches are difficult due to many factors. Using any of the machine learning approaches, one can attempt to detect attacks and propose

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https://doi.org/10.1007/978-981-16-7167-8_67

Chapter 35
A Smart Women Protection System Using IOT

Check

Sasmita Mohapatra, C. Ramya, N. G. Sahana, V. Savithri, and S. Yashaswini

1 Introduction

In modern times, even with the advancement in technology, women safety has always been a major concern. When women step out, there is always a sense of fear within them with respect to their safety and protection. There is no safety for women anywhere and they are most vulnerable when traveling alone in deserted places. Eliminating the hindrances of a perilous climate can assist ladies with satisfying their potential as people and as supporters of work, networks and economies. The objective is the application of Internet of Things to destroy the frightening lifestyle of women.

The 10T portrays the organization of actual items—"things"—that are implanted with sensors, programming, and different advancements to interface and trading information with different gadgets and frameworks over the Internet.

A smart safety system for ladies based on the IOT is suggested because of these crimes that ladies are exposed to in the current situation. It is actualized as a shrewd 10T device that includes ESP32 eye, temperature sensor, heartbeat sensor, motion sensor, ADXL, buzzer, GPS , Panic button, camera and shock module. In the proposed system, the device is triggered by the victim j ust by clicking a button to get her current location, and a live streaming video is obtained via the ESP32 Camera. The proposed framework helps ladies in crisis circumstances by enacting the modules on pressing button and gives crisis self-protection.

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Applications of Inorganic Polymers in Textile Wastewater Treatment

G. K. Prashanth, M. S. Dileep, P. A. Prashanth, Manoj Gadewar, B. M. Nagabhushana, and S. R. Boselin Prabhu

1 Introduction

Huge number of atoms are bound to each other to form a very long chain of macromolecule in 1D (one dimensional) array is called a polymer. In Greek, the word poly means many and meros means parts/units, i.e., a part (monomer) is repeated several times in a single unit. Polyethylene is one of the basic examples of polymers where ethylene is the monomer. The molecular properties create the characteristics of solid materials, such as elasticity, strength, film-forming, or fiber-forming qualities, which are not found in small-molecule systems. Polymers are usually so high in molecular weights that they are non-volatile for all practical purposes. The extensive use of polymers in all aspects of modern technology underpins these characteristics. In this

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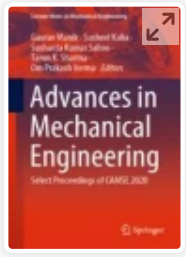


Advances in Mechanical Engineering, pp 499–507

Linear and Nonlinear Gravity Field Variation on Double-Diffusive Convection in a Porous Layer

Y. H. Gangadharaiah, T. Y. Chaya & S. P. Suma

Conference paper | First Online: 27 June 2021

Part of the Lecture Notes in Mechanical Engineering book series (LNME)

Abstract

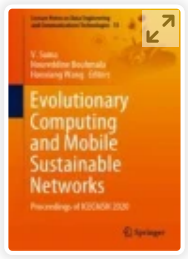
This paper analyzes the instability of a gravity field in a double-diffusive convective motion in horizontal porous matrix, heated from below uniformly with the inclusion of the Soret parameter. The critical Rayleigh numbers for the onset of stationary and oscillatory modes have been calculated by using the higher-order Gelerkin technique. We addressed four separate cases of linear and nonlinear gravity variation: (1)

$H(z) = -z$ (2) $H(z) = -z^2$ (3) $H(z) = -z^3$ and (4) $H(z) = -(e^z - 1)$. The gravity parameters Soret parameter and solute Rayleigh number on stationary and oscillatory convection and heat and mass transfer are graphically illustrated.

Keywords

Soret effect **Steady instability**

Oscillatory motion **Gravity field**



Evolutionary Computing and Mobile Sustainable Networks pp 887–897

Foot Ulcer and Acute Respiratory Distress Detection System for Diabetic Patients

M. S. Divya Rani, T. K. Padma Gayathri, Sree Lakshmi & E. Kavitha

Conference paper | First Online: 01 August 2020

Part of the Lecture Notes on Data Engineering and Communications Technologies book series (LNDECT,volume 53)

Abstract

Health care and wellness management for a diabetic are one of the most promising information technology in the field of medical science. A healthcare monitoring system is necessary to constantly monitor diabetic patients' physiological parameters. Hence the major scope of this proposed project work is to develop a smart health

monitoring system that overcomes many complications in diabetic patients by periodically monitoring patients' heartbeat rate, SPO2 (Peripheral capillary oxygen saturation) level, foot pressures, etc. Therefore, the IoT concept is used and sensors are connected to the human body with a well-managed wireless network that periodically monitors the physiological parameters of the body to avoid high risks in diabetic patients. Continuous health monitoring remotely works because of the integration of all components with wearable sensors and implantable body sensors networks that will increase the detection of emergency conditions at risk. Also, the proposed system is useful to operate remotely because of inbuilt Wi-Fi in the system.

Keywords

Diabetic Foot Ulcer (DFU)

SPO2 (Peripheral capillary oxygen saturation)

ECG (electrocardiogram)

Acute Respiratory Distress Syndrome (ARDS)

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Novel Cognitive Radio Framework for Optimized Resource Management over IoT Ecosystem

Publisher: IEEE

Vani B P ; R Sundarguru All Authors

Abstract:
Adoption of Cognitive Radio Network (CRN) is increasing owing to its potential facilitation towards accessibility of data services in wireless network. It is considered as an integral part of IoT system which demands faster connectivity with better admission control. However, IoT system has massive number of connected users with both home access point and core base station and it is quite resource consuming in order to relay the data communication even using 5G over IoT. Therefore, this paper introduces a very simple and novel mechanism for resource management in CRN particularly targeting to large scale IoT environment. This analytical model is implemented in MATLAB considering a standard simulation parameter, where the outcome shows that proposed system offers better throughput in less time in contrast to existing channel assignment approaches towards resource management in CRN.

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Conference Location: Coimbatore, India

Intelligent Garbage Collection Application for Smart City

Publisher: IEEE

R. Sivapriyan ; N Sakshi ; K. Mahesh **All Authors**

Abstract: This paper put forward an intelligent garbage collection application for Android/iOS mobile phones to benefit the resident and municipal workers. The existing waste colle... **View more**

Metadata

Abstract:
This paper put forward an intelligent garbage collection application for Android/iOS mobile phones to benefit the resident and municipal workers. The existing waste collection system is that the municipality sends a truck to each home and manually picks up the garbage bag. However, if the garbage collection truck is not on time, the garbage is not collected from their respective residence. This results in residents throwing the trash in the open area. Hence, a solution is proposed for a garbage collection system using the flutter-firebase along with geofencing technology. The main objective of this paper is to inform the residents when the garbage collection truck is on its way to collect the garbage via an Android/iOS device, and also list the details to the truck driver's mobile about number of persons waiting to dispose of the garbage. This proposed garbage collection application will ensure that the garbage is collected on time from each resident and waste is disposed of scientifically. Also, this application ensures the minimum waiting time for the residents to dispose the garbage and maximum area coverage in short time for the municipal worker without missing a resident. This application is developed using Flutter Software Development Kit and works well with both Android and iOS based mobile phones.

Citations
Keywords
Metrics
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Date of Conference: 08-09 October 2021

INSPEC Accession Number: 21498177

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Conference Location: Coimbatore, India

Contents

I. Introduction

Due to urbanization, and increase in population leads to high housing demand in urban areas. In turn, this will lead to producing tons of garbage. India generates around 62 million tons of waste every day [1]. Inappropriate disposal of domestic waste causes pollution and health hazards due to an unorganized garbage collection system, like the late arrival of municipal garbage truck or late coming residents to dispose of the garbage [2] –[4]. The garbage thrown outside or in the open area causes pollution and threat to public health hazard [5]. To streamline the garbage disposal scientifically, this paper describes using the latest technology to develop an application without any cost to the residents/municipality or using any hardware. Using this mobile application, the residents can monitor the live garbage truck location and get a notification once the truck approaches their residence. These days, most people use smart phones, and they can easily download this application free of cost. Using this application, the residents can plan to dispose of the garbage at a scheduled time, thus saving time. This application also provides the number of residents waiting to dispose of the garbage. Based on this information, the municipality can plan the number of trucks to be sent to collect the trash. The currently available applications lacks in the coordination between the collection system and resident [6] –[8]. From the literature review it is observed that integration of the mobile application with Internet of Things (IoT) serves good for humanity [9] –[11]. Fig. 1.

The smart garbage collection application over all view

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An Extensible Pervasive Platform for Large-Scale Anticipatory Mobile Computing
2017 IEEE 41st Annual Computer Software and Applications Conference (COMPSAC)
Published: 2017

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IEEE Transactions on Mobile Computing
Published: 2006

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Smart Android/iOS Application for Smart Learning

Publisher: IEEE

R Sivapriyan ; Sakshi N ; V Sureshbabu **All Authors**

Abstract: The teaching staff in educational institution use the traditional method to conduct Face-To-Face classes with students. The re-accruing of the pandemic has become a need ... **View more**

Metadata

Abstract:
The teaching staff in educational institution use the traditional method to conduct Face-To-Face classes with students. The re-accruing of the pandemic has become a need to supersede the present education system to a new sustainable education system. Currently, the pandemic has forced to shut down several activities, including educational activities and thus resulting in the students not attending the class physically. As learning is a must for every student, educational institution was forced to conduct courses online. However, some students cannot attend the online class on time for various reasons; and unable to follow the subject concept. Hence, this paper proposes an application that helps students retrieve a specific topic for their understanding. Implementing this system, the students need not travel to institutions daily and waste their travel time for attending the classes and also saving teachers travel time. This system will ensure that teachers and students are safe from re-accruing pandemics by avoiding contacting each other to understand the subject. To accomplish this task, this paper proposed an application that runs on the Android/iOS platform by using Flutter SDK and using Dart programming language.

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Conference Location: Kuala Lumpur, Malaysia

Contents

In our traditional educational system, there is a need for an infrastructure wherein the students and the teachers have to gather in one place at a stipulated period fixed by the institution. The teachers have to prepare for the subject and share knowledge with the students. Once the students are Graduated, the teacher needs to share the same knowledge for their juniors. This is an excruciating task for the teachers; covering the same topic and the teacher's life is very monotonous [1]. There are some cases where students arrive late and join the class. However, the students who have joined late will not understand the missed topic for that particular session. This is a challenge for teachers and students [2]. Apart from this, the current pandemic has made the education system more complex due to online learning. Attending online classes in Synchronous method have posed threats for students learning process, due to rigid schedule and technical challenges [3]. Hence this paper is proposing Asynchronous online learning. Fig. 1 indicates the advantages and disadvantages of synchronous and asynchronous learning.

Published: 2015

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A Study on Pattern Analysis of Extracted Features from Bearing Fault Vibration Signals

Publisher: IEEE

Nayana B R ; Geethanjali P All Authors

Abstract: In any pattern recognition challenge, extracted features play a vital role. It is important to extract useful features and then proceed with classification. Especially in... **View more**

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Abstract:
In any pattern recognition challenge, extracted features play a vital role. It is important to extract useful features and then proceed with classification. Especially in applications like mechanical fault diagnosis of machinery, where the characteristics features of the fault are to be captured. This can avoid the need for feature reduction/ selection techniques that would be needed once the number of features is greater and does not help advance the act of the classifier. This work presents an attempt to investigate the efficacy of eighteen features for classification. Among 18 features, 12 are statistical time domain features in which 4 are 1st 4 moments of the signal, 5 are simple statistical features and 3 are counters. Furthermore, 6 frequency domain features are computed directly in time domain, which are log transformed higher order moments of frequency domain. Subsequently, the features are studied for their pattern and their correlation with each other by visualization. Visualization observations are validated using classification performance parameters. The features are extracted from a benchmark dataset and a 13-class classification is

More Like This

implemented using well-established classifiers. Finally, the paper concludes that 4 effective features will suffice to achieve 99.7% accuracy of classification.

Published in: 2021 Innovations in Power and Advanced Computing Technologies (i-PACT)

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Conference Location: Kuala Lumpur, Malaysia

Contents

Mechanical damages are the utmost distinctive faults in machineries; in specific, bearing faults have quite a higher occurrence rate than other abnormalities [1]–[3]. On the other hand, the machine is built to function for longer periods of time [2]. This demands timely maintenance and regular diagnosis for incipient defect detection [4]–[5]. It is difficult to get the mechanical fault reflected on the acquired signal and make decisions based on that [6]. Researchers have attempted to acquire vibration signals both invasively and non-invasively. Though the invasive approach effectively captures fault features, the practical implications are challenging. As a result, the current trend in mechanical fault diagnosis is to use a non-invasive approach [5]. However, the extracted features must be sufficiently effective to reflect the machine condition as the parameters alter with respect to load and fault [7]. Several works in the literature document the extraction of features in the time domain, which has the advantage of being less computationally complex [8]–[9]. And in frequency domain, which has the advantage of capturing the maximum frequency related characteristics of the condition under consideration [6], [10]. In addition, to these there are works which extract features in all 3 domains namely, time, frequency and time-frequency [12]–[14]. With a better understanding of the pros and cons of feature extraction in each domain, the researcher can choose the domain for feature extraction based on the application. Accordingly, in this work, 12 of 18 features are statistical features extracted from temporal domain and the remaining 6 are spatial features being extracted from temporal domain [15]–[18]. In precise, spatial features are extracted in temporal space without performing transformation, this is fundamentally aided by Fourier transform and Parseval's theorem relation [17]–[18].

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A Feature Extraction Method Based on Sparse Filtering With Local Structure Preserved and Its Applications to Bearing Fault Diagnosis
IEEE Access
Published: 2019

Fault Diagnosis of Rotary Machine Bearings Under Inconsistent Working Conditions
IEEE Transactions on Instrumentation and Measurement
Published: 2020

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Comparative Analysis of Smart Voice Assistants

Publisher: IEEE

R Sivapriyan ; N Sakshi ; T Vishnu Priya **All Authors**

Abstract: Lately, voice-activated interfaces are becoming more popular, such as Amazon Alexa, Google Assistant, and Microsoft Cortana voice recognition applications. This paper rep... **View more**

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Abstract:
Lately, voice-activated interfaces are becoming more popular, such as Amazon Alexa, Google Assistant, and Microsoft Cortana voice recognition applications. This paper represents the outcome of gauging these three intelligent voice assistant applications. Their answers are based on user questions and how the user perceives these three intelligent voice assistant applications. As per the survey conducted on these three smart voice assistant applications, users feel that Alexa and Google Assistant applications are superior to Microsoft Cortana. Alexa and Google Assistant applications do not have any remarkable differences. The development and implementation of Artificial Intelligence objects ensure that voice-overs between humans and machines are realistic, and there are not many dependencies on human interactions. The new Voice Protocol Assistants system can be implemented in other different environments of applications, including education assistance, medical assistance, robotics and vehicles, an assistant system for physically challenged persons, home automation, and security access control. This paper compares the three most adopted voice assistants and identifies its strength and weakness compared with their peers.

Citations
Keywords
Metrics
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Contents

In the earlier era, users had to manually switch off the lights, fans, radio, tv, and other electrical appliances before they locked the house. At times, due to work pressure or other hindrance, users would have forgotten to switch off some of the electrical devices or due to power failure. The different challenge faced in earlier days was that if user ignored the recipe in the middle of cooking, user had to switch off the appliance, wash our hands, and then reach for the recipe book or navigate a website to obtain the correct recipe. Also, if the user wanted to listen to a song, the user had to visit the place where the musical appliance was installed physically. But in the modern era, a lot of electrical gadgets are available which helps user to lead a quality life thru voice-recognition assistant. A smart home is a home where an electrical appliance is controlled by using a smartphone. Nowadays, most home appliance products are being developed to ensure that it is smart home compatible. These products provide the homeowner's security, comfort and helps to reduce the use of electricity. However, an Internet connection is a must to run these appliances. Examples of intelligent home appliances are Smart Bulb, Smart TV, Smart Fridge, Smart Locks, Smart Garage Door Opener, Smart Fridge, Smart Security Cameras. Amazon, Google and Microsoft are developing and upgrading their voice service technology so that users can operate a particular device remotely thru voice or innovative mobile applications [1].

More Like This

Multimodal Human Computer Interaction with MIDAS Intelligent Infokiosk
2010 20th International Conference on Pattern Recognition
Published: 2010

A Systematic Review of Human–Computer Interaction and Explainable Artificial Intelligence in Healthcare With Artificial Intelligence Techniques
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Multiple Output Converter using PID Controller and Single Inductor

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ABSTRACT:

A converter is a device that converts DC voltage from one level to another. Depending on the circuit architecture, the output voltage can be raised or lowered in comparison to the input voltage. In many applications, DC–DC converters are primarily utilized as controlled and isolated power sources. Most analog and digital electronic systems require regulated dc power supply. The majority of power supplies are built to fulfil one or more of the following criteria:

Regulated output: With respect to changes in output loading, the output voltage must remain constant.

Isolation: The output may be required to be electrically isolated from the input.

In addition to these criteria, a frequent objective is to minimize the size and weight of power supplies while increasing their efficiency. A few examples of DC-DC converter applications include stepping down 5V DC on a personal computer motherboard to 3V, 2V, or less for one of the newest CPU processors, and stepping up 1.5V from a single cell to 5V or more to run electronic circuitry. The major goal of this study is to create dc voltage with little loss from one level to another. Because transformers cannot operate on dc, the demand for such converters has increased.

Keywords: ***Single Inductor, Two Output, Boost Converter [8]***

INTRODUCTION:

Multi-output Boost Converters:

In recent years, significant advancements have been made in the field of DC-DC converters in order to minimize their size and improve their efficiency. Many electronic gadgets, such as laptops and cell phones, require numerous outputs from a single input. Traditionally, transformers with several secondary windings as independent outputs have been employed to perform this function, but they have the disadvantages of greater size and weight, especially for portable devices. One way to reduce the effective size and weight of the converter is to use a single inductor multi-output converter. However, it has a voltage regulation problem, in that if the load on one output varies, the other outputs are also impacted, necessitating the use of an appropriate controller to maintain the voltage constant.

Control Methods for DC-DC Converters:

The basic two types of control for DC-DC converters are:

1. Voltage control Method

2. Current control Method

Conventional Multi-Output Converter:

To obtain many outputs in a traditional multiple output converter, transformers were employed. The loads are linked in each of the several tapings on the transformer secondary. The typical multi-output converter is seen in Figure 1. [1].

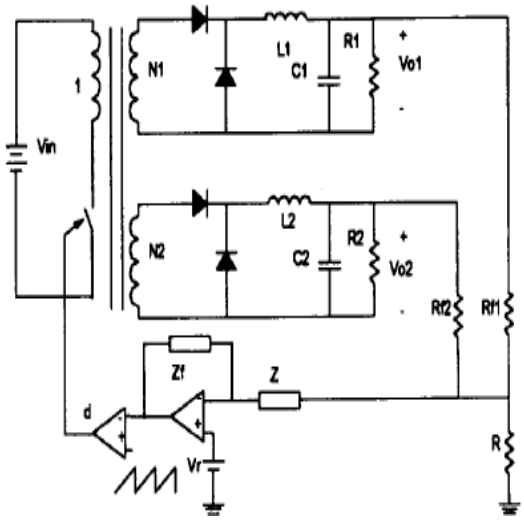

Fig.1 Conventional multi-output DC-DC converter with controller. [20]

Single Inductor Multi-Output Converter:

The size and weight of a traditional multi-output converter are its primary drawbacks. The multi-output converter with single inductor is used to minimize the size and component count. Because the circuit will have a single inductor even if there are n number of outputs.

For various modules in different semiconductor processes, many electronic systems require numerous power sources. Each extra power supply necessitates the purchase of additional parts. These additional components may result in increased area and weight for applications such as mobile phones and PDAs. In recent years, there has been a lot of work made into integrating the power supply into a single chip and reducing the number of extraneous off-chip components. One such technique is the Single Inductor Multi Output (SIMO) converter, which uses a single inductor to create several supply voltages. Because a single inductor is utilized for many outputs, a regulation issue will arise in this sort of converter.

Various additional sorts of converters, such as buck and buck-boost converters, may be created using this type of converter by simply altering the input and output settings. [8]

MODE OF OPERATION:

Single Inductor Multi-Output Converter:

The single input multi-output [8] boost converter's circuit design is illustrated in Fig.2. Along with the load, the single input single output converter will include one inductor and one filter capacitor. There will be just one inductor and ‘n' number of outputs with capacitors and loads in a single inductor multi output converter. [12]

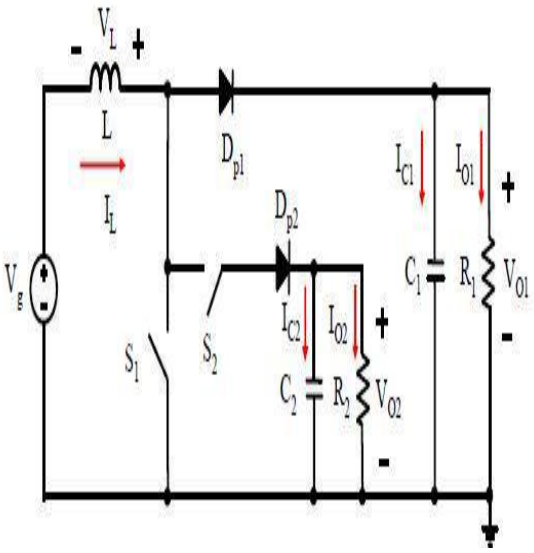

Fig.2 Single Input Multi-Output Boost Converter [10]

Mode 1:

Figure 1 shows the circuit diagram for the first mode of operation. When the switch s1 is turned on, the inductor [18] is charged to the supply voltage value (i.e., Vg). Despite the fact that the switch s2 is turned on, no current flows through Dp2 since the

voltage at V02 is larger than the voltage that appears across the inductor. [12]

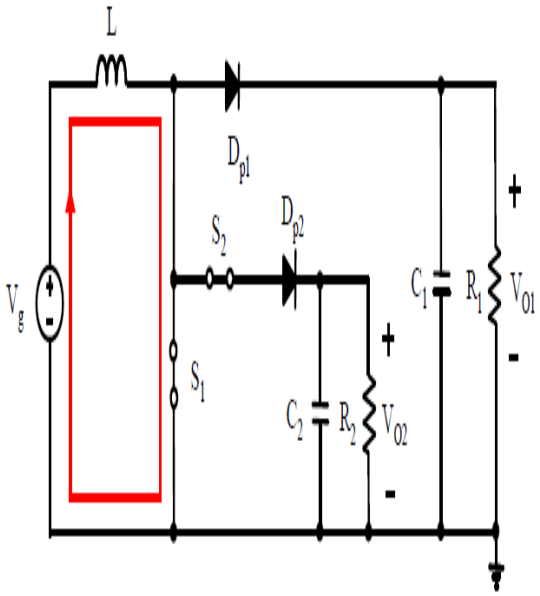

Fig.3 Mode 1 Operation [10]

As a result, the diode has a negative bias. The loads R1 and R2 will be supplied by the capacitors C1 and C2 until the diode is forward biased. D1 is the duty cycle for this setting.

Mode 2:

Figure 4 shows the circuit diagram for the second mode of operation. When the switch S1 is turned off, the switch S2 remains on, causing the diode Dp2 to be forward biased. R2 will show the inductor voltage as well as the supply voltage. During this period, the load R1 will be supplied by the capacitor C1.

The load linked to the second output should be smaller than the load connected to the first. [12] If the first output is connected to a lighter load than the second output, and the switch is not connected in series with the Dp1, the current will follow the least resistance path, bypassing the second load and acting as a single output boost converter.

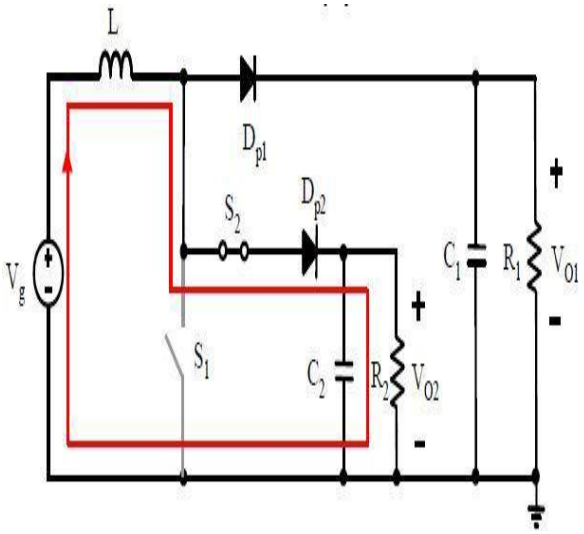

Fig.4 Mode 2 Operation [10]

If the lighter load must be connected to the first output, the switch must be connected in series with the diode Dp1, and the duty cycle for that switch must be the inverse of the duty cycle for switch S2. For this mode, the duty cycle is (D2-D1). The waveforms of different parameters are presented in Fig.6 as stage2.

Mode 3:

The circuit diagram for the third mode of operation is as shown in the Fig.5 The path of the current when the switches S1 and S2 both are OFF, is as shown in Fig.5

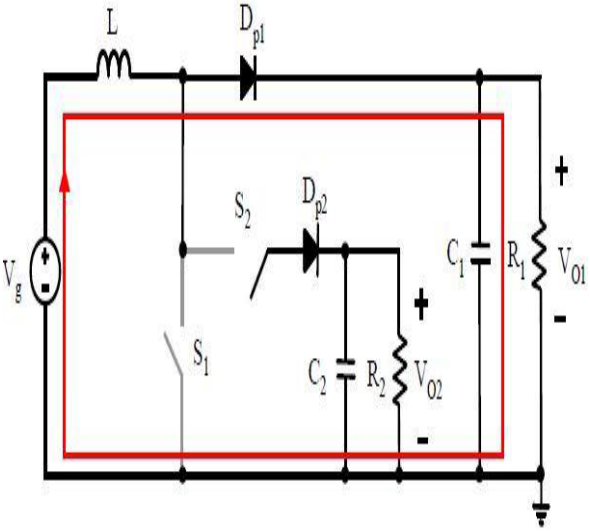

Fig.5 Mode 3 Operation [10]

The capacitor C2 will supply the second output during this mode. The inductor and supply voltages will be seen across the load R1. For this mode, the duty cycle is (1-D2). The waveforms of different parameters are depicted in stage 3 of Figure6.

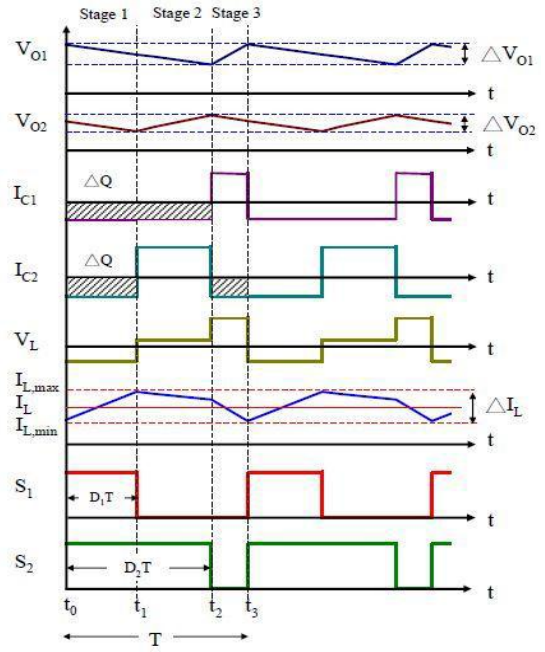

Fig.6 Waveforms of v01, v02, ic1, ic2, vl, il, vgs1 and vgs2 [10]

STATE SPACE MATRICES FOR THE MULTI OUTPUT BOOST CONVERTER:

For mode 1, the matrices A1, B1, C11 and C12 are found out as

$$A_1=\begin{bmatrix}0 & 0 & 0\\ 0 & -1/(C2*R2) & 0\\ 0 & 0 & -1/(C1*R1)\end{bmatrix}$$

$$B_1=\begin{bmatrix}1/L\\ 0\\ 0\end{bmatrix}\ C_{11}=\begin{bmatrix}0 & 1 & 0\end{bmatrix}\ C_{12}=\begin{bmatrix}0 & 0 & 1\end{bmatrix}$$

- (1)

For mode 2, the matrices A2, B2, C21 and C22 are found out as

$$A_2=\begin{bmatrix}0 & -1/L & 0\\ 1/C2 & -1/(C2*R2) & 0\\ 0 & 0 & -1/(C1*R1)\end{bmatrix}$$

$$B_2=\begin{bmatrix}1/L\\ 0\\ 0\end{bmatrix}\ C_{21}=\begin{bmatrix}0 & 1 & 0\end{bmatrix}\ C_{22}=\begin{bmatrix}0 & 0 & 1\end{bmatrix}$$

- (2)

For mode 3, the matrices A3, B3, C31 and C32 are found out as

$$A_3=\begin{bmatrix}0 & 0 & -1/L\\ 0 & -1/(C2*R2) & 0\\ 1/C1 & 0 & -1/(C1*R1)\end{bmatrix}$$

$$B_3=\begin{bmatrix}1/L\\ 0\\ 0\end{bmatrix}\ C_{31}=\begin{bmatrix}0 & 1 & 0\end{bmatrix}\ C_{32}=\begin{bmatrix}0 & 0 & 1\end{bmatrix}$$

-(3)

The matrix A is given by,

$$A=A_1(D_1)+A_2(D_2-D_1)+A_3(1-D_2) \quad -(4)$$

The matrix B is given by,

$$B=B_1(D_1)+B_2(D_2-D_1)+B_3(1-D_2) \quad -(5)$$

The matrix Ci is given by,

$$C=C_{11}(D_1)+C_{21}(D_2-D_1)+C_{31}(1-D_2) \quad -(6)$$

The matrix Cj is given by,

$$C=C_{12}(D_1)+C_{22}(D_2-D_1)+C_{32}(1-D_2) \quad -(7)$$

Expression for Output Voltages:

$$V_{01}=[-\,Ci\,A^{-1}B]*V_g,$$

$$V_{02}=[-\,Cj\,A^{-1}B]*V_g. \quad -(8)$$

PID CONTROLLER FOR THE MULTI-OUTPUT BOOST CONVERTER:

The transfer function of the individual converter with one input and one output is found out and are given below,

Transfer function for v01/vg:

$$\frac{-1.421e{-}014\,s^2+1.482e006\,s+9.333e007}{s^3+98.69\,s^2+9.871e005\,s+4.859e007}$$

- (9)

Transfer function for v02/vg:

$$\frac{-5.684e\text{-}014\ s^2 + 1.489e006\ s + 5.317e007}{s^3 + 98.69\ s^2 + 9.871e005\ s + 4.859e007}$$

- (10)

Using the "PID controller" block in SIMULINK, the values for the PID Controller parameters for the above transfer functions are calculated. The tuning set up for the same is given in Fig 7.

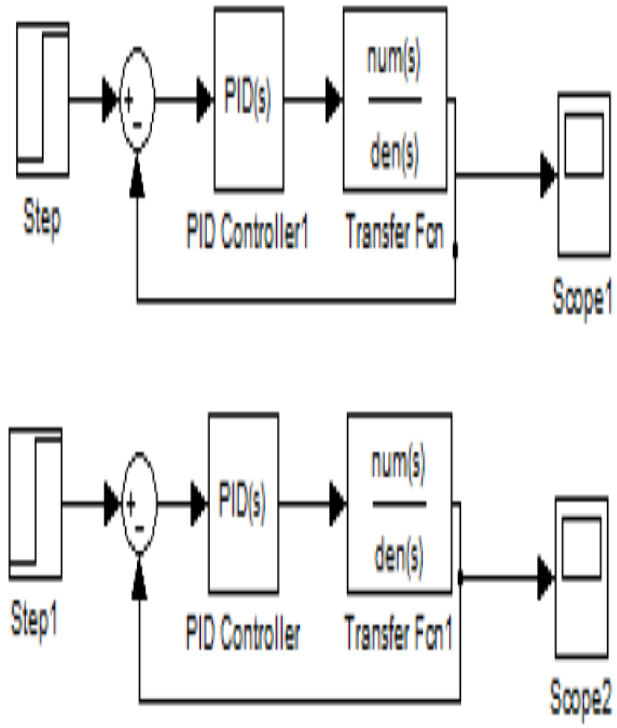

Fig.7. PID Controller Tuning Setup

The values for the PID controller are given below:
For first converter, the PID values are,
Kp = 9.84844937231319
Ki = 971.707106109513
Kd = 0.00881925417544838

For second converter the values are,
Kp = 7.22324544079259
Ki = 604.169911511697
Kd = 0.00737921565880658

SIMULATIN DIAGRAM WITH PID CONTROLLER:

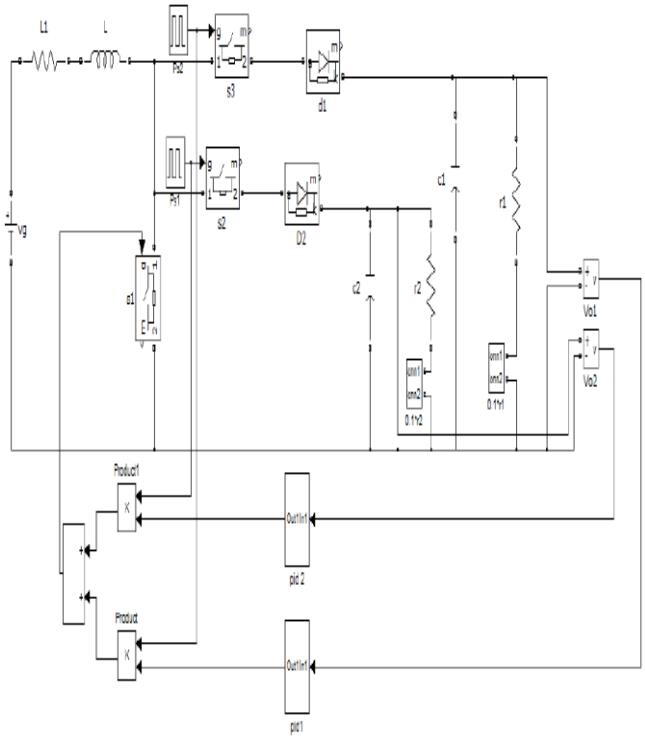

Fig.8. Simulation diagram with controller

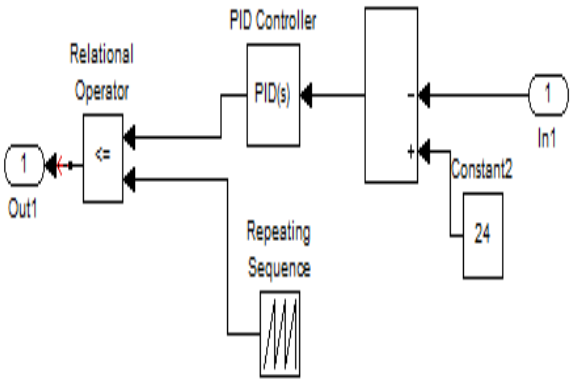

Fig.9. Control pulses from controller 1

The input V01 is compared to the reference and the error is sent to the PID controller, while the control signal is compared to the saw tooth at the same frequency as the converter switching frequency. When the switch S2 is not conducting, the pulses are redirected and sent to the switch S1.

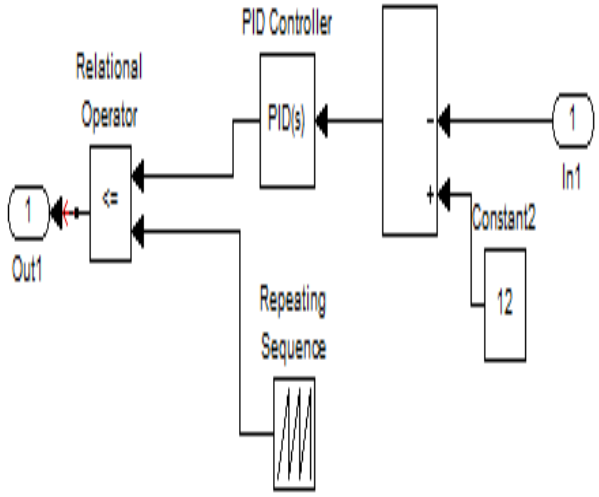

Fig.10. Control pulses from controller 2

The output V02 is sent into In1 and compared to the reference, with the error fed into the PID controller, and the control signal compared to a saw tooth waveform with the same frequency as the converter switching frequency. When the switch S2 is conducting, the pulses are created and sent to the switch S1.

SIMULATION RESULTS:

Output Voltages and Currents:

Figure 11 shows the simulation results with the controller. At certain intervals, a change in load is applied to test the converter's regulation. In both situations, the load R2 is adjusted in 0.2s and the load R1 in 0.3s, with the voltage in both outputs remaining constant. As a result, the cross-regulation problem has been addressed, and the controller is now functioning properly for voltage mode control, but there is a change in current when the loads change.

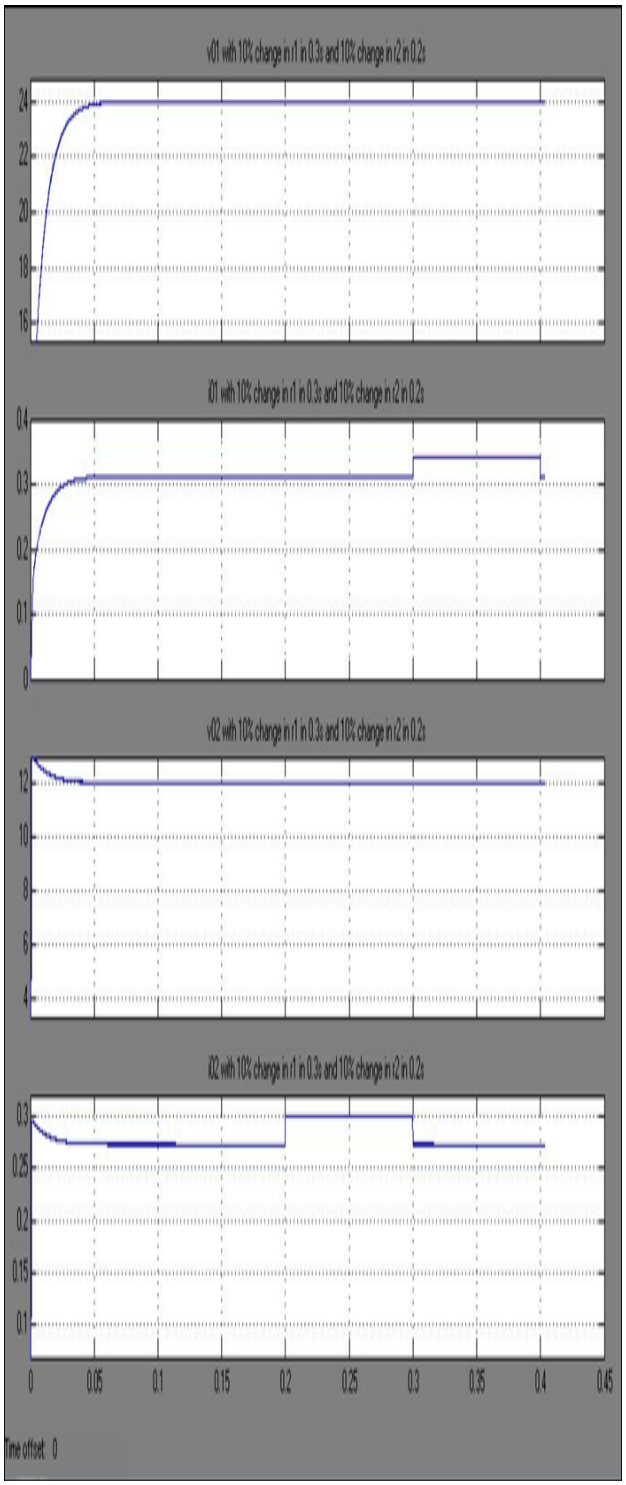

Fig.11. Voltage and current waveforms of closed loop simulation

Inductor Current and Control Pulses:

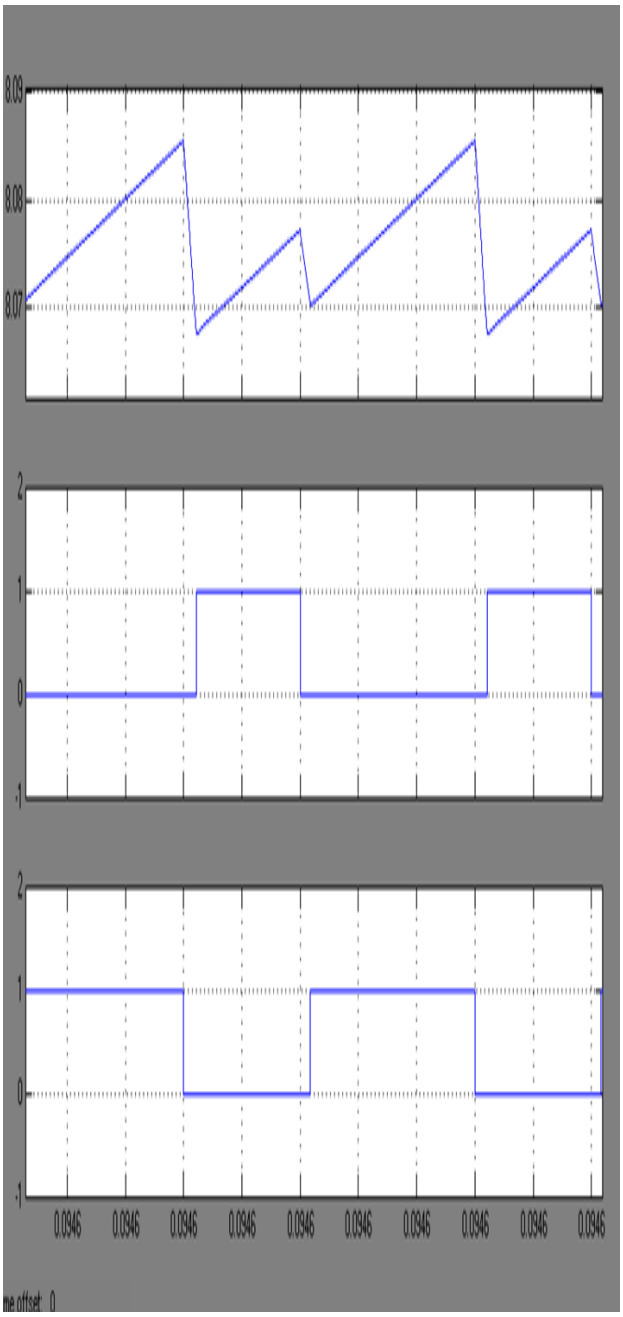

Fig.12. Inductor current and controller pulses

The inductor current and controller pulses are illustrated above; the inductor is charged and discharged twice in one cycle [19].

CONCLUSION:

The results of a closed loop simulation of a single inductor multi output boost converter is contrasted with the predicted results. When compared to an open loop system, the reaction of a closed loop system [8] is smooth. In this article, the tuning controller is a PID controller. Multiple-output control can be achieved to a high degree.

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Automated Energy Conservation Using Quantized Neural Network and Internet of Things

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Abstract-

In developing countries like India, the demand for energy always keeps increasing due to the steady state increase in population of the developing countries. With this, negative economic and environmental impacts also increase. Hence there is a clear need to use the available energy efficiently. While the use of renewable sources of energy is booming in order to minimize the dependency on fossil fuels, managing the already available energy in an efficient and conservative manner is a challenge we need to face head on. This project aims to bring a solution to this problem. Using quantized artificial neural network and IOT in a residential or commercial building, the system will be able to locate areas with constant high energy consumption and using AI and ML, access the CCTV feed of that area and interrupt the supply if no humans are detected in the vicinity.

Keywords—Energy, Internet of things, Conservation, Quantization Network, NodeMCU, Relay.

I. INTRODUCTION

Energy is paramount in every aspect of human activity. The world today seeks to conserve energy not only due to the declining nature of non-renewable resources but also a way to tackle the environmental challenges that energy excesses have brought about especially global warming; its health effects, carbon emissions and footprints, and the costs incurred due to wastage **[1].** We want to live a comfortable, productive, and pleasant life. As a result, even if the temperature outside climbs slightly, we immediately turn on the air conditioner to keep our home cool. This is once again consuming energy. Unfortunately, we are unaware that we have begun to take things for granted and have started to waste energy unnecessarily **[2]**. Most of us forget that while energy is abundant, it is limited, and thus it is critical that we use our energy resources wisely in order to maintain our quality of life.

The energy consumption has become one of the major problems in our industry. Power consumption plays a vital role in energy consumption. Sometimes the user forgets to turn off the lights and fans; the energy gets wasted **[3].** Hence there is a need for power management system to save our electric power. Light, fans and many other electrical devices are controlled by on or off method. Nowadays most of them are controlled by the remote device **[4]**. To control through the remote, we need a system; often we need a fan and light to perform a daily basis so that most of the electric power getting wasted because we were making use of the computer to control the electrical appliances. Therefore, we need to spend the significant amount of power cost **[5].**

Energy conservation" and "Energy efficiency" are often used interchangeably, but there are some differences **[6]**. At the most basic level, energy conservation means using less energy and is usually a behavioral change, like turning our lights off or setting our thermostat lower **[**7**].** Energy efficiency, however, means using energy more efficiently, and is often a technological change. Energy efficiency measures the difference between how much energy is used to provide the same level of comfort, performance or convenience by the same type of product, building or vehicle. A combination of both energy conservation and energy efficiency measures yields an ideal solution **[8].**

One of the primary ways to improve energy conservation in buildings is to use an energy audit **[9].** An energy audit is an inspection and analysis of energy use and flows for energy conservation in a building, processor system to reduce the amount of energy input into the system without negatively affecting the outputs.

Consumers are often poorly informed of the savings of energy efficient products **[10].** A prominent example of this is the energy savings that can be made by replacing incandescent light bulbs with more modern alternatives. When purchasing light bulbs, many consumers opt for cheap incandescent bulbs, failing to take into account their higher energy costs and lower life spans when compared to modern compact fluorescent and LED bulbs **[11].** Although these energy efficient alternatives have a higher upfront cost, their long lifespan and low energy use can save consumers a considerable amount of money **[12].**

Energy monitoring systems are used widely in industrial plants and buildings to observe the energy consumption. The residential sector, unlike the commercial and industrial sectors, is made up of multiple small energy users such as houses, mobile homes, and apartments **[13]**. Research has shown that these residential energy consumers waste almost 41% of the power supplied to their homes. Change of voltage, energy consumption, power factor, and current parameters must be measured for buildings **[14].**Users that know exactly when energy consumption occurs and where it takes place are able to take more inform decisions about how to lower their building energy consumption rates **[15].** Currently, however, millions of users are still largely in the dark about the amount of energy they consume. In 2009 a study conducted by the Department of Energy on Energy consumption loads, found that miscellaneous electrical loads account for 45% of the electricity consumption in residential buildings and 34% in commercial buildings **[16]**.

Studies have suggested that savings of over 35% of the miscellaneous electrical loads total energy use may be possible. In this paper, we propose a system where we can automatically turn on or off the electrical appliances **[17].** These environmental issues are very critical and these

problems are mostly due to the excessive use of energy. The light units make large part of energy consumption all over the world **[18].**

The goal of this project is to find the best, most cost-effective solution for energy conservation, which will be beneficial to developing countries in the process of energy management and utilization in various sectors **[19].**

In this project we use Quantized Artificial Neural Network and IOT in residential or commercial buildings. This system will automatically be able to detect the area with constant high energy consumption [20]. With the help of Machine Learning, Artificial Intelligence, feeds from the CCTV feed of that area and interrupts the supply if no humans are detected in that area.

II. COMPONENT OVERVIEW

A. Non-Invasive Current Sensor

Current sensors, also commonly referred to as current transformers or CTs, are devices that measure the current running through a wire. They are used with both AC and DC current. Current sensors allow us to be able to measure current passively, without interrupting the circuit in any way. They are placed around the conductor whose current we want to measure. Current can be measured directly (mutual induction) or indirectly (Hall Effect). In this project, we have used the Non Invasive Current Sensor ACS712 which is a fully integrated linear current sensor that works on Hall Effect. This sensor is widely used in motor speed control, electrical load detections, Switched Mode Power Supplies, etc. The ACS712 sensor is shown in Fig 1. and the schematic diagram is shown in Fig 2.

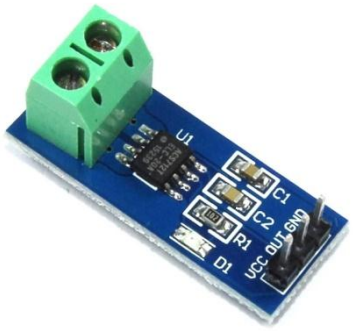

Fig1. ACS712 Current Sensor

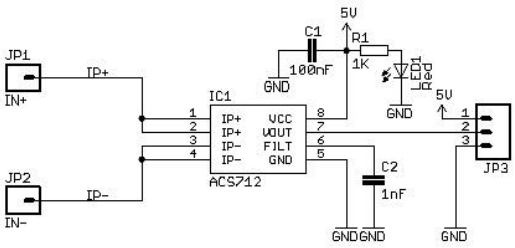

Fig 2. Schematic diagram of ACS712 Current Sensor

B. Voltage sensor

A voltage sensor can determine, monitor, and measure the supply of voltage. The input to the voltage sensor is the voltage itself, and the output can be analog voltage signals, switches, audible signals, analog current levels, frequency, etc. In voltage sensors, the measurement is based on a voltage divider.

We are using a ZMPT101B Voltage Sensor in this project. It is a high-precision voltage Transformer. This module makes it easy to monitor AC mains voltage up to 1000 volts. Holds up to 4kV per breakdown voltage, the ratio of turns is 1: 1.

The ZPMT101B voltage sensor is shown in Fig 3 and the schematic diagram is shown in Fig 4.

Fig 3. ZMPT101B Voltage Sensor

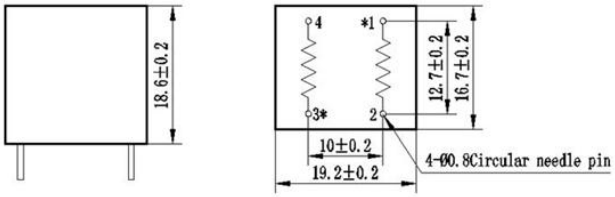

Fig 4. Schematic diagram of ZMPT101B Voltage Sensor

C. Relay Module

A relay is a switch that enables the electromechanical closing or opening of circuits that carry heavy current by utilizing a separate mild current. When the relay is turned on, it connects two ends of a circuit, and when it's turned off, it disconnects them. All the different kinds of electromechanical relays basically work the same way. Their main components include an electromagnet, spring, mechanically movable contact, and switching points. A 4 channel relay module is shown in Fig 5

Fig 5. 4 Channel Relay Module

D. ESP8266

The ESP8266 is a system-on-chip (SoC) microcontroller which provides capabilities for 2.4 GHz Wi-Fi.. It has a 64 KB boot ROM, 32 KB instruction RAM, and 80 KB user data RAM. We can program the ESP 8266 board with suitable software like the Arduino IDE etc. The ESP8266 development board is shown in Fig 6.

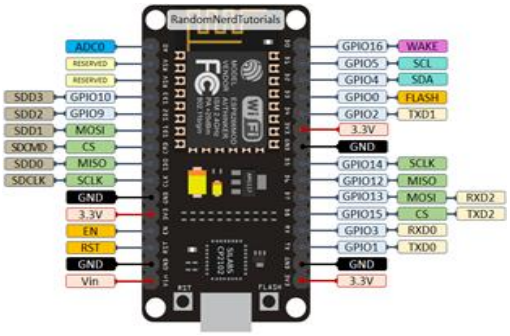

Fig 6. ESP 8266 board

5. ***Capacitor Bank***

Capacitor Bank is a combination of numerous capacitors of similar rating that are joined in parallel or series with one another to collect electrical energy. The resulting bank is then used to counteract or correct a power factor lag or phase shift in an AC power supply. They can also be utilized in a DC power supply to step up the total amount of stored energy or to step up the ripple current capacity of the power supply.

Capacitor banks are generally used for

●Power Factor Correction

●Reactive Power Compensation.

III. WORKING OVERVIEW

A. Energy Consumption Measuring Unit

In the present day we need to go to the meter room and take the readings and then get the energy that is consumed. Thus, monitoring and keeping a track of the records of the meter is no doubt a tedious task. Thanks to the most developing technology the Internet of Things, this helps to do all these tasks by automation. The Internet of things saves money, time and manpower, by collecting data from a circuit, and displays it in a cloud, with the help of computational intelligence. With the development of big clouds, it is possible for anyone to control a device from any part of the globe. The Internet of things has really made life easier.

Development of a smart energy meter has been a lot more active in the recent trends and technologies. This whole setup includes a bidirectional energy meter with a correction of power factor. To make this energy meter smart, we make use of basic device for IoT, the ESP8266.

We will be interfacing the sensors and the capacitor banks with the ESP8266 Wi-Fi module. This NodeMCU will read the analog output of the sensors, convert and calculate the power. This power is monitored over a period of time, hence the product of power and time gives the energy consumed and will send the data to the cloud.

Once the circuit is rigged up, the action is as follows.

●The voltage signal obtained is converted into the digital signal using the built-in ADC of the NodeMCU.

●Similarly, for the current sensor, the signal from the device is converted into a voltage signal, as the current sensor happens to be a current transformer. That analog input is converted into digital by the built-in ADC of the NodeMCU.

●A zero crossing detector is added to the NodeMCU. These 2 digitized signals i.e. voltage and currents are sent to it. The MCU calculates the time distinction between the zero crossings of those 2 signals.

●This point distinction is indirectly proportional to the system power factor.

●Thus this distinction point time activates the relay drives that switch the shunt capacitors across the load.

●Thus, we now have the power and the corrected power factor across the NodeMCU. This is calculated over a given time and therefore we obtain energy as the output from the NodeMCU.

●We use a LCD screen to display the energy consumed over a period of time continuously.

●Now our next data is to send these readings to the cloud in order to automate this energy consumption.

●With the help of an IoT cloud, automation is possible.

This entire process is divided into 2 parts,
1. Agreeing to accept the cloud and interfacing esp8266 Wi-Fi module with Wi-Fi
2. Sending meter readings to the cloud.

B. AI based energy conservation Unit

The local server made by the NodeMCU is accessed by the Single Board Computer (SBC) of choice – Raspberry Pi 4B. Raspberry Pi 4B is a very popular choice amongst the SBCs because of its price to performance ratio.

All the data in the local server is transferred into a .CSV (Comma Separated Value – RFC 1400) file by running a Python script. The scripts sorts the data into power consumed, against the room with the IP address of the camera in the room. Once the dataset is created, the data is again sorted to make a list of top power consumers.

In standard practice, the CCTV cameras in the buildings will be connected to a single NVR (Network Video Recorder). The NVR with its internal storage medium stores the data for a certain number of days. Since the scope of this project is real time, accessing the already stored footage wouldn't serve the purpose. It is for this reason the energy consumption measuring aspect of this project is vital.

The extra complexity and economic burden brought about by this is easily negated because of its key functionality of pointing which footage to access. In our prototype testing environment, the two IP cameras were plugged into a network switch. The Pi4B was also plugged into the network switch giving it direct access to the footage. This was done because NVRs which allow third party access to the footage are very expensive.

AI and QNN

Once the algorithm chooses the IP Camera, the footage is requested for running the Artificial Intelligence script. The script is trained with Quantized Neural Network models to reduce its demand on system resources and run as efficiently as

possible. Neural networks are very resource intensive algorithms. They not only incur significant computational costs, they also consume a lot of memory in addition.

Even though the commercially available computational resources increase day by day, optimizing the training and inference of deep neural networks is extremely important.If we run our models in the cloud, we want to minimize the infrastructure costs and the carbon footprint. When we are running our models on the edge, network optimization becomes even more significant. If we have to run our models on smartphones or embedded devices, hardware limitations are immediately apparent.

Since more and more models move from the servers to the edge, reducing size and computational complexity is essential. One particular and fascinating technique is quantization, which replaces floating points with integers inside the network. The fundamental idea behind quantization is that if we convert the weights and inputs into integer types, we consume less memory and on certain hardware, the calculations are faster.We can't just simply store numbers in the memory, only ones and zeros. So, to properly keep numbers and use them for computation, we must encode them. This is where we see that the result is not an int8. Since multiplying two 8-bit integers is a 16-bit integer, we can de-quantize the result with the transformation.

Quantization in practice:

There are two principal ways to do quantization in practice.

1. Post-training:
Train the model using float32 weights and inputs, then quantize the weights. Its main advantage is that it is simple to apply. Downside is, it can result in accuracy loss.

2. Quantization-aware training:
Quantize the weights during training. Here, even the gradients are calculated for the quantized weights. When applying int8 quantization, this has the best result, but it is more involved than the other option.
In practice, the performance strongly depends on the hardware. A network quantized to int8 will perform much better on a processor specialized to integer calculations. The Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC used in The Raspberry Pi 4B is such a processor.

IV. RESULTS

The first independent system i.e. Automated Energy Conservation system using IoT was verified using a prototyping board and was successfully transferred onto a Printed Circuit Board (PCB), that was completely designed by ourselves. The smart energy meter was successfully tested and verified, which will be further made into a prototype. Fig 7, Fig 8, and Fig 9 shows the work done until now.

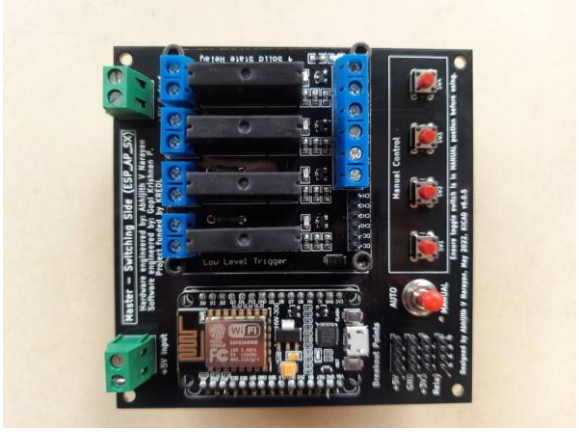

Fig 7. Switching Side PCB

Fig 8. Client Side PCB

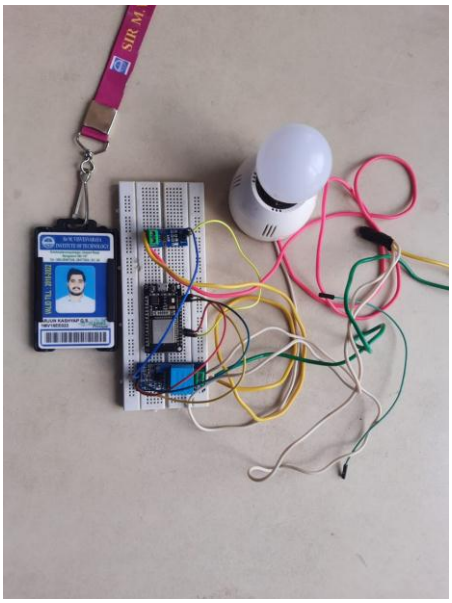

Fig 9. Energy Meter in Breadboard

V. CONCLUSION

Energy conservation should start from home. In a technology driven society, it's a shame if we do not try to employ advanced techniques for the conservation of energy. Efficient use of the available electric power is as important as the generation of electricity using renewable sources of energy. As future engineers and especially being from the electrical branch, we should be on the frontline dealing with this problem. An AI based system using advanced machine learning techniques like ours reduces the need for human intervention thereby decreasing the wastage of electricity by a considerable amount. This project also opens up the possibility of enabling much more granular control over how the energy is being used. Few of the very practical expansions to this system can be, for example, using a temperature sensor and automatically turning off the air conditioning system when a set temperature is reached. Another example can be employing a digital ambient light sensor like the BH1750 and placing them in critical locations and turning off the lights in the room when there is enough sunlight to illuminate the whole room. Similarly, humidifiers, heaters, air purifiers can be controlled using appropriate sensors. We are looking forward to employing this system in our own college to showcase and encourage the idea and the inevitable need for energy conservation.

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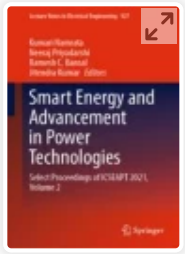

Smart Energy and Advancement in Power Technologies pp 331–341

Identification and Validation of Prominent Features for Predicting Mortality in Heart Patients with Left Ventricular Dysfunction Using Machine Learning

R. Subha ✉, Rekha Radhakrishnan, P. Sumalatha & B. R. Nayana

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Abstract

Machine Learning (ML) is a strong tool for medical prognosis, and it has the potential to give this branch of medicine a huge boost by allowing doctors to make accurate predictions about a patient's future

health using various forms of medical data. ML algorithms have proven to be reliable and effective in decision making with good classification accuracy. They can model nonlinear relationships, which are frequent in medical data, and apply them to predictive tasks such as forecasting a future event. In this paper, an attempt has been made to predict the mortality of heart patients with left ventricular dysfunction. Feature selection methods have been used to rank the input features in the dataset and identify four prominent features. Different combinations of these prominent features have been applied to five ML algorithms namely, Decision Tree, Gradient Boost, Random Forest, Support Vector Machine and k Nearest Neighbors to find the best performing combinations using F1-Score and AUC ROC. Considering additional performance parameters, further analysis is carried out to identify the best feature combination and the most effective ML algorithm for predicting mortality and the results are provided for the same.

Keywords

Cardiovascular disorder **Classification**

Decision trees **Machine learning**

Medical prognosis

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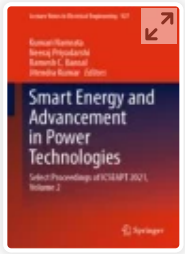

Smart Energy and Advancement in Power Technologies pp 421–435

Simulation of Modular Fly-Back Current-Fed Push–Pull DC-DC Converter for High Voltage Low Current Applications

D. Beula ✉, M. S. Indira & N. Balaji

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Abstract

A DC-DC converter has been proposed using Fly-back Current-fed Push–Pull topology with multiple secondary windings for high voltage low current applications. The converter is modular at the output which gives the flexibility to cater to specific output voltage levels. The High Voltage Transformer (HVT)

with multiple secondary windings and rectifier with voltage doublers result in a smaller turns ratio for higher voltage conversion. The rectifier components on the high voltage side are subjected to lower voltages that reduce the voltage stress on the rectifier component, compared to HVT with the single secondary winding. The converter is operated in complete energy transfer mode (Discontinuous conduction mode) for effective utilization of stored energy in the fly-back inductor as it is fed-back to the source. The discontinuous current-fed scheme provides an instantaneous current limiting facility for short circuits at the load side. Zero current turn-on of switches due to the discontinuous mode of operation reduces switching losses and the non-overlapping mode of power switches minimizes conduction loss. The operation of the converter is analyzed under steady-state conditions. A design procedure is established and the converter is designed for a typical load of 5 kV, 500 W at a switching frequency of 20 kHz. The performance of the converter is verified by simulation.

Keywords

Current-fed **DC-DC converter** **Modular**

Energy feedback **High voltage application**

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