TEERTHANKER MAHAVEER UNIVERSITY, MORADABAD
FACULTY OF ENGINEERING & COMPUTING SCIENCES

Volume 7, Issue-01 July - Dec 2021 www.tmu.ac.in

ISSN:2231-5160

S & T Review

An International Journal of Science and Technology

Editor in Chief | Prof. R.K. Dwivedi

Published by :Faculty Of Engineering & Computing Sciences, Moradabad-244001

BI- ANNUAL REFEREED JOURNAL OF FACULTY OF ENGINEERING & COMPUTING SCIENCES, TMU, MORADABAD

S & T Review

An International Journal of Science & Technology

ISSN: 2231-5160 **Vol. 7, No.1, JUL – DEC' 2021**

Teerthanker Mahaveer University

Teerthanker Mahaveer University has been established by an 'Act' (No. 30) of 2008 of the Government of Uttar Pradesh and is approved by the University Grants Commission (UGC) vide letter No. F. 9-31/2008(CPP-1) dated October, 2008. The University is located on National Highway-24, barely 144 Km from New Delhi.

The University stands committed to the ideals of Lord Mahaveer – Right Philosophy, Right Knowledge, and Right Conduct – in all the spheres of activity and aspire to be recognized as the ultimate destination for world class education.

The multi-disciplinary University offers career oriented courses at all levels, i.e., UG, PG and Doctoral degrees across diverse streams, namely, Medical, Dental, Pharmacy, Nursing, Paramedical Sciences, Physiotherapy, Hospital Administration, Education, Physical Education, Engineering, Architecture, Polytechnic, Management, Law, Journalism, Fine Arts, Jain Studies, and Agriculture Science to meet rising aspirations of the youth.

Faculty of Engineering & Computing Sciences

The College of Engineering has emerged as a hub for academic excellence in engineering training. The college contributes to quality education in all major disciplines of engineering and technical education and helps meet the needs of industry for trained technical manpower with practical experience and sound theoretical knowledge.

The college was established by the university with the aim of providing relevant, essential, upgraded education to the young aspirants in the field of computer science and engineering, including computer applications. In recent times and the years to come there will be increasing demand of skilled manpower in the domain of Computer Science and Engineering because of the 'Digital India' mission projected around the globe by Government of India.

S & T Review is a **peer-reviewed,** and multidisciplinary **engineering journal** that publishes original research, case studies, & review articles of all major branches of Engineering, Science and Technology. The Journal does not charge for publishing any manuscript. The papers contained in the journal carry the opinion and view of the contributors and not necessarily of the editorial Board. The editorial Board as such shall not be responsible for the authenticity and legality concerns regarding the submission made in this journal. The entire responsibility shall lie with the author of the papers or case studies.

CHIEF PATRON

Shri Suresh Jain

Chancellor,

TMU, Moradabad

I am extremely glad and feeling inner happiness on the arrival of vol-7 and issue-1 of S &T Review, an International Journal of Science and Technology and for this Faculty of Engineering and Computing Sciences deserves great applause. Since the world has been growing very rapidly and no doubt creative researches have changed the entire technology in the domain of Engineering, Medical Sciences, Computing Sciences and variety of industrial products. Certainly, research in any discipline is not one day taskas consistence and continuous efforts are required to put in for the sake of making it constructive for the bettermentof entire mankind. Bygone are the days when things used to seem impossible. The contemporary time witnesses the era wherein technology is creating wonders.In a world heralded by technology, research in academic institutes lays the foundation of a nation's growth and well-being.The University, since inception,is a research-driven university which, on one hand, strives to educate the students and on the other, to discover new knowledge frontiers through research.Heart pleasing this is to notice that Faculty of Engineering & Computing Sciences remains in sync with expanding frontiers of academics and industrial practices through various on-going research projects and collaborations with many national and international organizations. The college works diligently to realize its mission of providing the best learning, teaching and research opportunities to students and academicians alike, it continues to supply students with the basics of modern knowledge and high values. I would like to put into records sincerest appreciation and heartiest felicitations to Prof (Dr) R. K. Dwivedi, Director and Principal, FoECS, and Editor- in- Chief S&T Review, Associate Editors , Advisory Committee for bringing out the journal successfully up to the extreme satisfaction of research students, researchers and scientists on regular interval.

I believe thatthe college will continue tomark revolution through quality research work to bring laurels to TeerthankerMahaveer University in India and abroad.

Institution is doing surprisingly great in all directions. Wishing a bright future to all stakeholders!

CHIEF PATRON

Shri Manish Jain
Group Vice Chairman,
TMU, Moradabad

Stellar accomplishments broaden the frontiers of knowledge and scholarship with each passing day. In this eon of Globalization of education, the apparentemphasis is on the quality of education.Since there is nothing which stands as a single yardstick of quality, a good educational institution, therefore, strives unceasingly for sustenance and enhancement of quality in every field of its activity be it academics, research or extra-curricular.

Education defines the path of progress and prosperity for which Faculty of Engineering & Computing Sciences is very much committed as it is evident from the various activities carried out throughout the year under the vigilant supervision of Professor R.K. Dwivedi, Director & Principal, FoECS. Great Satisfaction & immense pleasure comes to the heart on witnessing that FoECS is publishing vol-7, issue-1 of S&T Review in the Month of December 2021as one more step in the direction of boosting the research environment in the college. The research activities at FoECS lead to an amazing enhancement of the experience of the students since the research training provided to the students has been creating the next generation of scholars well-prepared to advance knowledge and emerging trends of technology. The college holds firm conviction that extension of research opportunities to an ever-increasing group of undergraduate students adds a dimension of experience to the undergraduate education that, for sure, cannot be duplicated in the classroom.

S&T Review, an International Journal of Science and Technology stands as a witness to the monumental efforts taken by the college under the worthy guidance of Prof. R. K. Dwivedi, Director & Principal FoECS to make the college as centre of excellence in education and research.

I extend my greetings and bests wishes to the team FoECS and wish their endeavours for future prospects.

PATRON

Prof.Raghuvir Singh

Vice Chancellor,

TMU, Moradabad

The contemporary time witnesses an era which is truly defined as a fast changing world, a changing society which has been progressing at a galloping speed and there is no exaggeration in saying that impact of science, scientific research, technological development and globalization on our daily life is vibrant and inescapable. Consequently, the requirement to be geared up for tomorrow is surely greater than ever since the advent of life on earth. With this mind, the university continues to march progressively towards its aim to provide responsible citizens who will record their valuable contribution in nation building. Known to all, the progress of nation depends upon the quality of teaching-learning process along with research activities. Keeping the same in mind,together with providing responsible citizens, effectiveness and efficiency of aforesaid is the goal of the university. FoECS is simply unstoppable in its progress as it has been actively involved in countless activities that have brought to light the hidden talents of the college students and staff. The highly qualified and dedicated members of the college, since inception, have always been standing shoulder to shoulder with the management and have been carrying out their duties with a level of commitment.

University education system, particularly technical education, requires a platform to encourage budding researchers for publishing their research output in the form of journal articles.Heart receives enormous pleasure to notice thepublication of current issue of S & T Review, an International Journal of Science, and Technology which is serving as a platform for publishing the research works covering all branches of Engineering and allied fields.These scholarly publications will be a medium for academic and scientific discussions and enrichment of research areas which willfinally lead to the overall development of the community and society at large.

Congratulations to Prof. R.K. Dwivedi, Director andPrincipal, FoECS, Editor-in- Chief, Associate Editors, Section Editors and Advisory committee to motivate a positive environment of research in the college.

Editor in Chief

Prof. (Dr.) R. K. Dwivedi

Principal & Director, FOE & CS,

TMU, Moradabad

Faculty of Engineering & Computing Sciences e is well known for the way it is moving ahead on the road of academic excellence in conjunction with dedicated modus operandi towards dissemination of knowledge in the academic world. The College strongly advocates the role of research in education,hence is committed to ripen an inclination on the way to research in both faculty and students. In this quest, the College has taken the initiative to unveil yet anotherissue of the journal named S &T Review, an International Journal of Science and Technology to emboldenresearchers and academicians to pursue research.

My heart brims with great joy and happiness on noticing the efforts the team putting in for the publication of S&T Review.With an aim to uphold high academic standards in line with academic ethics and academic integrity, a rigorous process of blind review of research papers is embraced accompanied by screening of plagiarism of each manuscript received by team S&T Review for publication. The research work published in the journal, beyond the shadow of doubt, is original which are neither in print nor presented at any other public forum.

A deep sense of satisfaction surge through my heart in acclaiming that FoECS has been progressing by leaps and bounds and has grown in stature and strength as it has emerged as one of the finest educational institutes dedicated to the pursuit of knowledge and experience. I believe that the current issue of Volume 7, alike preceding issues, will add luster to college's prestige.

In the words of great visionary Hon'ble former president Dr APJ Abdul Kalam:

"Learning gives creativity, Creativity leads to thinking,
Thinking leads to knowledge, Knowledge makes you great."

May the quality education FoECS has been imparting to the students enlighten their minds and ignite the spark of aiming high in their hearts

S & T Review

Volume -7 Issue-1, December 2021

Utilization of Solar Power for Wireless Charging Power Bank

Prakhar Jain, Paras Jain
Department of Electrical Engineering
Teerthanker Mahaveer UniversityMoradabad, India
j.prakhar410@gmail.com

Abstract

The objective of this work is to design the solar powered wireless charging power bank. Power bank has provided with the solar panel which uses the ultimate source of energy (sunlight) solar energy to convert it to the electrical energy and transfers the energy to the batteries to store and batteries are connectedto the charging circuit to charge mobile wirelessly and through USB port as well alternately it also has capacity of 10000mAh to charge your phone. This work describes how mobile phones can be charged wirelessly through solar energy with the help of magnetic strips.

1. Introduction

Solar energy and wireless charging are emerging technology nowdays. We all are moving towards the advanced technologies and wireless technology is one of them. Wireless charging is also known as wireless power transfer, power is transferred cordlessly. Wireless charging also reduces the wear and tear of the hardware ports. It is also very convenient to the user. In this work we have attached magnetic strips to the power bank and provided an attachment with the it which will place at the back of smart phone and then we can place our smart phone on the power bank for charging the device. We have provided the capacity of 10000mAh to the power bank and it can be powered by solar energy.

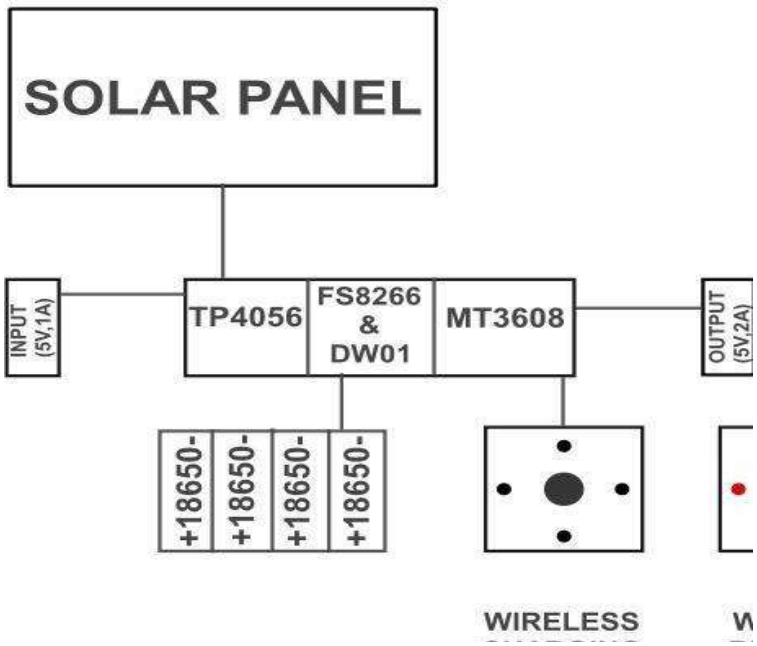


Figure 1 : Generalized Diagram of Work

2. Problem statement

The major factor that drove us to this work is that it is one of the methods of charging which uses renewable source of energy where we can overcome the exhaustible usage of power and charge. It reduces the environmental pollution and user friendly. During disasters and power outages, it can be used with ease. Even in the remote areas having scarcity of electricity, such models can be used. To overcome the problem of cord charging we worked for the wireless module to provide wireless charging to the device.

3. Proposed Methodology

Proposed system as shown in the fig 1 consist of a solar panel which acts as DC power supply and is used to charge the batteries and this process is done by battery charging unit TP4056, this module also protects the battery from over charging and over-discharging. The direct current produced by the batteries is boosted by the dc-dc booster ICB628 SOT23. Regulation of voltage is maintained by MT3608, it maintains constant voltage level for the smooth functioning of the model. And wireless charging is done by the phenomenon of mutual inductance. The model is provided with the magnetic stripswhich are made in contact with the device to charge.

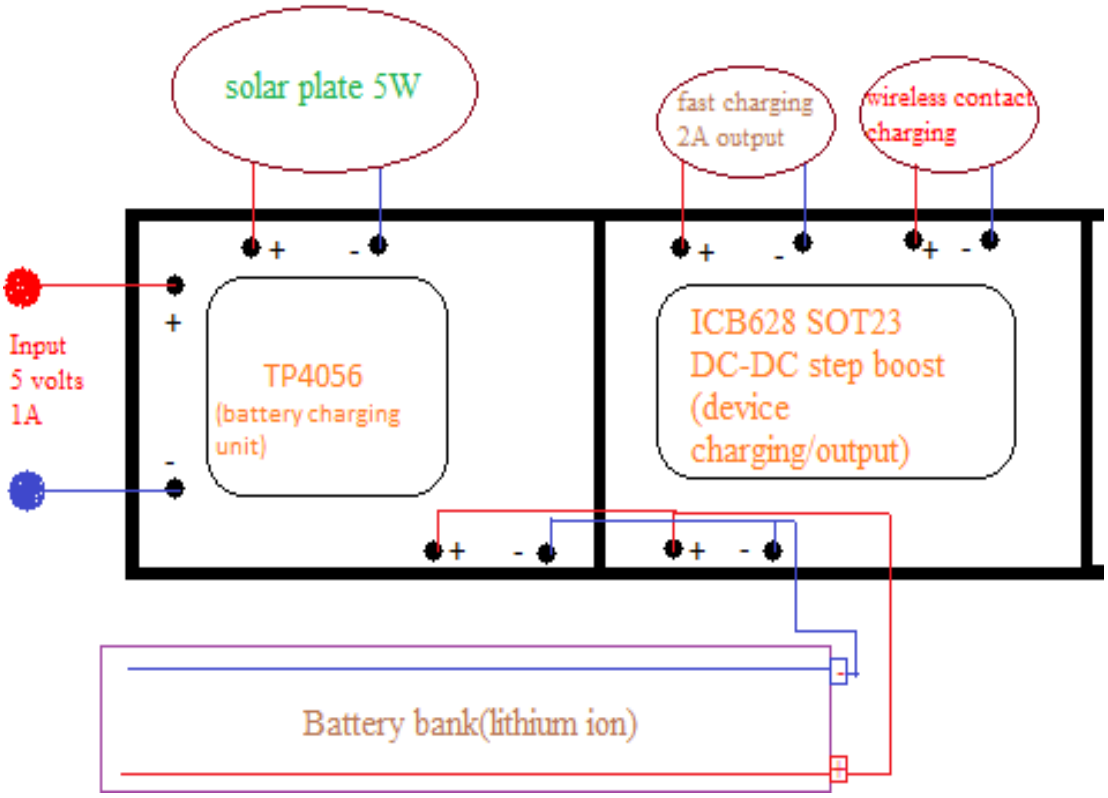


Figure 2 : Block Diagram

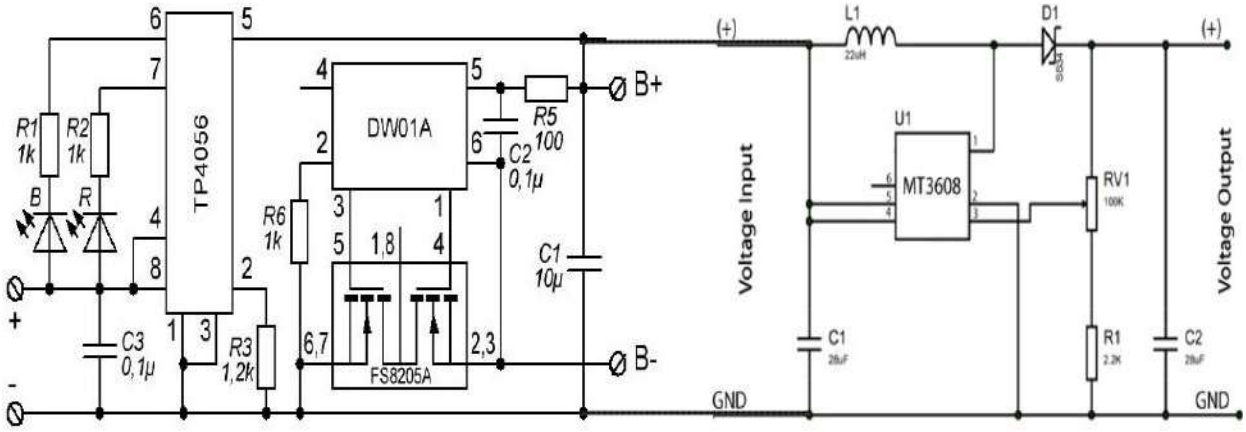


Figure 3 : Circuitry of the system

4. Engineering solution

i. It is compact and lightweight to conserve resources.

ii. Can be easily recycle at the end of life.

iii. Parts reuse/ recyclability, dismantling.

iv. Minimizes the use of interconnecting wires.

5. Result and Discussion

In Fig 4 we can see a 5- volt solar panel and the setup was done to test the solar panel, the current drawn from the panel is displayed on the display of multimeter i.e., 100 mA and it can sufficiently charge our battery bank , it is fulfilling our need. Use of this 5-volt panel make the design of the power bank more compact and product made is handy.

Figure 4: Voltage output of power bank

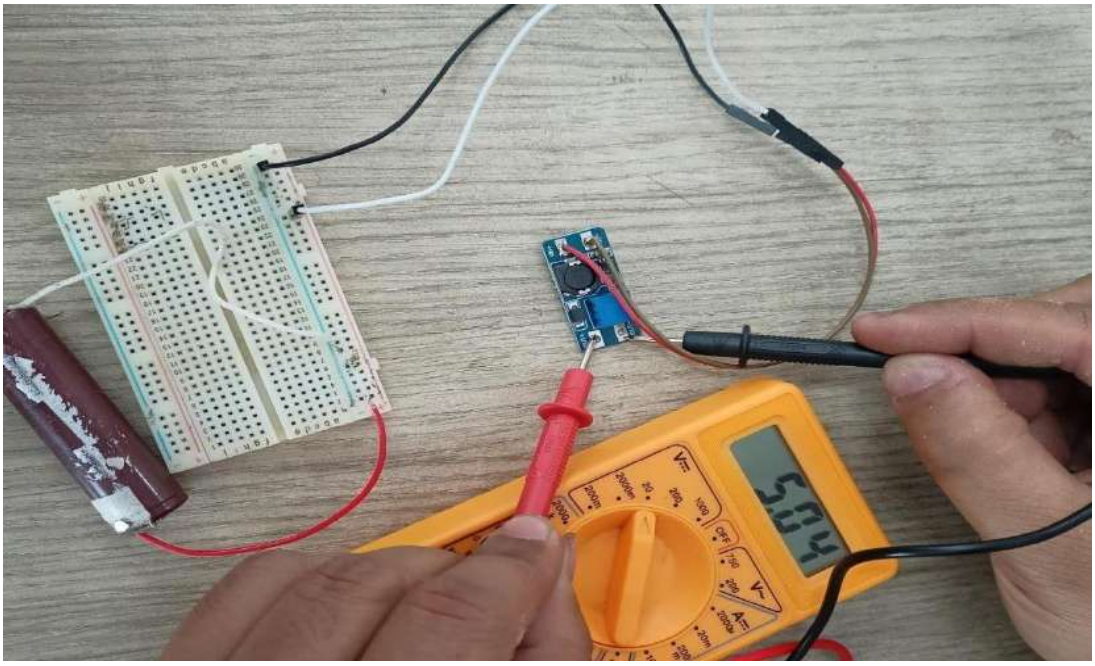


Fig5: Testing of moduleMT3608

In fig 5 testing of the module MT3608 is shown. MT3608 is a constant frequency, current mode step-up converter intended for small, low power applications. It helps in charging of a mobile phone.

6. Conclusion

This work successfully demonstrates the building of wireless charging power bank with the use of solar energy. The wireless technology gradually eliminates the use of cord and user friendly. This technology also reduces the wear and tear of charging ports. The use of solar energy for powering the power bank make it environment friendly and good for the places where there is scarcity of electricity.

References

[1] Chih-HaoHou Chun-Ti Yen Tsung- Hsi Wu Chin-Sien Moo, "A Battery Power Bank of Serial Battery Power Modules with Buck-Boost Converters", The 2014 International Power Electronics Conference, pp. 211-216, 2014.

[2] Ke Liu, John Makaran, "Design of a solar powered battery charger", Electrical Power & Energy Conference (EPEC), 2009IEEE, 2009, pp. 1-5.

[3] Sangyoung Park, Bumkyu Koh, Yanzhi Wang; Jaemin Kim, Younghyun Kim, Massoud Pedram Naehyuck Chang, "Maximum power transfer tracking in a solar USB charger for smartphones", Low Power Electronics and Design (ISLPED), 2013 IEEE International Symposium, pp. 88-93.

[4] Kevin Otto & Kristin Wood, Product Design –Techniques in Reverse Engineering and New Product Development, 4th ed. Noida (U.P): Pearson Education, 2014, pp. 51-409.

[5] K.Jaiganesh , K.Duraiswamy , "Dump Power Control Techniques for standalone Hybrid Wind / Solar Power Generation Control", 2012 - International Conference on Emerging Trends in Science, Engineering and Technology, pp. 422-428.

Determination of Hardness in Ground Water Samples of Moradabad by EDTA Tritimetric Method

Asim Ahmad
Department of Chemistry,
Faculty of Engineering, Teerthanker Mahaveer University
Moradabad

Abstract
The water which contains high concentration of calcium, magnesium chlorides, sulfates and bicarbonates is hard water. Water is the essence of life. But water with high degree of hardness is of no use for domestic and industrial applications. !20samples of ground water have been collected from district Moradabad and two different villages. The hardness of water is determined by EDTA titrimetric method. Out of all the samples tested 39 (32.5%) samples were moderately hard, 76 (63.33%) samples were hard water and 5(4.16%) samples were of very hard water. Very hard water is dangerous to health. The present Study did not reveal any soft water. There is a false notion that hard water is harmful to health, it's not hard water, it is very hard water (> 180ppm) . It has been noticed that minerals may be beneficial for good health to some extent. So, public should be educated about degrees of hardness and its effects.
Keywords: Titrimetric method, Ground water, Hardness.

1. Introduction

Hardness of water is a physico chemical property of water. The concentration of calcium and magnesium ions is determined in water samples. Sometime presence of aluminum, Zinc , Iron , Strontium , also contribute to hardness of water ,however they are generally present in very low concentrations(NRC, 1974). These ions reach the water supply by leaching from minerals of rocks and soil.The calcium is obtained from lime stone (calcium carbonate) and chalk (calcium sulfate). The magnesium is obtained from dolomite which also give calcium ions (Gumashta et al.,2012). Water hardness is the soap consuming capacity of hard water.When hard water is rubbed with hard water. It produces sticky substance as calcium /magnesium stearate or palmitate. Initially the presence of polyvalent cations like Ca, Mg, Sr, Ba, Fe, Al, Mn etc were considered as hardness producing cations but later on hardness was defined as the sum of the calcium and magnesium concentrations, determined by EDTA titrimetric method, and expressed in ppm / mg/l (Standard Methods, 1998). The presence of anions classify the types of hardness eg temporary hardness and permanent hardness. The temporary hardness can be removed by simply boiling the the water while permanent hardness cannot be removed by boiling the water. The temporary hardness is also known as carbonate hardness while non carbonate hardness is known as permanent hardness. The total hardness means both temporary hardness and permanent hardness. Based on the types of calcium and magnesium salts in water is categorized as soft or hard and very hard (Sengupta, 2013). From the technical point of view, multiple different scales Of water hardness have been suggested (eg. Very soft- soft-medium hard –very hard). It is expected that both extreme degrees i.e very soft and very hard are considered as undesirable concordantly from the technical and health points of view, but the optimum Ca and Mg water levels are not easy to determine since the health requirements may not coincide with the technical ones (Kosisek, 2003). The awareness about the hardness of water evidenced in late 1950's. The relationship between water hardness and the incidence of vascular disease was first described by a Japanese chemist Kobayashi (Kobayashi, 1957) who showed, based on epidemiological analysis, higher mortality rate from cerebrovascular diseases (Stroke)in the areas of Japanese rivers with more

alkaline (i.e harder) water used for drinking purposes. The WHO says that "there does not appear to be any convincing evidence that water hardness causes adverse health effects in humans " (WHO,2003).In fact , the United State National Research Council has found that hard water can actually serve as a dietary supplement for calcium and Magnesium (NRC,1974).It has been found that generally hard water is not harmful to one's health. But can pose serious problems in industrial applications. The hard water produces scales, sludges, corrosion, priming, foaming and caustic embrittlement including cooling towers and other equipment's that handles hard water. In domestic settings, hard water is often indicated by a lack of suds formation when soap is agitated in water, and by the formation of lime scale in kettles and water heaters. The hard water is softened by various methods for the proper use in domestic and industrial usage. Keeping in view of all adverse effect of hard water the present study was carried out to estimate the amount of hardness. In the ground water of Moradabad and nearby villages of Sambhal and Amroha.

2. Materials and Methods

One hundred and twenty samples (120) ground water samples were collected from district Moradabad Uttar Pradesh and two adjacent villages. All the water samples were collected aseptically in a sterilized screw capped glass bottles and brought to the laboratory. The hardness of all water samples was tested by using EDTA titrimetric method by taking 50 ml of water sample into a conical flask along with 100ml of ammonia buffer solution and 100-200mg of Eriochrome Black –T indicator followed by titration with EDTA solution present in burette. End point is noted down by changing of the water solution color from wine to blue and expressed as $CaCO_3$equivalent in mg/l (Standard Methods, 1998). amount of hardness in water was calculated by using the formula.
Hardness as mg/l $CaCO_3$ =ml of EDTA solution x1000/ volume of water sample taken.

Table 1: Hard and soft water

Classification	Hardness in mg/l	Hardness in ppm
Soft	0-60	less than 60
Moderately hard	61-120	60-120
Hard	121-180	120-180
Very hard	≥181	≥180

Table 2: showing the results for hardness of different ground water samples

S. No sample	Place of sample	No of samples	Showing degree of hardness	% of
1	Moradabad	40	S-0 MH-17 H-21 VH-02	S-0 MH-42.5 H-52.5 VH-5
2	Village sambhal	40		S-0

S-0				
			MH-12	
MH—30				
			H-27	
H-67.5				
			VH-01	
2.5				
3	Village Amroha		40	S-0
S-0				
			MH-10	
2.5				
			H-28	
70				
			VH-02	
0.5				

S=Soft water, MH=Moderately hard water, H=Hard water, VH= Very hard water

3. Result and Discussion

The present studies have revealed that out of three places, the two villages have shown high level of hardness as compared to the town. In Moradabad town, out of 40 water samples collected, almost all the samples were moderately hard (42.5%) and hard water samples (52.5%) Only few samples were very hard water (5%). The results of villages were different from the results of town. Forty each number Of samples were collected from two villages. In Sambhal village, more number of samples have shown hardness between 150-300mg/l.Of $CaCO_3$ (67.5%) i.e hard water. Some of the samples have shown moderate hardness (30%) and very few of them have shown extreme hardness (2.5%) Table. Similar Type of results were found in the study of samples of Amroha village also. The results are Hard water –(70%) , Moderately hard water (2.5%) , and very hard water (5%0. Finally, no soft watered sample was found in all the 120 samples. (Table).Altogether out of 120 samples , most of the samples are found hard water (63.33). There are only 5 samples (4.16%) which are found to be very hard water. According To Kozisek (2003) both the extreme degrees of hardness are dangerous to human Health i.e very hard and very soft water. The present study did not find any soft water. But it has been reported that there are few samples (4.16%) which are very hard and can be ignored. Water intake of cattle and milk production have been found Unaffected by water containing up to 290 ppm of hardness (NRC,1974). Hence The water is safe for cattle in the town and villages. Hard drinking water is generally not harmful to human health (WHO, 2003) but can pose serious problems in industrial settings. Most of the people especially House wives dislike hard water because it useless for washing the clothes. Calcium is the element which reduces the corrosion and less likely to leach Toxic trace minerals, such as cadmium and lead , out of metal pipes(Seelig, 1977). According to the US National Academy of Sciences by 1977, there had been more than 50 studies, in nine countries. It has inverse relationship ardiovascular between water Hardness and mortality from cardiovascular disease (Harold and Foster, 1994). Most of the scientists have indicated a negative statistical association of various Types of cancer morbidity /mortality with the hardness of water and calcium (Yang, 1998). Some studies showed increased eczema in children (Miyake et al ,2004) and Arnedo –Pena, 2007).

4. Conclusion

The present study has proved extreme degree of hardness in only 4.16% of the samples which may not be harmful to the people. Although majority of people dislike the use of hard water. It has been found that concentration of Ca and Mg ions show some protective effect on cardiovascular mortality. The use of hard water does not give any evidence to prove causality among those people who are using hard water. The required concentration of Ca and Mg are good for sound health but excess of Ca is not good for bones as it causes extra growth of bones specially in the back bone and become a big problem. Some people think that hard water is harmful to health. It has been found that extremely hard water is Ex osmosis of blood cells and the acquire small size. This is important to bring awareness Among the people about soft, moderately hard , hard and very hard water.

References

[1] Arnedo Pena , A.,Bellido –Blasco , J, Artero-Civera, 2007, "Domestic water Hardness and prevalence of atopic eczema in Castellon (Spain) school Children ,Salud Piblica De Mexico",492 (4):295-310.

[2] Oram, B. (2008). Drinking Water Hard Water Hardness Calcium Magnesium Scale Stained Laundry. *Drinking Water Testing Environmental Testing Lab Water Research Center*.

[3] Gumashta ,J Gumashta , R Sadawarte , S.K. 2012, "Hard water and heart, revisited, IOSR" , Journal of pharmacy and Biological sciences ,1 (1):)7-20

[4] Harold, D.F , 1994, "Ground water and Human Health , Ground water resources Of British Columbia. Ministry of environment , Lands and Parks and Environment Canada", 6.1 -6.3

[5] ISO. 1984 , International standard ISO 6059, "Water Quality –Determination of the Sum of calcium and magnesium – EDTA titrimetric method", International Organization for Standerization-Geneva

[6] Kozisek, F ,2003, "Health significance of drinking water , calcium and magnesium . National Institute of public health. A review".

[7] Miyake ,Y, Yokoyama , T., Yura, A., Shimizu , T 2004, "Ecological association of water Hardness with prevalence of childhood atopic dermatitis in Japanese urban area", Environ, Res,.94(1) : 33-37

[8] Sengupta ,P ,2013, "Potential health impacts of hard water", Int.,J of Prev. Med , 4(*): 866-875.

[9] Yang , C.Y , 1998 , "Calcium and Magnesium in drinking water and risk of death from Cerebrovascular disease .Stroke" , 29: 411-4

[10] World Health Organization (2003) Hardness in drinking water.

[11] Standard methods for the examination of water and waste water (1998), 2340 Hardness . 20th ed, American Public Health Association / American work Association / Water Environment Federation , Washington , DC.

Potato Leaf Disease Classification using CNN

Vibhor Jain[1], Prabal Agrawal[2]
[1,2]Department of Electronics & Communication, Teerthanker Mahaveer University, Moradabad
[1]vibhorjain1509@gmail.com
[2]prabalagrawal3@gmail.com

Abstract

Early and accurate analysis and identification of plant diseases are extremely beneficial in reducing plant diseases and improving crop quality and quantity. Because plant disease experts are not readily available in remote areas, there is a need for automatic, low-cost, approachable, and dependable solutions to identify plant diseases without the need for lab inspection and expert opinion. To identify plant diseases, deep learning approaches such as convolutional neural network (CNN) can be used. In this paper, the CNN model is used to categorize potato leaves into three groups: healthy leaves, early blight diseased leaves, and late blight diseased leaves. In this paper, a 2154 image dataset with 500 leaves from each class is used. The CNN models learn the features from the raw data automatically.

Keywords— Plant disease, convolutional neural network, Machine Learning.

1. Introduction

India is a cultivated country with approximately 70% of its population dependent on agriculture. Farmers have a large selection of suitable crops to choose from, as well as the ability to search for effective plant pesticides. Plant disease causes a significant reduction in both the quality and quantity of farm goods. Agriculture's goal is to provide not only food for people, but also a major source of energy and a solution to the global problem of global warming. Plant disease diagnosis is critical at an early stage in order to treat and monitor the disease. Visually tracked plant trends are analyzed as part of plant disease research. In the beginning, plant disease specialists were able to manually track and examine plant diseases. In the beginning, plant disease specialists could manually track and examine plant diseases, noticing light colour changes on the plant leaf, but this took an incredibly long time to process. The problem is then solved using image processing techniques. Plant disease detection and health monitoring are critical for long-term farming. Plant disease tracking by hand is extremely difficult. It necessitates a significant amount of effort, plant disease experience, and unneeded production time. Photographic analysis is also used to identify plant diseases.

According to the Agricultural and Processed Food Products Export Development Authority (APEDA), Uttar Pradesh is India's leading potato producer, accounting for more than 30.33 percent of the country's total output. In the textile industry, potato starch (farina) is used to sizing cotton and worsted. Potatoes are high in potassium, vitamins (particularly C and B6), and fibre. It lowers total cholesterol levels in the blood and aids in the treatment of diseases such as high blood pressure, heart disease, and cancer.

Plants and agricultural lands are negatively affected by diseases. Microorganisms, genetic disorders, and infectious agents such as bacteria, fungi, and viruses are the main causes of these diseases. Potato leaf diseases are primarily caused by fungi and bacteria. Soft rot and common scab are bacterial diseases, while late blight and early blight are fungal diseases. Detecting and diagnosing these diseases on such vital vegetation motivates us to develop an automated strategy that will improve crop yield, increase farmer profit, and contribute more to the country's economy.

For detecting these leaf diseases, many researchers in the field of computer vision and image processing proposed using traditional image processing techniques such as LBPand K-means

clustering. Deep learning models are better feature generators because they are better at mapping functions. So, in this paper, we used several classifiers to create a deep learning model to detect potato leaf diseases. The paper is divided into sections, with section I serving as an introduction, section II serving as a review of literature, section III serving as a data set description, section IV serving as a proposed model, and section V serving as a conclusion.

2. Related Work

There are many methods to detect the plant diseases and various researchers had suggested various techniques for detecting potato leaf diseases in their work. In this section, a summary of those approaches is presented.

P. Badar et. al. [2] have used an approach of segmentation using K Means Clustering [7] on various features of Potato leaf image samples such as color, texture, area, etc. and applied Back Propagation Neural Network algorithm for identifying and classifying the disease in the leaf image in which they obtained a classification accuracy of 92%. U. Kumari et. al. [4] have used an approach of image Segmentation in which they have extracted various features of an image like contrast, correlation, energy, homogeneity, mean, standard deviation, and variance, etc. After extracting features, Neural Network is applied as a classifier to identify and classify diseases on the leaves of 2 plants i.e.Tomato and Cotton. Using this approach, they were able to achieve a classification accuracy of 92.5%. M. Islam et. al. [3] have used the concept of image segmentation on potato leaf class of Plant Village dataset [1] and then they applied multiclass Support Vector Machine on that segmented image to classify the diseases in which they obtained 95% classification accuracy. C. G. Li et. al. [5] have used an image segmentation approach for the identification and classification of fungal diseases on the grape leaves dataset. This work uses K Means clustering for extracting color, texture, and shape features from the images, and SVM (Support Vector Machine) is applied to the extracted features for the classification of the diseases. J chen et. al. [6] have used a CNN model named LeafNet [8] and DSIFT [9] for extracting features of an image. After that, a bag of visual words (BOVW) model is used to classify the tea leaf images using SVM and MLP (multi-layer perceptron) classifiers. Recently, Faster R-CNN [10] approach has been adopted for image identification and classification purposes [12,132]. A. Ramcharan et. al. [11] has used the concept of transfer learning for cassava disease images.

3. Dataset Description

Kaggle is an open-source repository that provides Plant Village Dataset [1] for research purposes. The dataset comprises approximately 2152 well-labeled images of healthy leaves, Late Blight leaves and Early Blight potato leaves. The performance of the PDDCNN method is evaluated using potato leaf images from Plant Village, a publicly available dataset. Penn State University (US) and EPFL (Switzerland), a non-profit project, created the Plant Village dataset. JPG colour images with 256× 256 dimensions make up the database. It has 38 different types of diseased and healthy leaves from 14 different plants. The potato crop is the focus of this study. As a result, 1000 late blight leaves, 1000 early blight leaves, and 152 healthy leaf images were chosen for the experiment, as shown in Table 1.

Table 1: Potato Leaf Dataset

PlantVillage Dataset	
Class Labels	**Samples**
Early Blight	1000
Late Blight	1000
Healthy	152
Total Samples	**2152**

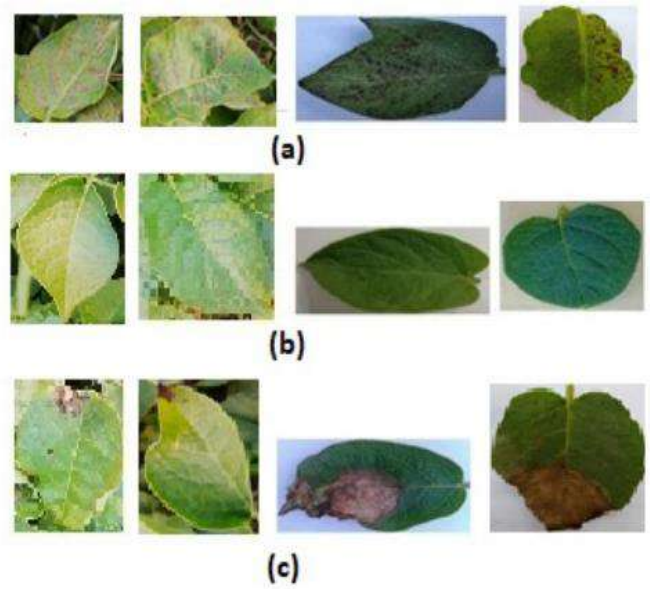


Figure 3. Examples of potato leaf images: (**a**) early blight, (**b**) healthy and (**c**) late blight.

4. Proposed Approach

A. Image Acquisition

The first step is to gather all images of infected or diseased plant leaves using a camera or a source that stores all infected plant leaf data. The first image is in RGB format (Red, Green and Blue). A device-independent color-space transition is generated for an RGB leaf image and then used for the colour transformation method.

B. Image Pre-processing

Noise is produced by the contaminated plant leaf in the image. It's possible that the noise is dust from the leaf sand and other materials. It is critical to remove the noisy data from the image in order to improve accuracy. After that, pre-processing techniques are used to remove noisy images. Image clipping, i.e. cropping the image of the leaf to obtain the area of interest, is one of the preprocessing techniques available. The smoothing filter is used to smooth out the image. The picture is being improved in order to improve the contrast. Any of the techniques it employs has an impact on the outcome.

B.1. Data Augmentation

To overcome overfitting and increase the dataset's diversity, different data augmentation techniques were applied to the training set using the Image Data Generator method of the Keras library in Python. Smaller pixel values and the same range were used to reduce the computational cost; scale transformation was used for this. As a result, the parameter value (1/255) was used to range every pixel value from 0 to 1. The rotation transformation was used to rotate the images to a specific angle; thus, 25 was used to rotate the images. Using the width shift range transformation, images can shift randomly to the right or left; select a 0.1 value for the width shift parameter. The height shift range parameter with a 0.1 range value was used to move training images vertically. One axis of the image was fixed during the shear transformation, and the other axis was stretched to a specific angle known as the shear angle; thus, a 0.2 shear angle was applied. The random zoom transformation was performed using the zoom range argument; >1.0 means magnifying the image, and 1.0 means zooming out the image; thus, 0.2 zoom range was used to magnify the image. Flip was used to horizontally flip the image. We used a 0.5–1.0 zoom range due to the brightness transformation,

where 0.0 means no brightness and 1.0 means maximum brightness. In channel shift transformation, a random value was chosen from the specified range to shift the channel values; thus, a 0.05 channel shift range was applied, and the fill mode was nearest.

C. Training, Validation and Testing

Training, validation, and testing were used to divide the PLD dataset into three parts. The validation and test datasets were used to evaluate the proposed model's performance, while the training dataset was used to train the PDDCNN model. As a result, we divided the training, validation, and testing datasets into 80 percent, 10%, and 10%, respectively. For the PLD dataset, 3257, 403, and 403 images were used for training, validation, and testing. Various data augmentation techniques, such as rescaling, rotation, width shift, height shift, shear range, zoom range, horizontal flip, brightness, and channel shift with the fill mode nearest, were used on the training set to increase the dataset's diversity and enhance it. It would solve the overfitting problem, allowing the model to be generalized.

The CNN model involved training on training samples from the input layer to the output layer, making a prediction, and determining errors or results. Back-propagation was performed in reverse order in the event of a bad prediction. As a result, the back-propagation algorithm was used in the current study to adjust the model weights for a better prognosis. One epoch represented the entire forwarding and backpropagation process. For the research, the Adam optimizing algorithm was used. The training images for the current study were taken from the early blight, healthy, and late blight class labels, respectively, while maintaining the 80 percent image ratios.On both datasets, the remaining 20% of untouched images were divided into validation and testing with a 10% ratio on each. The proposed PDDCNN model was trained on a training dataset in order to classify and predict the class label of each training image.

A. Image Segmentation

Segmentation is the process of dividing an image into separate parts that have similar or identical features. Segmentation can be done in a variety of ways, including clustering k-means, converting an RGB image to an HIS model, and so on. We used the K Means algorithm in this case. The clustering of K-means is used to classify objects into the number of classes K based on a set of features. The sum of the squares of the distance between the object and the cluster in the query is minimized for object classification.

B. Feature Extraction

In order to detect a plant disease, it is necessary to extract features. Many image processing applications use the extraction function. Color, texture, shape, and edges, among other characteristics, can be used to identify plant diseases. The morphological results are found to be superior to the other features. Texture refers to the way the image is coloured, as well as the roughness and hardness of the image. The characteristics of tainted vegetable leaves are collected using this method.

C. Classification

Following the function's extraction, a classifier is created, which is then used to identify the plant disease. The plant disease can be classified and defined as healthy or unhealthy leaves based on their leaves. The diseased leaf is graded further based on the type of disease that has infected it.

Result

Our system is capable of detecting diseases on potato plants with high accuracy. To improve the

plant's health, we need to deal with this with a thorough understanding of the disease and its treatment. Python and the Google GPU were used to create the framework (Graphical Processor Unit). Figure 2 shows examples of our system's output. Figures 2.a and 2.b depict healthy early blight potato leaves, respectively, and Figure 2.c depicts healthy late blight potato leaves. 2.c. Illustration Our system had an accuracy rate of80%.

a. Discussion

Photos of potato leaves with two disease types, one early bright and the other late bright, are used asinput for the model. The following are the images that are passed to the model as input. The input images are preprocessed to remove noise data, dust, and other impurities in order to improve the model's accuracy.

For data training, we used the transfer learning technique on a predefined convolutional neural network model called SSD mobile net. The SSD Mobilenet neural network algorithm is used to detect objects. SSD is a multi-box detector framework, and Mobilenet is used for classification. It is only by combining both that it is possible to detect objects. Mobile net layers are used as feature extractors because they convert pixels from an input image to a feature that defines the image. We can classify the image category using the mobile internet. The procedure for training and testing the model is as follows.

Initially, we gather a few hundred images from an external source that contain the required leaf images, i.e., potato diseased leaf. We need to use LabelImg to annotate the infected potato images because we need to draw a box around the infected region for the leaf image and we need to specify the class for it to train. This LabelImg software will generate an Extensible Markup Language (XML) file that describes the leaf image and the dimensions of the infected region. The image data must be divided into train and test samples. The train samples are used to train the model, while the test samples are used to see if the model is producing the expected results.

As stated previously, the LabelImg software creates an XML file, but the model (SSD mobile net) does not accept the XML file for training. Therefore, we must convert the XML file to another file format before using it to train the model. Using some code, we can convert the XML file to a comma-separated values (CSV) file. Use the generated train.csv file to train the model after converting a file from XML to CSV. For object detection, the ssdmobilenet model uses tensor flow as a backend. In normal systems, training the model takes longer. As a result, we used Google's open-source cloud platform, Google Colaboratory, which provides a GPU environment as well as storage space for the user up to a certain extent. It is faster than standard systems that do not have access to a Graphical Processor Unit (GPU). Because the platform's runtime is only 12 hours, we must exercise caution when training the model. To train the predefined model, we must modify some code in the model configuration file to meet our needs and save the file.

The model generates checkpoint files at regular intervals during training, so we must save those checkpoints so that we can resume training from that point even if the platform runtime restarts. We can startthe training from a specific checkpoint by changing some code in a checkpoint file. There will be something like execution steps in the ssdmobilenet configuration file. When the training reaches the specified execution step, we must specify a value by which the training will end. The model's output is shown in Figure 2.

b. Conclusion

Our proposed system was created with the benefit of farmers and the farming industry in mind. The established system is capable of detecting plant disease and prescribing a treatment. We'll deal with it by having a thorough understanding of the disease and how to treat it in order to improve the plant's

health. The proposed framework is written in Python and provides an accuracy of around 80%. The use of a Google GPU for processing will improve accuracy and speed. We will be able to train the model with more data soon, and it will be able to cover all of the diseases that are present, as well as suggest precautions. It can also be implemented in drones, with the drones capturing the leaves from the top and detecting the type of disease that has affected the plant, as well as providing the necessary instructions for farmers to take further action to stop the disease.

c. Future Scope

Nowadays, it is critical to detect a disease in a plant during the budding stage in order to improve yield productivity and quality. Because disease detection necessitates a high level of expertise, it would be ideal if we could implement this system on a smartphone, allowing farmers to snap a photo of a leaf and send it to the server. The server will recognize and classify the type of disease and send the results, as well as any prescribed medications, to the smartphone.

References

[1] A. Ali, "PlantVillage Dataset, Version 1, Retrieved 22 February 2020, https://www.kaggle.com/xabdallahali/plantvillage-dataset.
[2] A, Girish and P. Badar. "Potato Leaf Diseases Detection and Classification System Mr." (2016).
[3] M. Islam, A. Dinh, K. Wahid and P. Bhowmik, "Detection of potato diseases using image segmentation and multiclass support vector machine," 2017 IEEE 30th Canadian Conference on Electrical and Computer Engineering (CCECE), Windsor, 30 April-3 May 2017, pp. 1-4.
[4] C. U. Kumari, S. J. Prasad and G. Mounika, "Leaf Disease Detection: Feature Extraction with K-means clustering and Classification with ANN," 2019 3rd International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 27-29 March 2019, pp. 1095-1098.
[5] Li, Guanlin, M. Zhanhong and H. Wang, "Image Recognition of Grape Downy Mildew and Grape Powdery Mildew Based on Support Vector Machine", IFIP Advances in Information and Communication Technology. vol. 370, pp. 151-162, 2011. 10.1007/978-3-642-27275-2_17.
[6] J. Chen, Q. Liu, L. Gao, "Visual Tea Leaf Disease Recognition Using a Convolutional Neural Network Model", Symmetry, vol. 11, pp. 343-349, 2019. 10.3390/sym11030343.
[7] Y. Li and H. Wu, "A Clustering Method Based on K-Means Algorithm," Physics Procedia, vol. 25. pp. 1104-1109. 2019. 10.1016/j.phpro.2012.03.206.
[8] P. Barré, B. Stöver, K. Müller and V. Steinhage, "LeafNet: A computer vision system for automatic plant species identification," Ecological Informatics, vol. 40. pp. 4-10, 2017. 1016/j.ecoinf.2017.05.005.
[9] T. Lindeberg, "Scale Invariant Feature Transform" 10.4249/scholarpedia.10491.
[10] S. Ren, K. He, R. Girshick and J. Sun, "Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks," IEEE Transactions on Pattern Analysis and Machine Intelligence. vol. 39, pp. 1137 – 1149, 2017. 10.1109/TPAMI.2016.2577031.
[11] A. Ramcharan, K. Baranowski, P. McCloskey, Peter & Ahmed, L. Babuali J. Legg and D. Hughes, "Using Transfer Learning for Image-Based Cassava Disease Detection," Frontiers in Plant Science. vol. 8, 2017. 10.3389/fpls.2017.01852.
[12] D. Oppenheim, G. Shani, O. Erlich and L. Tsror, "Using Deep Learning for Image-Based Potato Tuber Disease Detection," Phytopathology, vol. 109(6), pp. 1083-1087, 2019. 10.1094/PHYTO-08-18- 0288-R. 109. 10.1094/PHYTO-08-18- 0288-R.
[13] A. Fuentes, S. Yoon, S. Kim, D. Park, "A Robust Deep-Learning-Based Detector for Real-Time Tomato Plant Diseases and Pests Recognition," Sensor, vol. 17, pp. 1-10, 2022. 10.3390/s17092022.

Economic Impact of Technologies Developed in S.Q.C using by control chart of Variable

AbhinavSaxena[1,] Ashok kumar[2], Shiv Kumar[3]

Department of Mathematics, Teerthankar Mahaveer University, Moradabad

Abstract

Lakme is one of the leading cosmetic brands with headquarters in Mumbai, India, owned presently by Unilever. The idea of establishing Lakme in the year 1952 surged into existence because Prime Minister Jawaharlal Nehru came to know that Indian women were splurging on imported cosmetics and spending precious foreign exchange on beauty products. In this case, he requested JRD Tata to start the beauty sector in India. Lakme then became a100% affiliate of Tata Oil Mills (TOMCO), a part of the TATA group. Later it became a unique company as it goes by its tagline 'Lakme Reinvent' after it has been acquired by Hindustan Unilever, 'On Top of the World' which now continuously innovates and offers a wide variety of cosmetics of the world class, skincare product, and beauty salons to the customers around the world. This article illustrates different elements of the organization, its company sections, marketing strategies, corporate structure, management, and structure operations while providing beauty and wellness services. The secondary data were obtained from various scholarly journals, websites, and books. We have analysed financial performance, corporate social responsibilities of the company and examined their strategies using the SWOC framework as a research case study.

Keywords: S.Q.C, TOMCO, SWOC, Mean chart, Sigma chart, Range Chart

1. Introduction

Measurements Quality control can be valuable in different approaches to guarantee the generation of value merchandise. This is accomplished by distinguishing proof and dismissal flawed or substandard merchandise. The deal targets can be settled based on special estimates, which are finished by utilizing shifting strategy for anticipating. [26] SQC like SPC yet with an accentuation on product quality and less accentuation on process control. Investigation of offers affected against the objectives set before would demonstrate the lack in accomplishment, which might be by virtue of a few causes:

Targets were too high and preposterous C.
Salesmen's execution has been poor.
Emergence of augmentation in contention.
Poor nature of association's thing.

Mean charts are used to control the measurable characteristics. We have to study the control on measure of central tendency and the measure of dispersion. Usually mean chart is paired with Range chart to control the mean and range of the characteristics. Mean chart also shows the way of changes of average and mean with respect to time. The points of the mean of data acts as the mean value of subgroups while Range charts are used to show the way of changing of the range of data with respect to the time. Range chart isused to utilize the process of monitoring of variables. The points of the range chart show the range value of the data.

2. The main objectives are:

Inspection separates defective components from the non-defective component so that adequate quality can be maintained.

Inspection locates defects in process or raw material which otherwise causes problems at the final stage.

It prevents further working on spoiled semi-finished products. It helps the product to be more economical.

Inspection detects the weak position and trouble in the weak position by checking the design.

To improve the standardand quality of the product.

i. To study the marketing strategies of Lakme cosmetics.

ii. To know the opinion of consumers toward the company's product.

iii. To analyze the reason for the seinitial strategy in India.

iv. To know and analyze the level of satisfaction of customers (who demand the product) and the supplies or manufactures (who produce the product).

v. To influence the people to prefer company's product.

vi. To study the factors affecting the consumption pattern

3. Methodology

SecondaryData

i. Internet
ii. Company Report & Broachers
iii. Magazines
iv. Newspapers Articles & journals

Data is also gathered by talking to the respondents (Target audience, understanding their beauty needs, what aspire them to go for the Lakme brand).Also the level of:

i. Brand awareness,
ii. Price level,
iii. Visibility of brand personality,
iv. Expectancy of Communication

All these factors were the prime criterion for selecting Lakme short listing and ranking level of trustworthiness or most favored which had helped us for identifying the winner in cosmetics industry.

3.1 Study Area Description

The research was a descriptive research as it was concerned with specific predictions, with

narrations of facts and characteristics concerning individuals specially entrepreneurs. In other words, descriptive research is a research where in researcher has no control over variable. He just presents the picture which has already studied. Our research is based on the Exploratory Study. Research is exploratory when you use no earlier model as a basis of your study. The most usual reason for using this approach is that you have no other choice. Normally you would like to take an earlier theory as a support, but the ripraps is none, oral available models come from wrong context. These outlines think about quantifiable information on quality attributes. Keeping in mind the end goal to control measurable attributes like thickness of liquid which are persistent and take after typical conveyance. Mean, range and sigma graphs are three diagrams of control outline for variable. The mean graph and Range outline are usually utilized as a part of managing variable information to screen the nature of an assembling procedure. The reason that both the graphs must be utilized together is that both the mean and the variety must be under control.

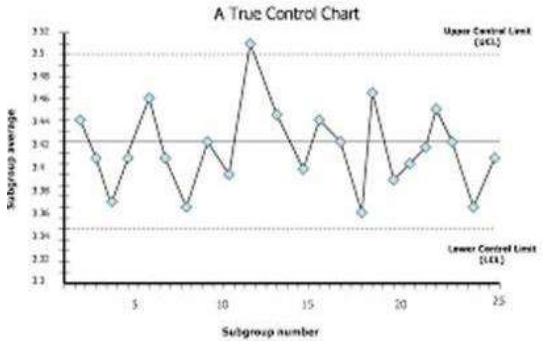


Fig 1: Total Quality Management

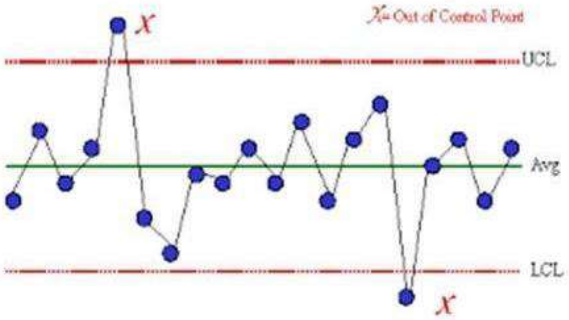
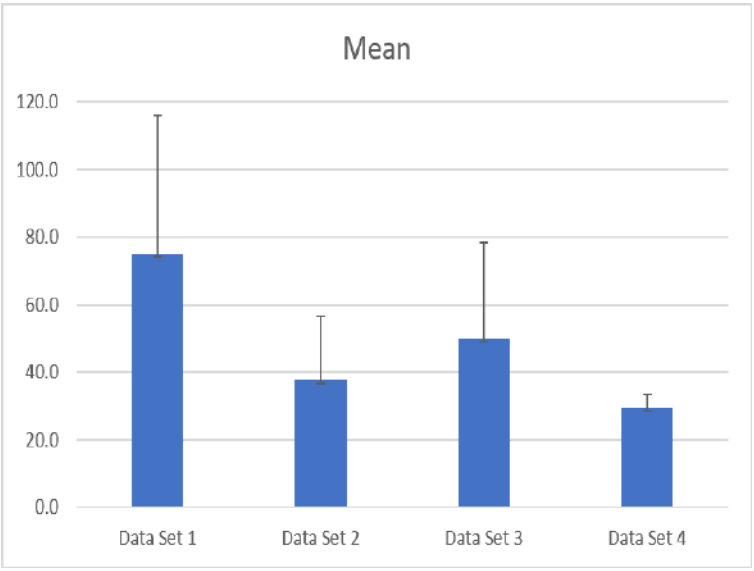


Fig 2: Mean Chart

A diagram utilized as a part of value control for observing procedure implies. Keeping in mind the end goal to control the quantifiable attributes we need to ponder the control on the measure of focal propensity and the measure of scattering. Normally mean-diagram is



combined with Range outline to control the mean and scope of the attributes.

R-CHART

The Range graph utilized as a part of value control for checking process changeability. They depend on extend. The R-graph lists the example irregularity is in factual control, at that point just the mean diagram is analyzed to choose the example mean in charge or not. Generally, the entire procedure is judged to be not in charge.

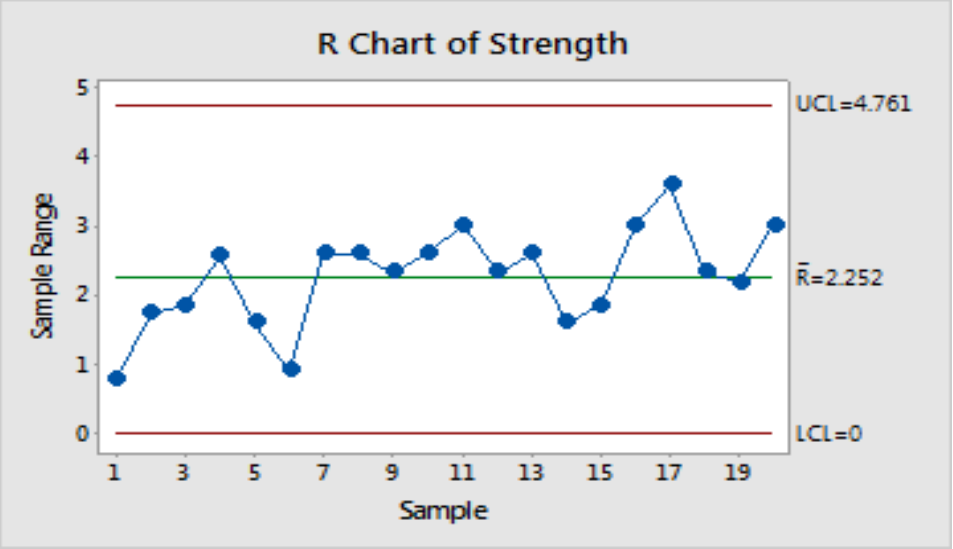


Fig 3: R Chart

4. Results

Lakme is the global leader in cosmetics with 25 global brands. It has five key areas of expertise – hair care, skin care, make-up and fragrances. This company has over 63,358employees working currently and it sells its products around in 130 countries all over the world. On the analysis of research conducted. It was found that certain findings are very critical and are directly or indirectly affecting the products: - There is a good awareness of Lakme cosmetics products among the consumers.

i. The quality of Lakme is very satisfactory viewed by the majority of customers.
ii. There is an eckto neck competition between L'Oréal, Oriflamme,VLCC, Revlon etc.
iii. 75% of the customers carefully satisfied with existing quality while 25% are partly satisfied.
iv. Majority of women are using lakme product.
v. Consumers prefer the Lakme products because it provides good quality, good services, etc. and it all fulfill their needs.

References

[1]. Chemistry Natural Cosmetics - Qiushi Chen (2009).

[2]. Consumer Marketing Impact of Personal Variables, Sociocultural Variables and Marketing Variables Souiden et al. (2009).

[3]. Marketing and Logistics Impact of Traditional and Cultural Values. Attitude toward Skin Beauty. Usage of Cosmetics for Fairness Koubaa et al. (2011).

[4]. Environment and Behaviour Personal values and commitment to energy conservation Neuman, J. (1986).

[5]. Resources Green Consumer Behavior in the Cosmetics Market Nora Amberg et al. (2019).

[6]. Analytical Chemistry Analysis of Cosmetic Products Alberto Chisvert et al. (2007).

[7]. Quality control and assurance Cosmetics and Beauty Products Review CompreheHeyam Ali (2018)

Optimization Model & Its Applications to Linking Assignments of Terminal Reliability

Chavi Gupta
Teerthanker Mahaveer University, Moradabad

Abstract

Probabilistic network whose links are subject of failure have been extensively studied in the literature, their reliability is regarded as the network's ability of continue operation after failures have occurred. We consider the all terminal reliability measure, defined as the probability that the network remains connected ager failures. In this paper, we discuss the design problem of assigning given distinct probabilities of the links of a network so as to maximize the reliability of the system.

Keywords: LAN, WAN, MAN Network, Reliability

1. Introduction

First of all, the installed base of different networks is large and growing.ATM systems are often used on satellite, cellular and 4 infrared networks, second of computer and networks get chapter, the place where decision get made moves downward. Many companies have a policy to the effect than purchasing costing over a million dollars have to be approved by top management.

Third different networks (e.g. ATM and wireless) have radically different technology, so it not should be surprising that as new hard were developments occur new software will be created to lit the new hardware.

For example :the average home row is like the average office ten years ago:it is full of computers that do not talk to one another in the future, it may be common place for the telephone, the television set and other application all to be networked together, so they can controlled recently. This new technology will undoubtedly bring new protocols. As an example of how different networks, interact, consider the following example:

At most universities, the computer science and electrical engineering department have their own LANS often different. In addition, the university computer outer often has a mainframe and super computer, the former for faculty members in the humanities who do not wish to get into the computer maintains business, and the letter for physicists who want to cruel numbers .

1. LAN-WAN: A computer scientist downloading a file to engineering.
2. LAN-WAN: A computer scientist sending most to a distant physicist.
3. WAN-LAN: Two poets exchange.
4. LAN- WAN-LAND: Engineers at different universities.

Following are illustrates these four types of connection as dotted lines.In each case, it is necessary to insect a 'black box' at the function between two networks, to handle the necessary conversions as packets moves from the network to other. The name used for the black box connecting two networks depends on the layer does the work. Some common names are given below (although there is not much agreement on terminology in this area)

Layer 1: Repeaters copy individual bites between cable segments.
Layer 2: Bridges store and forward data link frames between LANs.
Layer 3: Multi protocol routers forward packets between dissimilar networks.
Layer 4: Transport gateways connect byte streams in the transport layer.
Above 4: Application gate ways aloe inter-working above Layer 4.

For convenience, we will sometimes use the terms "gateway" to mean any device that connects two or more dissimilar networks. Common place for the telephone, the television set and other application all to be networked together, so they can controlled recently. This new technology will undoubtedly bring new protocols. As an example of how different networks, interact, consider the following example:

At most universities, the computer science and electrical engineering department have their own LANS often different. In addition, the university computer outer often has a mainframe and super computer, the former for faculty members in the humanities who do not wish to get into the computer maintains business, and the letter for physicists who want to cruel numbers .

1. LAN-WAN: A computer scientist downloading a file to engineering.
2. LAN-WAN: A computer scientist sending most to a distant physicist.
3. WAN-LAN: Two poets exchange.
4. LAN- WAN-LAND: Engineers at different universities.

Following are illustrates these four types of connection as dotted lines.In each case, it is necessary to insect a 'black box' at the function between two networks, to handle the necessary conversions as packets moves from the network to other. The name used for the black box connecting two networks depends on the layer does the work. Some common names are given below (although there is not much agreement on terminology in this area)

Layer 1: Repeaters copy individual bites between cable segments.
Layer 2: Bridges store and forward data link frames between LANs.
Layer 3: Multi protocol routers forward packets between dissimilar networks.
Layer 4: Transport gateways connect byte streams in the transport layer.
Above 4: Application gate ways aloe inter-working above Layer 4.

For convenience, we will sometimes use the terms "gateway" to mean any device that connects two or more dissimilar networks.

The concept of a shortest path deserves some explanation.Once way of measuring path length is the number of hops. Using this metric, another metric is the geographic distance in kilometers.

However, many other metrics are also possible besides hope and physical distance. For example, each one could be labeled with the mean queuing and transmission delay for some standard test packet as determined by hourly test runs. With this graph labeling, the shortest is the fastest path than the path with the fewest are or kilometers.

2. Reliability Preserving Reductions

In this section we describe a few combinational tools that are useful in computing the Reliability of a network with given assignment. To lighten notation, we write px instead of py(x).

(a) The Factoring Theorem: The factoring theorem evaluates the Reliability of a network G by considering the operating status of an edge. For this, we need to define the deletion and contraction of an edge x of G.If x is an edge from μ to v, then G-x is the sub graph obtained from G be deleting the edge x: note that deletion of x does not imply deletion of μ, v.

In G, contracting an edge x involves deleting x and merging its end vertices μ, v into a "super-vertex" that is given the adjacency of both μ, v in G.

The graph obtained from G by contracting x is denoted as G/x. A state of the network is a collection of edge and therefore its operating probability is a 'compound' event. It consists of more elementary events, the survival or failure each individual edge.Thus, the operating status of an edge x partition the status of G into two set and the terminal Reliability of G can be written as:

R(G)= pxR (G: x is functional)+(1-px_R (G: x is not functional)
The above equation is known as the pivotal decomposition [1, 2],Perhaps the earliest to this equation was made by Moskowitz in [6]; it is used there to derive the following simple but significant topological transformation for graph:
R(G)= pxR (G-x)+(1-px) R (G/x)----------(1)

This is often called the factoring theorem and has been instrumental in constructing recursive algorithm for the computation of (G), See [8]. The next there reduction rules can be verified using the factoring theorem.

(b)Parallel Reduction: Let x ={u, v} and y ={u, v} be two parallel edges in a graph G.A direct connection between u, v exists if at least one of the two edges operates; thus a parallel reduction replaces x and y with a single edge z = {u, v } such that p.

Z= px +py-px
Py (=1-qxqy, where q= 1-p)

If G is graph obtained from G, them R (G) =R (G)

(c)Series Reduction: Let x ={u, v} and y={v, w} two edges of G adjacent at a degree -2 vertex v. Then a series reduction replaces x and y by a single edge z= {u, v} such that pz =if G is the graph obtained from g than

r(G) =(1-qxqy) R(G).

Note that this reduction also referred to as a degree two reduction in [7] is different from the standard series reduction , since in this model three are no vertex failures.

(d)End - Reduction: Let x= {u, v} be an edge of G, and u an end- point .Clearly, any operating state of G must including x. Thus, an end-reduction deletes Vertex u an edge x producing a new graph G. Than R(G)= pxR(G).

3. Optimal Link Assignments

We now introduce a class of sparse graph that includes unicyclicgraphs . A connected graph G is an multi - ring network if all edges of G lie on at most one cycle. Thus, we require cycle to be edge-disjoint but not necessarily vertex disjoint. One can determine in liner time whether a graph G is a multi ring network, using the following recognition algorithm.

Step 1: Decompose the graph into its disconnected components B1.....,Bi,E.

Step 2: For each of these components, test if either $[B_i]$=1or if the sub graph Induced by B_i.

Step 3: Return "yes" if all biconnected components pass the test and "No" otherwise. Note that the algorithm can easily be modified to produce a list 5 of all the edge disjoint cycle in the graph, if the graph is indeed a multi ring. This

PEf:{m} --->E • {• }
f(i) • , C_i• {• }
i=1,.....,mrf

(i) which can be rewritten as the sum of products in line 3 above.

Hence, we have essentially established the following theorem.

Definition: A set of edges E={E is assignment invariant if fir any two assignment Y,Y for G and P that differ at most on E,R (G,PY) =R (G,P,Y).

The next proposition is obvious from the definition.

Proposition 1:I is an assignment- invariant set. The next claim established the fact that essential edges are more important for the Reliability of the network .

Propsition.2: If y is an optimal link assignment for G, x is an essential edge and y fails to be essential, then py (x) 4.2: if y is an optimal link assignment for G, x is essential edge and y and y fails to be essential then py (x) >py (y).

Proof . Let y be a optimal link assignment for G and obtain a new assignment y switching the values of x and y. Since $R(G, y) \geq R(G, y)$ we can write :

$\Theta\Box(G)u\Box py(u)v/\Box\Theta(1-py(v))-py(v)) \geq \Theta\Box\Omega(G)\ u\ \Box\Theta\ py(u)\ v/\Box\Theta(1-py(v))$

Note that in the above expression the only Θ terms that do not cancel out, are those for which x• Θ and y Θ .Therefore we have

py(x) (1-py(y))(...) ≥ py (x) (1-py(y)) (...),

py(x) (1-py(y)) ≥ (y) (1-py(x)),

py (x) ≥ py(y), as required.

Using the last two propositions, we can immediately determine optimal link assignments in unicycle. Note that for a unicycle G, the edges are partitioned into I and C=E-1, the essential edges and the cycle edges.

Proposition 3: An optimal link assignment for a unicycle G assigns the [1] many highest probabilities to the essential edges and the remaining probabilities to the cycle edges , in any order.

Proof: it is clear that the non- cycle edges of G are its essential set I. From proposition (4.1) and (4.2), any optimal assignment must attach higher probabilities to the edges I than to the cycle edges C.

We claim that both I and C are assignment-invariant, so that any permutation of values within I and C does not affect the Reliability of the network. But by theorem 4.1 or, equivalently, by applying the reduction of section 3, the Reliability of the network is and this terms is clearly invariant with respect to the permutation under consideration.

Complexity consideration from the previous section, we know that the Reliability associated with an assignment for a multi ring network is always computable in polynomial time. Moreover, if there is at most one cycle in the network, then we can actually compute an optimal assignment, essentially be sorting the probabilities. By contrast, we will now show that already for two cycles it becomes NP-hard to determine optimal assignments.

To see this, let us write the two cycle as A, B• E. Using the same notation as above, we have from the theorem:

Set S:=si

And T:=si

Consider a graph consisting of two edge-disjoint cycles. A and B of length t and t-t, respectively, and probability vector P=P_1,……$P_t$given by $p_i=1(1+S_i$). Then G together with P and bound c is a yes-instance of BCOLAIff (a □ Asa) (b □ Bsb) ≥ c/T-S-1. Now choose the bound c to be

C= T (S2/4+S+1)

Then we have a yes instance if □ A sa=b □ B sb=S/2.

But that means that S1,…….S is a yes instance of partition. Then opposite direction is entirely similar. Moreover, the BCOLA instance G, P and C can be constructed from the Partition instance in polynomial time, Hence, BCOLA is NP hard and we are done.

References:

1. Chervenar,A.L., “TertiraryStorage:An Evaluation of new application,” Ph.D. thesis.CSD, Univ. of California at Berkelay (1994).
2. Demers ,Keshav,S. and Shenker,S., “Analysis and simulation of a fair queuing algorithm”.
3. Mishra,P.P. and Kanakia,H., “A Hop by Hop rate Based Congestion Control Scheme”.
4. Otway,D., and Ress, O., “Efficient and Timely mutual Authentication”.
5. Shannon, C., “A Mathematical Theory of Communication”.
6. Batcher,K.E, “Sorting Networks and their applications”.
7. Adans, N., Gold, R. Schilit, B.N. Tso, M.H. and Want, R., “An Infrared Network for Mobile Computers”.
8. AT & T and Belclke, “ Observation or error characteristics of fiber topic Transmission systems”.

A Case Study on the Programming to Integer Programming

Mr. LakshayChauhan
R.M.P.S. College, Saharanpur

Abtract

Integer Programming deals with certain situations in which the variables assume non- negative integer (Complete or whole number) values only. In linear programming models the variables may take even a fraction values and the figure are rounded off to the nearest integer to get the solution. i.e., number of vehicles available in a problem cannot be fraction. When such rounding off is done the solution does not remain an optimal solution. In integer programming the solution containing unacceptable and fraction values are ruled out and the next best solution using the whole numbers is obtained.

1. Introduction

First of all, to obtain an optimal integer solution to an "all integer programming problems" used systematic method. But later, to solve more complicated problems, this method was extended to "mixed integer programming" when variables required as a integer. The large and complex data of linear programming problems can be solved in reasonable time, however the performance of integer algorithms has not been found to be uniformly efficient and useful. In integer programming rounding off is used to get a value approximately true or correct.

A converge to the optimal integer solution in a finite number of iterations making use to familiar dual simplex method, known as "cutting- plane method". In linear programming certain secondary conditions are added in such a manner that the ultimate result satisfies the conditions of only integer solutions. These secondary conditions cut or eliminate aspects of the solution which are not feasible integer. In others, for solving both the all integer and the mixed integer problems, we used the "Branch and Bound technique" having straight forward idea of finding all feasible integer solutions.

Integer Programming Formulation:

A linear programming problems in which some or all variables x_1, x_2, x_3,……x_n are the integer (also including whole numbers) is referred as an integer programming problem.

Mathematical model of IPP as follows:

Optimization:

$$\sum_{k=1}^{n} c_k x_k$$

s.t.

$$\sum_{k} a_{ik} x_k = b_i \qquad i = 1, 2, 3, ...n$$

$$x_k \geq 0 \qquad where \;\; k = 1, 2, 3, ...n$$

The I.P.P in which variables can take non negative values continuously, is termed continuous programming problems. If we left end restriction x_k , the problem becomes a continuous programming problems.

"$x_k$integer values" is only the restriction which distinguishes L.P.P and I.P.P.

If at consider a problems of a factory which has n assignment to undertake. But due to

income foundation, not all can be undertake. Assume the present values of K the assignment be C_k(k=1,2,3,….n). If b_i (i=1,2,3,…n) be the sum of capital available in times, then the factory problems mathematically becomes as follows:

$$Maximize: \quad z = \sum_{k=1}^{n} c_k x_k$$

$$s.t. \quad \sum_{k=1}^{n} a_{ik} x_k \le b_i \qquad i = 1,2,3,.....m$$

$$x_k = 0 \, or \, 1 \qquad k = 1,2,3,.....n$$

$$where \quad \left.\begin{matrix} x_k = 1 \\ x_k = 0 \end{matrix}\right\} \begin{matrix} if \ assignment \ k \ is \ passed \\ if \ assignment \ k \ is \ not \ passed \end{matrix}$$

Many branches of industry wanted the interest in an integer form. They have to decided on the number of units of each product to be manufactured, so as to maximize the profit. It is possible to solve by L.P.P. the optimal solution many result in fractional values of the decision variables. Such a linear program with decision variables restricted to integer values is called integer programming.

The integer problem can be divided in following parts:

(i) Integer Programming Problem:The L.P.P.

$$Max \, z = cz$$

$$s.t. \ AX = B, \quad X \ge 0$$

And some x_k ε X are integer, where C, X ε R^n, B ε R^m and A is an m*n matrix.

(ii) All Integer Programming Problems: If x_k ε X are integer, then an integer programming problem said to all integer programming problem.

(iii)Mixed Integer Programming Problem:If not all x_k ε X are integer, then an integer programming problem said to mixed integer programming problem.

2. Algorithm of Integer programming

(1) Set Covering Problem: If overlapping services are offered by a number of installations to a number of facilities. The objective is to determine the minimum number of installations that will cover for each facility. For example: To promote on campus safety, the U of A security Department is in the Process of installing emergency Telephones at selected locations. The department wants to install the minimum member of telephones, Provide that each to the campus main streets is served by at least one telephone. Fig.1.1 maps to Principal ways (A to K) on campus.

Define

$$x_j = \begin{cases} 1, A \text{ telephone is installing at least one} \\ 0, otherwise \end{cases}$$

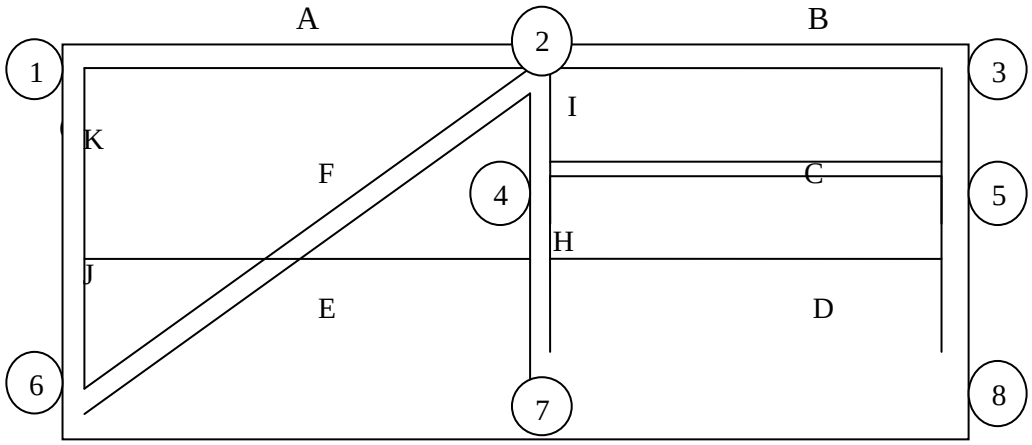
The constraints of the problem require installing at least one telephones on each of the 11 ways (A to K).Thus the model becomes,

Minimize $z = x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8$

Subject to; $x_1 + x_2 \ge 1$ (way A)

$x_2+x_3 \ge 1$ (way B)
$x_4+x_5 \ge 1$ (way C)
$x_7+x_8 \ge 1$ (way D)
$x_6+x_7 \ge 1$ (way E)
$x_2+x_6 \ge 1$ (way F)
$x_1+x_6 \ge 1$ (way G)

$x_4+x_7 \geq 1$ (way H)
$x_2+x_4 \geq 1$ (way I)
$x_5+x_8 \geq 1$ (way J)
$x_3+x_5 \geq 1$ (way K)
$x_J=(0,1)$, j= 1,2,3,…..8



The optimum solution of the problem requires installing 4 telephones at intersections 1, 2, 5, 7

(2) Fixed Amount problems and condition: If We produce at least N units of a certain product on n different machines, then this problems is arise. Let $x_k$be the number of units produced on machine K, k= 1, 2,…..n. The production cost function for the k^{th} machine is followed as:-

$$c_k(x_k) = \begin{cases} f_k + c_k x_k, & x_k > 0 \\ 0 & x_k = 0 \end{cases}$$

Where f_k is the required cost for machine K.

So we formulate this problems as :-

$$Min \quad z = \sum_{k=1}^{n} c_k(x_k)$$

$$s.t. \qquad \sum_{k=1}^{n} x_k \geq N, \qquad x_k \geq 0 \; and \; \text{int}\, eger$$

Here the objective function is non linear because the fixed amount f_k

This problems may be solved by using the mixed integer programming as:-

Let P be a very large number exceeding the capacity of any of the machines and l_k=0 or 1 for every k.

So above formulation be reduces as:

$$Min \; z = \sum_{k=1}^{n} f_k l_k + \sum_{k=1}^{n} c_k x_k$$

$$s.t. \qquad \sum_{k=1}^{n} x_k \geq N, \qquad x_k \geq P l_k$$

For example: Three telephone companies to subscribe to their long distance service in United States. AWill charge a flat $16 per month plus $.25 a minute. B will charge $25 a month but will reduce the per min. cost to $21.As for C,the flat monthly charge in $18,the cost per minute is $22.I usually make an average of 200 minutes of long distance calls a month.
So we formulate this problems as:-
X_1 =A longest length minutes per month.
X_2 =B longest length minutes per months.
X_3 =C longest length minutes per months.
Y_1= 1 If X_1>0 and 0 if X_1=0
Y_2= 1 If X_2>0 and 0 if X_2=0
Y_3= 1 If X_3>0 and 0 if X_3=0
If $y_j$will equal to 1 if $x_j$is position by using the constraint

$$x_j \le My_{j,} \quad j = 1,2,3,$$

The values of M should be selected sufficiently large so as not restrict to the variables $x_j$artificialy. I make about 200 minutes of calls a month, then $x_j \le 200$ for all j and M = 200. So we write:

$$\begin{aligned} Minimize\, z &= 0.25x_1 + 0.21x_2 + 0.22x_3 + 16y_1 + 25y_2 + 18y_3 \\ s.t. \quad & x_1 + x_2 + x_3 = 200 \\ & x_1 \le 200y_1 \\ & x_2 \le 200y_2 \\ & x_3 \le 200y_3 \\ & x_1, x_2, x_3 \ge 0 \end{aligned}$$

It is shows that j^{th}monthly flat fee will be part of the objective function Z, only if x_j= 0. At the optimum, then the minimization of z, together with the fact that the objective coefficient of Y_J is the strictly positive, will force Y_j to equal zero.

References:

[1] Barnett, A., "Misapplication Review: High Road to glory".Interfaces, Vol. 17 No. 5, PP. 51-54, 1987.

[2] Salkin, H., and K. Mathur, "Foundation of integer Programming, North-Holland," New York, 1989

[3] Taha, H., Integer Programming, "Theory application and computation," Academic Press, Orlando, FL 1975.

[4] A .Geoffrion and R. Marstern, "Integer Programming Algrothms: A framework and state of the Art survey," Management science 18(1972), 465.

[5] Schrijver, A , "Theory of linear and integer programming wiley," New York. 1998.

[6] Wolsey, L., "integer programming," Wiley, New York, 1998.

[7] Nemhauser, G. and L Wolsey, "Integer and combinational optimization," Wiley, New York. 1988.

Post-Optimality Analysis for Optimality and Feasibility

Sarthak Goyal
Teerthanker Mahaveer University, Moradabad

1. Introduction

The optimal solution of the linear programming problem (max z =CX, subject to AX =B, X ≥0) depends upon the parameters (a_{ij}, b_i, c_j) of the problem. The sensitivity of the optimum solution by determining the ranges for the different parameters that would keep the optimum basic solution unchanged. In this paper, we deal with making changes in the parameters of the models and finding the new optimum solution.. "Post optimal analysis" determines the new solution in an efficient way.

The following tables lists the cases that can arise in post optimal analysis and the action needed to obtain the new solution:

Condition after parameters change	Recommended action
(1) Current solution remains optimal and feasible	No further action is necessary
(2) Current solution becomes feasible	Use dual simplex to recover feasibility
(3) Current solution becomes non optimal	Use primal simplex to recover optimality
(4) Current solution becomes both non optimal and infeasible	Use the generalized simplex method to obtain new soluion

1.1 The Role of the Post Optimality Analysis

"Post optimality analysis is conducted after finding the optimal solution to the given LP model and it Basically consists of an analysis what happens if some of the model conditions changes. Post optimality techniques includes

- Sensitivity Analysis
- Shadow Prices
- Re – optimization

"*Sensitivity analysis*" is conducted to determine how the parameters in the model affect the optimal solution and is an important part of post optimality.

"*Re – optimization*" (after post optimality analysis and testing/revising the model) might be conducted in order t provide the decision maker with alternative models and solutions if required.

"*Shadow Prices*" represents the marginal values (effect of the objective function values) of a given limited resource (the b_i values) in the optimization problem.

Theorem:

$$if\ x_j \geq 0, \qquad x_j + \lambda x_j \geq 0, \quad where\ j = 1, 2, ...n$$

$$then, \quad \max_{\substack{j \\ (x'_j \geq 0)}} \left[-\frac{x_j}{x'_j} \right] \leq \lambda \leq \min_{\substack{j \\ (x'_j \leq 0)}} \left[-\frac{x_j}{x'_j} \right]$$

Proof:

Since $x_j \geq 0$, and $x_j + \lambda x_j \geq 0$ we have the following three possibilities-

(i) for those j for which $x_j > 0$, we have

$$\lambda \geq -\frac{x_j}{x'_j} \ or \ \lambda \geq \max_j \left[-\frac{x_j}{x'_j} \right] \qquad (x'_j \geq 0)$$

(ii) for those j for which $x_j' < 0$, we have

$$\lambda \leq -\frac{x_j}{x'_j} \ or \ \lambda \leq \min_j \left[-\frac{x_j}{x'_j} \right] \qquad (x'_j \leq 0)$$

(iii) for those j for which $x_j' = 0$, we have λ as unrestricted.

Thus, from (i) & (ii) , we conclude that λ must satisfy the relationship

$$\max_{\substack{j \\ (x_j \geq 0)}} \left[-\frac{x_j}{x'_j} \right] \leq \lambda \leq \min_{\substack{j \\ (x_j \geq 0)}} \left[-\frac{x_j}{x'_j} \right]$$

If $x_j \geq 0$ for all j, then there is no upper bound. Similarly, if $x_j' \leq 0$ for all j, then there is no lower bound

Changes Affecting Optimality:

This section considers two particular situations that could affect the optimality of the current solution:

(1) Changes in the original objective coefficient:These changes affect only the optimality of the solution. Such changes thus requires recomputing the z row coefficient according to the following procedure.

Example: LP : maximize $z = 5x_1+12x_2+4x_3$

s.t. $x_1+2x_2+x_3 \leq 10$

$2x_1 - x_2+3x_3 = 8$

$x_1, x_2, x_3 \geq 0$

the resulting primal and associated dual problems are thus defined as follows-

Primal	***Dual***
maximize $z = 5x_1 + 12x_2 + 4x_3 – MR$	minimize $w = 10y_1 + 8y_2$
s.t., $x_1 + 2x_2 + x_3 + x_4 = 10$	s.t. $y_1 + 2y_2 \geq 5$
$2x_1 - x_2 + 3x_3 + R = 8$	$2y_1 - y_2 \geq 12$
$x_1, x_2, x_3, x_4, R \geq 0$	$y_1 + 3y_2 \geq 4$
	$y_1 \geq 0$
	$y_2 \geq -M$ (y_2 isunderstricted)

we now show that how the optimal dual values are determined using the two methods described at the

start of this paper.

The starting primal variables x_4 and R uniquely correspond to the duel variables y_1 and y_2. Thus, we determine the optimum dual solution as follow:

Starting primal basic variables	**x_4**	**R**
z – equation coefficient	29/5	- 2/5 + M
original objective coefficient	0	-M
Dual variables	y_1	y_2
Optimal dual values	29/5 + 0 = 29/5	-2/5+M+(-M)=-2/5

The optimal inverse matrix, highlighted under the starting variables x_4 and R

$$optimal\ inverse = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix}$$

The optimal primal variables are listed in the table in row order as x_2 and then x_1. This means that the elements of the original objective coefficients for the two variables must appear in the same order (original objective coefficients) = (coefficient of x_2, coefficient of x_1)=(12,5)

Optimal tables of the primal

Basic	x_1	x_2	x_3	x_4	R	solution
Z	0	0	3/5	29/5	-2/5+M	274/5
x_2	0	1	-1/5	2/5	-1/5	12/5
X_1	1	0	7/5	1/5	2/5	26/5

In a simplex iteration, a left hand or a right hand side column is completed as follows:

$$\begin{pmatrix} constra\,\text{int}\ column \\ in\ iteration\ i \end{pmatrix} = \begin{pmatrix} inverse\ in \\ iteration\ i \end{pmatrix} \times \begin{pmatrix} original\ constra\,\text{int} \\ column \end{pmatrix}$$

$$\begin{pmatrix} x_1 - column \\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} inverse\ in \\ optimal\ iteration \end{pmatrix} \times \begin{pmatrix} original \\ x_1 - column \end{pmatrix}$$

$$= \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

We compute the remaining constraint columns,

$$\begin{pmatrix} x_2 - column \\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} x_3 - column \\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} -1/5 \\ 7/5 \end{pmatrix}$$

$$\begin{pmatrix} x_4 - column \\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 2/5 \\ 1/5 \end{pmatrix}$$

$$\begin{pmatrix} R - column \\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -1/5 \\ 2/5 \end{pmatrix}$$

$$\begin{pmatrix} Right\ hand\ side\ column \\ in\ optimal\ iteration \end{pmatrix} = \begin{pmatrix} x_2 \\ x_1 \end{pmatrix} = \begin{pmatrix} 2/5 & -1/5 \\ 1/5 & 2/5 \end{pmatrix} \times \begin{pmatrix} 10 \\ 8 \end{pmatrix} = \begin{pmatrix} 12/5 \\ 26/5 \end{pmatrix}$$

The optimal values of the dual variables $(y_1,y_2)= (29/5,-2/5)$
These values are used in formula

$$\begin{pmatrix} primal\ z - equation \\ coefficient\ of\ \text{variables}\ x_j \end{pmatrix} = \begin{pmatrix} left\ hand\ side\ of \\ j^{th}\ dual\ constra\text{int} \end{pmatrix} - \begin{pmatrix} right\ hand\ side\ of \\ j^{th}\ dual\ constra\text{int} \end{pmatrix}$$

So this formula used,

Z - Coefficient of $x_1 = y_1 + 2y_2 - 5 = 29/5+(2*-2/5) - 5= 0$

$x_2= 2y_1 - y_2 - 12 = (2*29/5) - (-2/5) -12 = 0$

$x_3= y_1 + 3y_2 - 4 = 29/5+(3*-2/5) - 4= 3/5$

$x_4= y_1 - 0 = 29/5 - 0= 29/5$

Z - Coefficient of $R = Y_2 –(-M) = - 2/5 – (-M)$

$= -2/5 + M$

Notice that formula 1 and 2 calculations can be applied at any iteration of either the primal or the dual problems. All we need is the inverse associated with the (primal or dual) iteration and original LP data.

(2) Addition of a new economic variables to the model.

The addition of a new activity in an LP model is equivalent to adding a new variables. Intuitively, the addition of a new activity is desirable only if it is profitable that is, if it improves the optimal values of the objective function. If new activity satisfies the optimality condition, then the activity is not profitable. Else, it is advantageous to undertake the new activity.

For example: TOYCO recognize that toy trains are not currently in production because they are not profitable. The company wants to replace toy trains with a new product, a toy fire engine to be assembled on the exiting facilities. TOYCO estimate then revenue per toy fire engine to be $4 and the assembly times per unit to be 1 minute on each of operations 1 and 2, and 2 minute on operation 3.now we show the impact of solution.

Let x_7 represent the new fire engine product.Given that

$(y_1, y_2, y_3) = (1,2,0)$ are the optimal dual values, we get reduced cost of $x_7 = 1.y_1 +1.y_2+ 2y_3 - 4$

$= 1*1+1*2+2*0 – 4 = -1$

The result shows that it is profitable to include x_7 in the optimal basic solution. To obtain the new optimum, we first compute its column constraint using formula.

$$x_7\ constra\text{int}\ column = \begin{pmatrix} 1/2 & -1/4 & 0 \\ 0 & 1/2 & 0 \\ -2 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 1/4 \\ 1/2 \\ 1 \end{pmatrix}$$

Thus the current simplex table must be modified as follows:

Basic	x_1	x_2	x_3	x_7	x_4	x_5	x_6	solution
Z	4	0	0	-1	1	2	0	1350
x_2	-1/4	1	0	¼	½	-1/4	0	100
x_3	3/2	0	1	½	0	½	0	230
x_6	2	0	0	1	-2	1	1	20

The new optimum is determined by letting x_7 enter the basic solution in which case x_6 must leave. The new solution is x_1=0, x_2=0, x_3=125, x_7=210,
And z = $1465(verify), which improves the revenues by $115.

References

[1] Nering, E.M and Tucker, "Linear Programming and Related Problems," Academic Press, Boston, 1992.

[2] Hanxen, P. and R.Wendell, " A Note on Airline commuting", Interfaces, vol. 12, No. 1, pp 85-87,1982.
[3] Dantzig, G. Linear Programming and extension, "Princeton University Press," Princeton, N.J., 1963.
[4] Bradley, S., A.Hax, and T.Magnati, "Applied Mathematical Prigramming," Addition Wesley, Reading, MA,1977.
[5] Bazaraa, M., J.Jarvis and H.Sherali, "Linear Programming and network flows," 2nd edition, Wiley, New York, 1990.
[6] iwckar, U., "Introduction to applied optimization," Kluwer Academic Pubishers, Boston, 2003.

A Review on IOT Based Smart Energy Meter

Rahul Verma[1] Suneel Kumar [2] Amit Kumar[3]
Department of Electrical Engineering, TMU, Moradabad, UP, India
[1]rahul.ten1803010@tmu.ac.in[2]suneel.ten1803004@tmu.ac.in [3]amit.ten1803001@tmu.ac.in

Abstract
We are familiar about the fact that a person standing outside our house from the electricity board whose responsibility to take the readings from energy meter and handover the bill to the consumer every month according to the reading we have to pay the bill, the main drawback of this system is that person has to go are by area and take the reading from the meter and generate the bill. Many times in rural areas, the person from electric board takes advantage and scam the uneducated rural people. He claims that he can reduce their bill amount for that he took some money from them as bribe and generate the false bill by taking less reading than the actual reading every month. This leads to a great problem to the consumer when they get the actual bill. To overcome this drawback, we come with an idea of smart energy meter using IOT and Arduino. In this method consumer will get the meter reading on their mobile phone and pay their bill by themselves this method is energy efficient i.e., consume less power and also it is fastest.
Keywords: IOT (Internet of Things)

1. Introduction

When the electricity bills are issued then only we are getting the idea about the power consumption. Bills is distribution only once in a month. So the consumer has no idea about their energy usage during this period of time. If the consumer can check their energy come consumption on their mobile phone day -to- day instead of checking energy meter. In this way he can monitor and manage the energy consumption. The cost and the regular usages of power consumption are informed to the user to overcome the high energy bill usage.

Nowadays, IoT technology is being applied in so many areas like electricity, water, gas, etc. to make our life easy and automated. Automatic Meter Reading(ARM) technology facilitates the evaluation of our energy consumption and analysis the data for billing and payment. This technology having wireless communication which is cheaper than wired medium . In this way, we can reduce human effort needed to record the meter reading which had been recorded by visiting the home individually.

2. Literature review

In the year of 2012, the authors "B. S. Koay, Y. H. Sng, P. H. Chong, P . Shum, X. Y. Wang, and H. W. Kuek" presented a paper titled "Design and implementation of Bluetooth energy meter", in this paper they described such as electronics energy measurement is continuously replacing a new technology of electro mechanical meter instead of existing technology.
In the year of 2011, the authors "Garrab A and Bauallege A" presented a paper titled "A new AMR method in Smart Networks for energy saving based on Smart Meter and partial Power Line Communication". The methodology used was AMR solution provides enhanced continuous application. In this paper they described such as the increasing demand of energy,

one-way communication and the limitations of energy management. The aim of this project is to identify a real time pricing thanks to the proposed communication system. This result is with great interest in economical and low carbon society point of view.

Himanshu K Patel et al., [4] demonstrated Arduino based smart energy meter that removes human intervention in meter readings and bill generation thereby reducing the error that usually causes in India. The system consists the provision of sending an SMS to user for update on energy consumption along with final bill generation along with the freedom of reload via SMS.

3. Proposed Model

Our proposed project has been designed for energy consumption and energy management. This model is cost effective and compact so, installation becomes easier. There is no rotating part in the energy meter system. The process is started with the mains 220 volt AC that is delivered from power line. Line voltage and current are measured by a voltage sensor (ZMPT101B) and a current sensor (ACS712) respectively. These sensors are connected with the microcontroller or Arduino UNO ATmega328P which will measure the current with respect to the load. The different types of power i.e. active, reactive, apparent power can be calculated easily using different mathematical equations. The measured data will be displayed on LCD and transmitted to the android device via Bluetooth module(HC-06) and it will be sent on the mobile phone.

Every second, the microcontroller senses the power calculations and store itself. As per the consumer desire, the message can send to mobile for every 1 hour or 1 day or 1 week. The cost saving is being done, no data tampering & time saving for both he consumers & the energy providers.

4. Methodology

In this paper, we are designing electricity energy meter based on IoT concept. The whole procedure is based on the theArduino Uno ATmega328P. The Internet of Things is the internet operational of physical devices which allows the objects toeexchange data in the system.

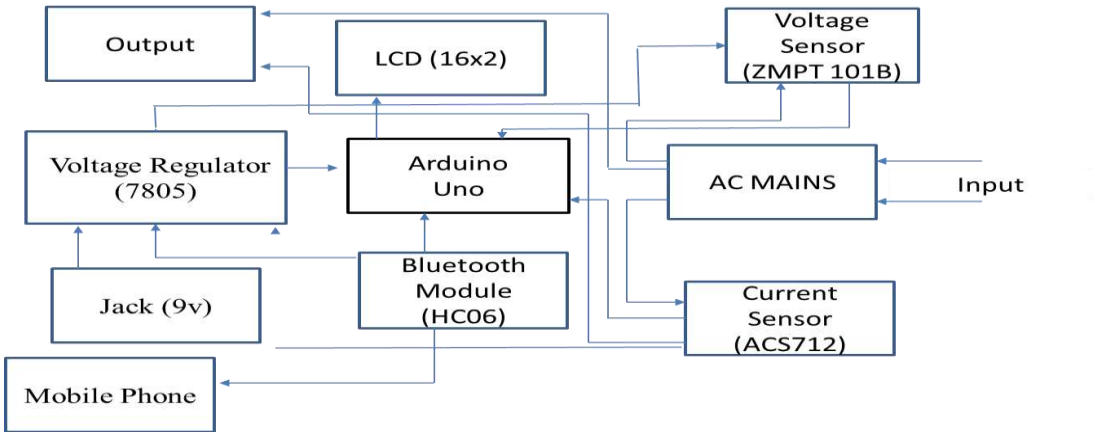


Figure1. Block Diagram of Proposed Model

5. **Overall Circuit**

The main circuit of this project consists of following :

1. Arduino Uno ATmega328P
2. Voltage Sensor (ZMPT101B)
3. Current Sensor(ACS712)
4. Bluetooth Module(HC- 06)
5. Voltage Regulator(7805)
6. LCD(16*2)

6. Result and Discussion

The consumer receives a SMS via Bluetooth Module on the mobile phone. The consumer is aware about the value of daily consumption with the help of this model. He can reduce his consumption. He have better control over the expenditure and manage the energy consumption.

Conclusion

This model provides the wireless meter reading system that can monitor and analyze the data at every interval which provides accurate results with less errors. Here are some merits of this smart energy meter:

- The proposed system eliminates the human involvement.
- Live track record of energy consumption.
- Record of past consumption.
- Fast response, efficient and eco-friendly.
- Consumer can manage their energy consumption time to time.

Reference

[1] Mr. Rakeshkumar D. Modi 1, Mr. Rakesh P. Sukhadia, "A Review on IOT Based Smart Electricity Energy Meter", International Journal For Technological Research In Engineering, Volume 4, Issue 1, 2016.

[2] Pooja D Talwar 1, Prof. S B Kulkarni, "IOT Based Energy Meter Reading", International Journal of Recent Trends in Engineering and Research, ISSN 2455-1457.

[3] Gobhinath.S, Gunasundari.N, Gowthami.P, "Internet of Things (IOT) Based Energy Meter ", International Research Journal of Engineering and Technology (IJERT), Vol 3, Issue 04, 2016.

[4] Anitha.k, prathik, "Smart Energy Meter surveillance Using IoT", Institute of Electrical and Electronics Engineering (IEEE), 2019.

[5] Garrab. A, Bauallegue. A, Ben Abdullah, A new AMR approach for energy savings in "Smart Grids using Smart meter and partial power line communication", IEEE First International Conference on ICICS, Vol 3, pp. March 2012.

Parallel Operation and Energy Enhancement in Renewable Energy Resources

Mohd Tauheed, Mayank Raj
Department of Electrical Engineering
Teerthanker Mahaveer University Moradabad, India
Tauheed.ten1915001@tmu.ac.in[1], *Mayank.ten1803006@tmu.ac.in*[2]

Abstract

Depleted fossil fuel resources and environment concern has increased, renewable energy sources and improving power management technologies has become a very important engineering sector. Using a solar panel or an array of panels or wind turbine without a controller that can perform maximum power point tracking [MPPT] Will often result in wasted power which ultimately result in need to install more panel for more power requirement. For the cleaning of solar panel an automatic system is designed which increases the efficiency of solar panel. This work deals with the design of maximum power point tracker and automatic system of cleaning solar panel in real time hardware implementation of algorithm for solar panel and wind turbine. The algorithm called "Perturb and observe" algorithm has been implemented thereby developing a novel MPPT algorithm.

Keywords: PV (Photo-Voltaic), MPPT (Maximum power point tracking)

1. Introduction

In today's scenario renewable resources like solar and winds are the world's fastest growing energy resources. By using this type of operation there is less emission of pollutants in the environment. Day by day the demand of electricity is rapidly increasing, but the availability of the base load plant are not fulfilling to the supply electricity as per consumers demand. As in India the raw material are depleting rapidly so there is increase in cost of the raw material. In current scenario the petrol and diesel prices are hike to much. So, the government are focussing on renewable energy resources such as parallel operation system like solar and wind energy.

In this thesis parallel operation in renewable resources is studied and simulated as well as implement a design of automatic cleaning system of a solar panel. The entire parallel system comprises of PV and wind system. The PV system is powered by the solar energy which is abundantly available in nature. When the light incident on the PV cell is conducted into the electrical energy which is called as photovoltaic effect. The generated electricity can be used to power a load or can be stored in a battery.

The wind turbine system is used to used to convert wind energy to rotational mechanical energy and this mechanical energy is used to convert to electrical energy using a generator. By the use of the parallel operation system is developed to synchronize the voltage level from the both parallel system and given the output as constant voltage at any condition. Then this voltage level is through a MPPT algorithm to provide maximum power at constant voltage then this power is stored in the battery for supplying the power.

2. Proposed Parallel Operation System

In this system we are converting supply form wind and solar modules and converting them to one single constant voltage output irrespective of variation in input voltage from the modules. This input from modules is fed to microcontroller which in turned determines the voltage level and accordingly switch a DPDT relay which is directly connected with the source. Microcontroller decides whether the input voltage level is higher or lower than preset values

and accordingly relay switch between buck choppers or boost chopper for both the inputs respectively.
In next step we get a constant voltage output which is fed to a MOSFET which act like a chopper coupled with a current sensor. Chopper changes the voltage level to allow rated capacity current to flow into the battery which ensures Maximum power to be transferred. Tis hybrid system is so effective that it can also be used effectively when one of two sources is working.

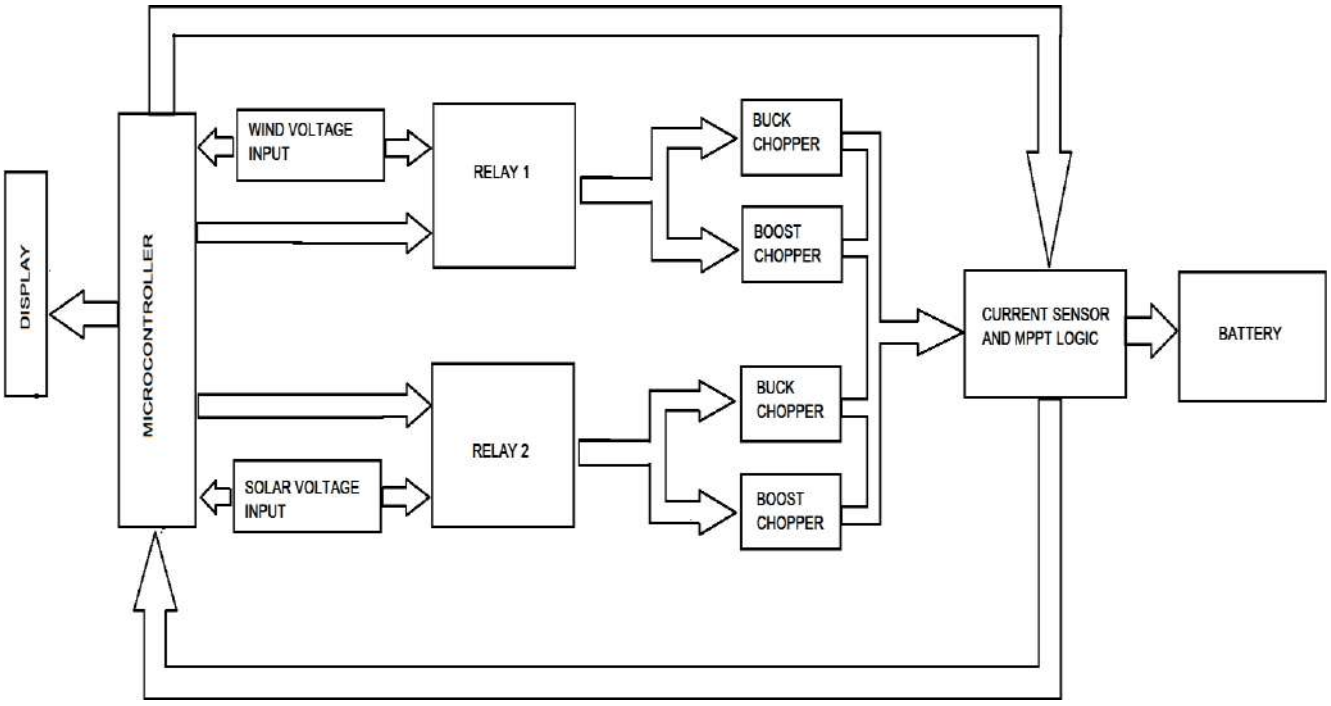


Figure1: Block diagram of proposed system

3. Photovoltaic energy system

Photovoltaic cell is the building block of PV system and semiconductor material such as Germanium and Silicon are the building block of PV cells. When photon heat the surface of solar cell, the electron and holes are generated by breaking the covalent bond inside the atom of semiconductor material and in response electric field is generated by connecting the positive and negative terminal. When these terminals are connected by a conductor an electric current will start flowing. This electricity is used to power a load.
A single cell generates very low voltage approx. 0.4 so more than one PV cell can be connected either in series or parallel to form a PV module. Usually there are 36 to 76 cells in general PV module. We are using having PV module 72 cells.
A photovoltaic array is simply an interconnection of several PV modules in series and parallel.

Algorithms used in MPPT

Two algorithms have been used in our MPPT modelling. The basics of algorithms are given below.

i. One algorithm used to ensure constant output voltage of 15 V irrespective of variation of input voltage from input sources.

• When both input from Wind and Solar input is less than 15 V, both supplies passes through a boost converter which step up their voltage level to 15 V.

• When both input from Wind and Solar input is greater than 15 V, both supplies passes through a buck converter which step down their voltage level to 15 V.
• When one input from Wind or Solar input is less than 15 V, and other is greater than 15 V then the input greater then 15 V from source passes through buck converter and get step down to 15 V and other source which is less than 15 V get step up to 15 V.
• When one of the supply is 15 V then it can be passes through any of the buck or boost module, in our case which is buck module as buck module is connected to NC contacts of relay.

ii. Second algorithm ensures that maximum output power to be delivered to load by switching a MOSFET

• 15 V constant voltage output is obtained from chopper modules it is passes through a current sensor and a MOSFET. Current sensor measures the load current and MOSFET used to switch the duty cycle to obtained maximum power.
• A duty ratio of 50% is taken reference and power this duty is taken as reference power.
• A algorithm is design based on Perturb and Observe method which switches duty cycle which is on time to the time period ratio and takes power output samples at each duty cycle. It checks if a unit increment in duty cycle increases the current output power sample or not if it increases the current output power sample then in next step it increases the duty cycle by a unit again and these loops.
• If at any point unit increment in duty cycle resulted in decrement in a current output power sample from previous output power sample then it decreases the duty cycle by one unit. And this cycle continues and Maximum power point oscillates around actual MPPT.

4. Hardware specification of components

a. ARDUINO NANO

Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is a smallest, complete, and breadboard friendly. It has everything that has (electrically) with more analog input pins and on board +5V AREF jumper. The Nano is automatically sense and switch to the higher potential source of power, there is no need for the power select jumper.

Use In Circuit:

In our circuit Arduino NANO is been used for switching of relay to maintain constant output voltage and to control duty cycle by switching MOSFET

b. LM2596 DC-DC STEP DOWN MODULE

This is an LM2596 DC-DC buck converter step-down power module with high-precision potentiometer for adjusting output voltage, capable of driving a load up to 3A with high efficiency. When the output current required is greater than 2.5A(10W) an external heat sink is suggested.

Use In Circuit

Step down chopper module is used to step down the input voltage from wind or solar module and maintain t at constant 15 V output voltage in case of input voltage is less than 15 V

c. XL6009 DC-DC STEP UP MOULE

Step up chopper module is used to step up the input voltage from wind or solar module and maintaining t at constant 15 V output voltages in case of input voltage is greater than 15 V

d. ACS712 CURRENT SENSOR MODULE

ACS712 current sensor operates from 5V and outputs analog voltage proportional to current measured on the sensing terminals. You can simple use a microcontroller ADC to read the values. Sensing terminal can even measure current for loads operating at high voltages like 230V AC mains while output sensed voltage is isolated from measuring part. Provides up to

3000 VRMS galvanic isolation.

Use In Circuit

Current sensor is used in circuit to measure the output current and to calculate power from output current for MPPT algorithm.

e. JHD 162A LCD 16X2 ALPHANUMERIC DISPLAY

Use In Circuit

To display Solar Panel voltage input, Wind mill voltage input, Load current And Load voltage.

f. 7805 VOLTAGE REGULATOR IC

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels

Use in Circuit:

To supply +5 V to all Vcc of circuit like microcontroller And Current sensor.

g. IRFZ44N N CHANNEL MOSFET

IRF-Z44N basically belongs to the family of Metal Oxide Semiconductor Field Effect Transistor (MOSFET). It is a power MOSFET. There are two types of MOSFET i.e. N-channel and P-channel. IRF-Z44N belongs to the N-channel family. It uses “Trench” technology and is enveloped in a plastic structure. It has very low on state resistance. It has zener diode which provides ESD protection up to 2 kilo-volt. It is a low cost device and provides higher efficiency.

Use in Circuit:

To Change Duty Cycle ratio of output current via command from microcontroller .

h. BC107 NPN TRANSISTOR

BC107 is an NPN bipolar planner low power transistor which is mainly designed for general purpose switching and amplification purpose. It is mainly composed of three terminals named as an emitter, base, and collector .Being a current controlled device, small current at the base side is used to control large current at the emitter and collector side. When a voltage is applied at the base terminal, it gets biased and draws current and starts controlling large current at the emitter and collector side. Bc107 is an important device used for switching and amplification purpose.

To provide signal to relay chopper for switching between step up or step down chopper.

i. 1N4007 DIODE

A diode is a device which allows current flow through only one direction. That is the current should always flow from the Anode to cathode. The cathode terminal can be identified by using a grey bar. We can use this in circuits that are designed for less than 1A.

To block backward flow of current in choppers as at a time among two choppers of Solar or Wind input only one is active at any given instant . so there is a chance of backward flow of current to other chopper, to block such phenomenon diode is used.

j. RESISTORS

Resistance of 2 KΩ, 3.7 KΩ and 1 KΩ are used in our circuit,3.7 KΩ and 1 KΩ are used in series as voltage divider circuit to fed into microcontroller. Two 2 KΩ resistors are used in Base of transistors to limit current in fault case.A 1 KΩ resistor is used in Gate terminal of MOSFET.

5. Conclusion

Project have been successfully built, tested and implemented. Various parameters are observed and found to be providing faithful results under error limits. This project is physically feasible and economically viable for real world implementation.
This automated cleaning system mainly focuses on small system but adding some normal changes in system it can be useful for over large arrays. Our system can be installed on solar street light or also on solar roof top systems. The rack and pinion mechanism is also possible to do this work. Linear actuator system works very smoothly, it is able to achieve the designed parameters.

In this project, the MPPT and charge algorithm which has been burned into the Arduino Nano microcontroller are implemented. The amount of power obtained from the solar panel and wind power generated are displayed on the LCD.This project demonstrate the system's ability to store wind energy and solar energy in the battery and move it to the electricity grid when needed.

REFERENCES

[1] Falah Mustafa, AdeelAndSahb, A. Salam Al-Ammri, Areej Ghazi "Self Cleaning Control System for PV Solar Panel Street Light" 978- 1-4799-7947-9/15, 2015 6th International Renewable Energy Congress (IREC)
[2] Rutvij P. Kulkarni, Mandar A. Kadam, Tushar T. Shinde, Nitin B. Sonone, Prof. Atul D. Atalkar "Automatic Solar Panel Cleaning System" International Journal of Advance Research in Science and Engineering (IJARSE) Volume:07 Issue:07 ISSN: 2319-8354.
[3] Manju B, Abdul Bari, Pavan C M "Automatic Solar Panel Cleaning System" International Journal of Advance in Scientific Research and Engineering (IJASRE), Volume:04, Issue:07, Julay-2018, E-ISSN: 2454-8006
[4] T. Salmi, M. Bouzguenda, A. Gagtli, "MATLAB/Simulink based modeling of solar photovoltaic cell," International journal of renewable energy research, vol.2, no.2, 2012.
[5] S. Meenakshi, K.Rajambal, S. Elangovan "Intelligent controller for stand-alone hybrid generation system," IEEE, May. 2006.
[6] Nabil A. Ahmed, MasafumiMiyatake, "A stand-alone hybrid generation system combining solar photovoltaic and wind turbine with simple maximum power point tracking control," IPEMC 2006, IEEE, 2006.
[7] M. G. Villalva, J. R. Gazoli, "Modeling and circuit based simulation of photovoltaic arrays,"Brazilian power electronics conference (COBEP), 2009.

MAKING OF EARTH RESISTANCE METER AND MONITORING USING ARDUINO

Rahul Jain[1], Pranav Chauhan[2], Shubhanker Sharma[3]
Electrical Engineering Department, TMU Moradabad
rahul85350rj@gmail.com

Abstract

The main object behind making this project i.e. Earth Resistance metre is to measure the value of resistance of Earthing to prevent the casualties from happening and also to save the appliances during the unwanted lightning. This project is made to detect high resistance joints, which is the main cause behind disallowing current to follow that path and forces it to follow the path through the appliances. The Connection of this project with Arduino makes it stand out from the crowd. The Arduino-uno connection with the project makes it Automatic and reliable.

Introduction: -

Safety and precautions are the very basic terms used when we deal with either equipment of Electrical. In Electrical Engineering, high voltages are preferred, which arise a factor of safety of both the human and the appliances. The Earth faults are hazardous and hence need proper earthing to prevent fault current from entering into anybody or metallic object. The purpose of earthing is to minimize the effect of transient voltage that occurred due to a strike of lightning. Nowadays, Electrical equipment safety has been a major concern not only they are costly to buy but also it can harm the person near the appliances.

1. Problem Statement: -

The need to make this project arose when in Early October 2021, government issued the guidelines for the taller building to check the earthing of their premises because the problem of Lightning became common those days due to climate change.

What is a ground and what does it do?

i. Earth grounding: the intentional connection from a circuit conductor, usually the neutral, to a ground electrode placed in the earth.
ii. Equipment grounding: ensures that operating equipment within a structure is properly grounded.

2. Methodology Proposed: -

There are many methods available to measure the value of Earth Resistance

i. Four-point method (Wenner method)
ii. Three terminal methods (falloff potential method
iii. Clamp-on test method
iv. Slope method.

The Fall-of-Potential Method is the most used approach for measuring resistance to earth.

3. Fall of Potential Method: -

To make this project cost efficient and reliable, we have used the **Fall of potential** Method. Fall of Potential Method uses three electrodes i.e. an Earth electrode, a voltage probe and a Current probe. The three electrodes are grounded and the distance between them is kept as

Depth of Ground Electrode	Distance of Inner electrode	Distance of Outer Electrode
2 metre	15 metre	25 metre
3 metre	20 metre	30 metre
6 metre	25 metre	40 metre

Table: - 1

Basic Structure of Fall of Potential method: -

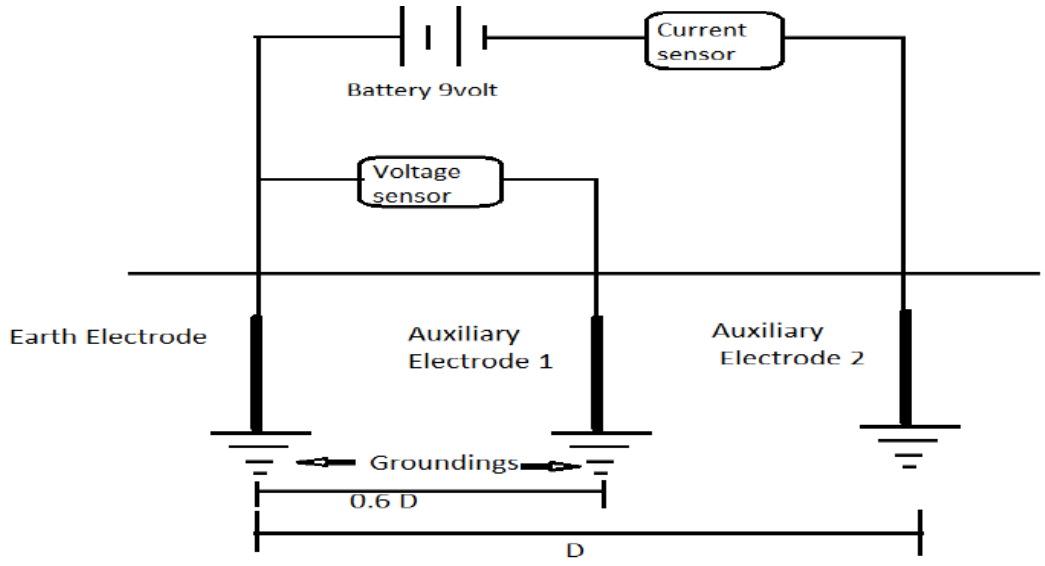


Figure: 1 - Fall of Potential Method Basic Structure

Other than the above distances, there are some variables which also affects the value of Earth Resistance metre in abundance, namely: -

i. The composition of the soil

ii. The moisture content of the soil

iii. The temperature of the soil

iv. The depth of the electrode

4. Components: -

Arduino-uno establishes connection between wi-fi module, current sensor (ACS712) and voltage sensor. It gets connected to our mobile phones by using the blink app.

The Wi-fi module (ESP8266) is basically used to establish a link between the entire components of project to blink app, which gives the final result to our system.

5. FLOW CHART: -

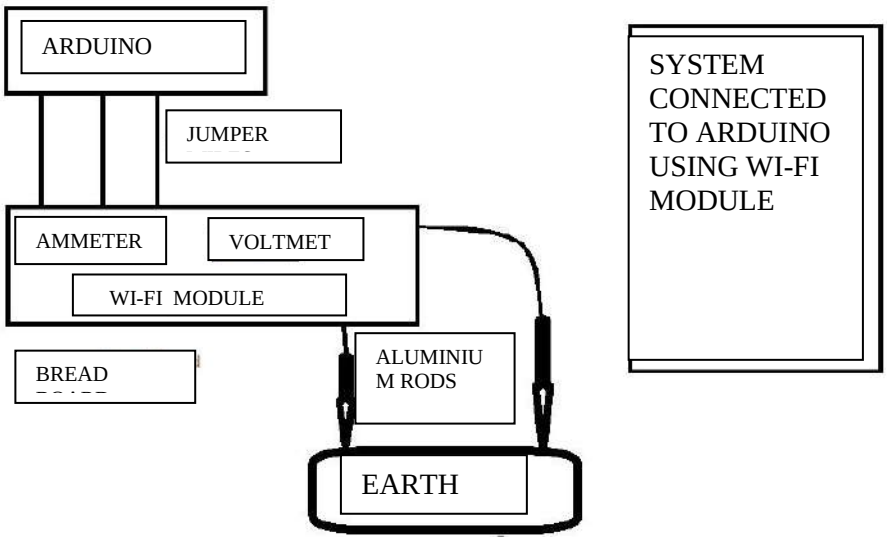


Figure: 2 – Flow Chart of Connections

6. Use of Salt solution: -

Salt is not a good conductor of electricity, but salt solution is a good conductor. Salt maintains moisture and charcoal gives good conductivity causes earth point/pit in good electrical conductivity place.

Image: 1 -Arduino Uno &Wi-fi Module

7. Coding: -

```
#include<stdio.h>
#include<conio.h>
void main(){
int Volt, Current, div;
printf("Enter first number - ");
scanf("%d",&Volt);
printf("Enter second number - ");
scanf("%d",&Current);
```

```
div = volt / Current;
printf("The divison of numbers %d and %d is %d",volt,current,div);
getch();
}
```

8. Method: -

The method involves injecting a current into the ground at a distance from the grounding system under test, and then measuring potential at different points between the grounding system and injector electrode. Further, the value of generated current is measured and finally Ohm's law comes into the picture.
Ohm's law led to our concept of resistance and the unit of an ohm for measuring it. If we apply a potential difference to any conductor and measure the current that results, the resistance of the conductor is the voltage drop divided by the current.

R(ohms) = V(volts)/I(amperes)

9. Accuracy: -

Accuracy is a major factor while designing any project. To get the better results from this project, repositioning of the inner probe is preferred. Even sometimes, the distance is also increased between all the three probes until the measured value remain almost constant.

10. Results: -

Ideally a ground should be of zero ohms resistance.

There is not one standard ground resistance threshold that is recognized by all agencies. However, the NFPA and IEEE have recommended a ground resistance value of 5.0 ohms or less.

11. Conclusion: -

The combination of all the components constitutes the Earth Resistance Meter with automatic measuring the value and providing the results on our device through the blink app. The major objective of this project was to reduce human intervention in both the value measurement and repeatedly connecting the meter through the Earthing strip.

References: -

[1] Maoheng Jing , Xishan Wen , HanshengCai , Yun Teng , Shangmao Hu , Yi Zhang , Lei Lan , And Hailiang Lu , (Member, IEEE) School of Electrical Engineering and Automation, Wuhan University, Wuhan 430072, China and Electric Power Research Institute, CSG, Guangzhou 510670, China

[2] Earthing in Electrical Network. Retrieved December, 19th 2011, from, https://electrical-engineering-portal.com/earthing-in-electrical-network-purpose-methods-and-measurement

[3] Fall of Potential Measurement. Retrieved from, https://www.fluke.com/en-in/learn/blog/grounding/earth-ground-fall-potential

[4] Why Charcoal and Salt is used in Earthing. Retrieved from, https://www.answers.com/physics/Why_charcoal_and_salt_is_used_in_earthing

[5] American Journal of Applied Sciences 5 (10): 1313-1317, 2008.. Retrieved from, https://www.researchgate.net/publication/26516898_Validation_of_the_Calculation_and_Measurement_Techniques_of_Earth_Resistance_Values/link/004635263121e575b1000000/download

[6].An introduction to Fall of Potential Method, August 20th, 2020 by Lorenzo Mari, Retrieved from, https://eepower.com/technical-articles/an-introduction-to-the-fall-of-potential-method/#

Design of Vertical Axis Wind Turbine

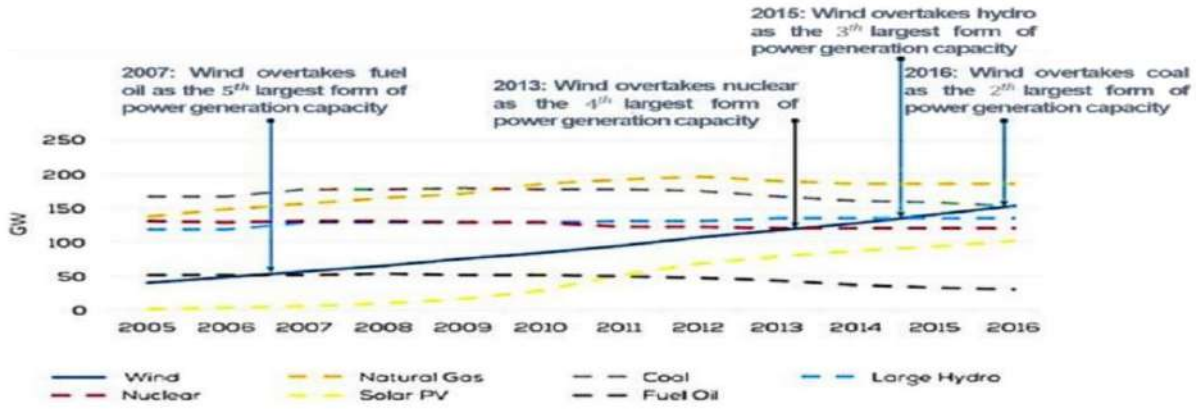
Prince Chauhan[1], Aniket Kumar[1] ,Rishabh kamboj[1] , Arun Gupta[1*]
Department of Mechanical Engineering,
Faculty Of Engineering and Computing Sciences,
Teerthankar Mahaveer University, Moradabad, India.
prince.ten1804013@tmu.ac.in, aniket.ten1804005@tmu.ac.in, rishabh.ten1804015@tmu.ac.in , arun.engineering@tmu.ac.in

Abstract* -There are two technologies of wind Turbine. One is the horizontal-Axis wind turbine which dominates the market of wind farms since the Horizontal-Axis wind turbine has a higher energy Transfer efficiency. Another vertical-Axis Wind Turbine, The paper discusses the historical evolution of the lift-type Vertical-Axis Wind Turbine. Since its inception in the early 1930, The Vertical-Axis Wind Turbine no development until the early 1970, When engineers Canada and the USA began to study VAWT design as a source of generating electricity. Vertical-Axis Wind Turbine power generation equipment can be placed at ground level, which is easy for maintenance. Also Vertical-Axis Wind Turbine are Omni-direction, means they don't needs to be direction of the wind to produce power. The last developments in the floating Vertical-Axis Wind Turbine technology and attempts to commercialise this technology have been documented.

Keywords—Wind energy, Energy generation, VAWT.

1. INTRODUCTION

It has been witnessed, in recent years, that the world-wide problem of energy storage and environmental pollution is popularizing the use of clean and renewal energy in power generation industry. Today, significant attention is drowning to utilizing wind power to avoid using fossil fuels for electric power generation. Wind power uses the power of wind air flow through wind



turbines to mechanically generate electric power. The wind turbine system produced the electrical energy from the wind speed after converting it to mechanical energy by the generator.

In this paper, the first part show a statistic about wind turbine installment in the world and briefly in Tunisia. In second part, we present a comparison between horizontal and vertical axis wind turbine and generator types are presented. finally, some comparisons of different generators of wind system are shown.

2. WIND TURNINE IN WORLD

The focus on energy generation from Renewable Energy Resources has enhanced considerably within the recent years within the wake of growing environmental pollution, rising energy demand and depleting fuel resources. completely different sources of renewable energy embody biomass, solar, geothermal, electricity, and wind energy. Among these resources wind has verified to be a less expensive energy resource and therefore intensive analysis efforts are place to enhance the technology of electricity generation through wind energy.

Faced this problem, it is necessary to find other sources of energy that are non-polluting, safe for people and environment. The majority of the countries of the world are engaged in the development and use of renewable energy: solar, wind, biomass. Currently, one of the most in demand for the production of electric energy is the wind energy. Statistics show in fig. Prove that wind power insallation is soaring towards leading the path too electrical power production. From 2000, the growth rate is stable. Expect 2013, the annual net growth capacity is amplifying and results in a stunning 63,467 MW installment in 2015.

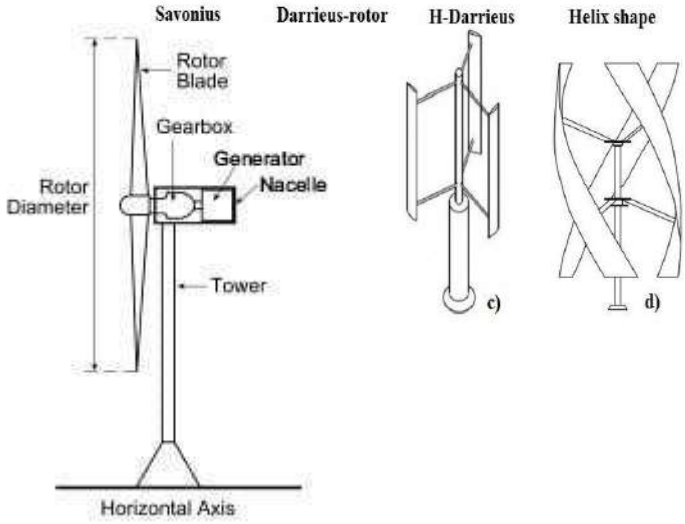
3. COMPARASION BETWEEN HORIZONTAL AND VERTICAL AXIS WIND TURBINE

A great degree of design versatility is available in wind turbines designs configuration. The horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT) are mainly used fir energy extraction. The HAWT is mainly used in large scale applications that'swhy its implementation is a concern due to huge installment set up and initial cost. Whereas VAWT are the solution for smaller areas or medium sized residential space.

.

A. Horizontal Axis Wind Turbine

He horizontal axis wind turbine(HAWT) is a wind turbine in which the main rotor shaft is pointed



in the direction of the wind to extract power. The rotor receives energy from the wind and produces a torque on a low-speed shaft. The low-speed shaft transfer energy toa gearbox, high speed shaft, and generator, which are enclosed in the nacelle for protection. Notice how the blades are connected to the rotor and To the shaft. This shaft is called the low speed shaft because the wind turns the rotating assembly at a 10 to 20 revolutions per minute (rpm) typically

4. Design of Horizontal Axis Wind Turbine

The low –speed shaft connects to the gearbox, which has a set of gears that increase the output speed of the shaft to approximately 1,800 rpm from an output frequency of 60 hz (or a speed of 1500 rpm if the frequency is 50 Hz. For this reason the shaft from the gearbox is called high-speed shaft.

The high speed shaft is then connected to the generator, which converts the rotational motion to AC voltage. This speed is critical of it is used to turn the generator directly because the frequency of the ac from the generator is related directly to the rate at which it is turned.

The HAWT is the favorite configuration of turbine for electrical generator. If is the most commune The horizontal axis wind turbine is broadly to increase production volume, which requires considerable investment and takes up more speed for installation compared with VAWT.

B. Vertical Axis Wind Turbine

The VAWTs are used for domestic purpose and low volume of production. They are classified according to their aerodynamiccharacteristics in two families the aerodynamic designed on the basis of the lift (Aero generators with rotor of Darrieus: designed by the French engineer George Darrieus) and those based on the drag (Aero generator with the rotor of savonius: invented by the finish siguardSavonius in 1924). The rotational axis is perpendicular to the wind direction or the mounting surface. The main advantage is the Generator in on ground level, therefore more accessible and does not need a yaw system.

5. MAJOR DIFFRENCE BETWEEN HAWTs AND VAWTs

FACTOR	VAWT	HWAT
Power generation efficiency	50-60%. Less wind flow usage and partial blades are in operation	>70%. More wind flow usage and all blades are in operation. Less aerodynamic loss.
Blade Rotation speed	Quite small. Lower weight of the blade.	Quite large. Heavy weight of the blades.
Vibration Levels	Low. Symmetricity to the shaft.	High. Heavy blades on one end of the shaft.
Noise	0-10db. Due to low vibration level.	5-60db. Due to high vibration level.
Required Wind Speed	Low. Because of the lower weight of the blades.	Strong. Because of the heavy weight of the blades.
Starting Wind Speed	Fair. Because of the lower weight of the blades.	Strong. Because of the heavy weight of the blades.
Wind Direction	No effects. Can operate with wind from any direction.	Sensible. Has to turn around and fact to the wind direction. Sensible. Has to turn around and fact to the wind direction.
Effect on Environment	Small. Rotation area is small. Lower noise	Large. Rotation area is huge. Higher noise there is design and manufacture standard. There height makes them obtrusively visible across, disruption the appearance of the landscape.
Commercial Availablility	Low. Has no standard.	High
Installation cost	Low. Major equipment is near ground.	High. Major equipment is on the tall tower. Massive tower construction is required to support the near blades, gearbox, and generator.
Maintenance cost	Low. Major equipment is near ground.	High. Major equipment is on the tall tower.

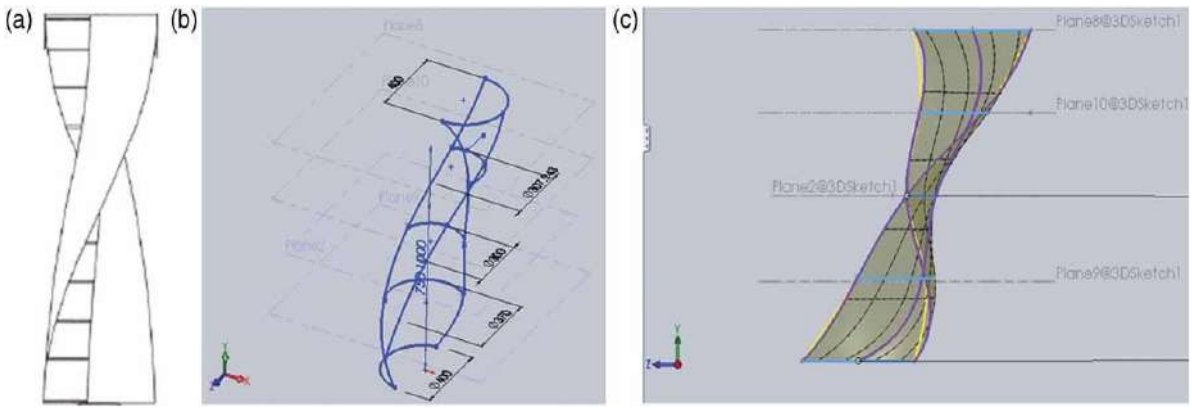
6. WHY CHOOSE THE VERTICAL AXIS WIND TURBINE

The Vertical Axis Wind Turbine is awind power generation to design that puts the main rotor shaft transverse to the wind. In a VAWT design, there is no need for pointing mechanisms as the blades are omni-directional, meaning they catch the wind regardless of direction without needing to reorient the turbine blades.A vertical-axis wind turbine is a part of wind turbine where the main rotor shaft is set transverse to the wind while the main components are located at the base of the

turbine. This arrangement allows the generator &gearbox to be located close to the ground, facilitating service and repair. The design intended that the turbine should have low cut-in wind speed, and can be easily moveable. The machine should be capable of harnessing energy from the non-directional wind at low cut-in speed, which makes it a better choice for many urban applications. Fig. 1 shows a view of the proposed turbine blades and support system. The blades were attached to the hub with the help of three steel bars, and each bar is welded to the center to provide stability to the design. The blade was fabricated from flattened trapezoidal profiled galvanized (GI) steel sheet of equal dimensions. A 12 gauge GI sheet has been chosen due to inherent material properties, viz. good tensile and compressive strength, rugged, high stiffness to weight ratio, good resistance to corrosion, and durability. The mild steel is used for the hub, which is connected to the main shaft. The main shaft is also made of a mild steel rod. The shaft is passed through the two bearings and connected to the shaft of the generator with the help of a coupling arrangement. The generator is rested on the wooden base, which is supported by the three steel bars on the ground. The shaft is connected to an AC permanent magnet generator produce the electrical output. An electrical converter is used to convert low voltage AC into high-quality DC power forbattery charging. The rectifier provides a constant voltage at the battery terminal. The other parts of the machine are a mechanical shaft, stator, two magnet rotors, and a rectifier. The electrical outputs were measured by transducers and subsequently fed to the dump load . The current and voltage were recorded with high accuracy at the outlet of the rectifier, and an anemometer was used for the measurement of wind speed. The accuracy of measured power was estimated 0.5%, whereas the accuracy of anemometer was taken from the product specifications (3%).

7. BLADE DESIGN

Thedesignofbladewasexecutedintoa3Dsketch(Fig.). First, the sketch was divided into five parts,each part have a different twist angle from top to thebasereaching180°.The blade structure is base on semi-circles which give the diameter in each section such diameter change as are approximate to blade center. The structure is symmetrical from the center to the ends but with opposite direction. Once the structure was established, the blade surface was created by the lofted surface tool using splines to delineate and with 1m height. The top and the base are 1 diameter separate eachother respect the axis.



Theturbinehastwoidenticaltwistbladeswitha180°torsion (Fig.). Both blades are placed facing awayfromeachothertohave360°ofsweeparea(Fig.)to then be assembled on a 1.5 m steel shaft. The bladesassemble was carried out by holding the ends of eachblade on the shaft, base and top of each blade with thesame extremes of the other but in opposite directions

8. CONCLUSION

the current attempt, solidity, number of blade, chord length of blade etc. are the basic design consideration for design and development. After the input design parameters, the conceptual model was designed in software. All the efforts were made to develop the model which can generate the output even at low wind speed. Parts were developed and fabricated with light materials. The magnets are used to increase the starting torque by using the repulsive force. Finally, the testing of the model was the main area towards the success of project and outcome of the project of input decided while designing and development of the product. In the current attempt, self-starting speed is of 4.0 m/s, which is much lower. Also turbine is in motion once it starts even after the speed is less than 4.0 m/s. This is due to the repulsive force of magnets used. The simplicity in construction, design and assembly of the vertical axis wind turbine can be very popular in the residential as well as industrial application to generate electricity with the aid of non-renewable energy source can be very much popular to provide free electricity to provide illuminations, battery charging etc. the constrained in the wind turbine is the continuous non availability of the wind energy source. But based on the available wind energy source the generated electric energy can be stored in battery and inverter charging and the charged battery energy source can be utilized later on in need. A continuous study, analysis, experimentation and trials are to be carried out by all human researchers and domestic and industrial effort. The calculated power obtained up to 40w. The turbine efficiency was calculated approximately as up to 30%. The power development and efficiency can be work out for optimization by constructing different aspect ratio VAWT.

REFERENCES

[1]. *Prof. Sunil Shukla, Dr. P. K. Sharma , Suryabhan A. Patil* - A Review Paper on Vertical Axis Wind Turbine for Design and Performance Study to Generate Electricity on Highway; *Department Mechanical Engineering, NIIST,* International Journal of Advance Engineering and Research Development, (2016)

[2]. *WenlongTian, Zhaoyong Mao, Xinyu An, Baoshou Zhang , Haibing Wen* - Numerical study of energy recoveryfrom the wakes of moving vehicles on 2 highways by using a vertical axis wind turbine (2017).

[3]. *Samir J. Deshmukh, SagarCharthal* – Design and Development of Vertical Axis Wind Turbine; *Department*
Mechanical Engineering in Prof. Ram Meghe Institute of technology & Research (2017)

[4]. *ShubhamNandurkar, TirthrajLonare,mVaishnaviFulzele, PranayBagde* -Design and Fabrication of VerticalAxis Wind Turbine with Magnetic Repulsion, *Department of Mechanical Engineering,* GondwanaUniversity,Goverment College of Engineering, Chandrapur, India (2018).

[5] .*Brian Handa , Andrew Cashman* - Aerodynamic modeling methods for a large-scale vertical axis wind turbine: comparative study;*Department of Mechanical, Biomedical and Manufacturing Engineering*, Cork Institute ofTechnology, Cork, Ireland (2018)

[6].*Dowon Han, Young Gun Heo, NakJoon Choi, Sang Hyun Nam, Kyoung Ho Choi and Kyung Chun Kim* - Design,Fabrication, and Performance Test of a 100-W Helical-Blade Vertical-Axis Wind Turbine at Low Tip-Speed Ratio, (2018).

[7]. Seyed*HosseinHezaveh, ElieBou-Zeid,JohnDabiri, Matthias Kinzel, Gerard Cortina, Luigi Martinel* -Increasing the Power Production of Vertical-Axis Wind-Turbine Farms Using Synergistic Clustering (2018).

[8]. *Mahdi Abkar* -Theoretical Modeling of Vertical-Axis Wind Turbine Wakes*; Department of Engineering*, Aarhus University(2019).

S & T Review - An International Journal of Science and Technology
Bi-Annual Referred Journal

Guidelines to Authors

S & T Review invites original research and review manuscripts not submitted for publication elsewhere. The Journal considers all the manuscripts on the strict condition that they have been submitted only to the Journal, that they have not been published already. It is mandatory on the part of the corresponding author to furnish the certificate of copy right at the time of submission of the manuscript.

Certificate of Copyright

Copyright in the text and illustrations of the paper titled:

.....

.....

by (Author(s) name):

.....

to be published in S & T Review- An International Journal of Science & Technology has been transferred to the Teerthanker Mahaveer University, Moradabad. I confirm that proper citations to the previously reported work have been given and no data/tables/figures have been quoted verbatim from other publication without giving due acknowledgement and without the permission of the auther(s). The paper is the original work of the author. It has not been published earlier and has not been sent for the publication elsewhere. All copyright requirements in respect of the material used directly or indirectly in the paper have been duly met.

Signature: **Date:** **Place:**

Copyright Agreement

Licensing Agreement is required for all papers. This should be posted or mailed (scanned copy) at mail Id drsrali.engineering@tmu.ac.in.

Signature(s) and name(s) of author(s)

The copyright of the paper will be transferred from the author to the publisher. One original copy should be submitted to the editor. The manuscript, after referees acceptance will be sent back to the corresponding author along with referees comments. For resubmission, the revised version of the manuscript using word processing software such as MS Word or PDF files, or as an attachment to e-mail should be submitted to the editor.

Preparation of the Manuscript

Manuscripts should be typed in single spaces (11 pt, Times New Roman font) on A4 paper size. All pages should be numbered consecutively. Use SI units, and give equivalent SI units in parenthesis, when the use of other units is unavoidable. Symbols should be according to standard guidelines.

Title Page

The first page should contain a concise and comprehensive title, the names and adresses of the authors and contact details of the corresponding author (e-mail). Title must be in 18 pt regular font.

Short Running Title

The title should be a brief phrase describing the contents of the paper not exceeding of 70 characters.

Author(s)

Names of the author(s) be typed in first letter capital (11 pt)

Address(es) of Author(s)

Adresses of the institution(s) where he/she/they are working must be written in 10 pt. and e-mail adress in 9 pt.

Main Headings

Each manuscript should be divided into the following main headings (typed in bold, first letter capital, on the left hand side of the page; 12 pt. with spacing 12 pt before and after): Abstract, Introduction, Materials and Methods, Results, Discussion, Acknowledgement, References. If the result and Discussion sections are combined, a conclusion section should be added.

Sub-Headings

Typed flush left, bold and first letter should be in capital (11pt with spacing of 9 pt before anf after)

Abstract

A self contained abstract (200-300 words) outlining in a single paragraph covering aim, scope, results and conclusions of the paper must be supplied. It should be brief, typed in normal 10 pt.

Key Words

There should be at least four or five keywords indicating the content of the manuscript. There

should be a spacing of 10 pt before and after.

Tables

Only MS word table format should be used for preparing tables. Do not use tabs and spaces. Do not break contents of a cell across multiple cells. Cell entries should be clearly belong to a specific row and column. Tables should be prepared using a roman font; italic and bold should not be used for emphasis. Tables should number using arabic numerals, they should be cited in numerical order in th text. Titles should identify the table as briefly as possible. Headings should identify the column as briefly as possible

Figures captions

Figures must be numbered using arabic numerals, graphics should be prepared using applications capable of generating high resolution GIF, TIFF,JPEG or Power Point before pasting in the microsoft Word manuscript file. Figures captions must be in 10pt regular font.Captions of a single line must be cantered whereas multi-line captions must be justified. Captions with figure numbers must be placed after their associated figures. Photostat copies and dot matrix prints will not be accepted.

Mathematical equations

In case of papers dealing with mathematical analysis, please try to ensure all symbols are defined in the text. All equations should be numbered in consecutive arabic numbers numbers written in parentheses that are aligned on the right side of the page, with the equations centered on the page. Reference of equations may be referred as equation (1), equation (2)-(4) in the text. Subscripts and superscripts that are lables should not be in italics. Always use the standard symbols for the representation of different variables.

References

References should be listed at the end of the mauscript in the order of their citation in the body of the text. Refrences should be cited in the text in arabic numerals as superscript enclosed within parenthesis. Latest reputed journal articles, books with latest edition must be reffered and those The following format of references may be consulted.

Research papers

1. M. Hasegawa, S.furutani, S.Doki and S.Okuma, " Robust vector control of induction motors using full- order obeeserver in consideration of core loss, "IEEE Transactions on Industrial electronics, vol.50, no.5, 2003, pp. 912-919.

Books & proceedings of confrences

2. B.k.Bose, " power electronics and AC Drives, " englewood cliffs, Prentice Hall, New Jursey, 1986
3. T. Niknam, A.M. Ranjbar, and A.R. Shirani, " impact of distribusted generation on the volt/varcontrol in distribution networks," in Proc. of IEEE Bologna Power Tech Conf., bologna, Italy, Jun. 2003, vol.3,pp. 1-7

Thesis & Dissertation

4. A.Ahmed, Aeration by plunging Liquild jet. Ph.d. thesis, Lough borough University of technology, Leicestershire, UK, 1974

Patent

5. K.Miwa, S.maed and Y.Murata, "Purification of stevioside by electrolysis", Kokai Tokkyo, Japan, 79 89, 066 (1979)

Peer review

The manuscripts which require the peer review from author side as per the recommendations of reviewers will be sent back along with reviewers' comments to the corresponding author. It should be checked carefully and the modified manuscript should be submitted within ten days of receipt. No page proofs will be sent to author(s).

Multiple Submissions

It is clear policy of the Journal not to consider manuscripts that have been previously submitted to other journals.

SUBSCRIPTION FORM

S & T REVIEW - AN INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLOGY
FACULTY OF ENGINEERING & COMPUTING SCIENCES
TEERTHANKER MAHAVEER UNIVERSITY, MORADABAD, UP, INDIA

Subscription Charges

Students/ Research Scholars/ Alumni (one year: 2 issues)	**500/-**
Institutions/Corporate (one year: 2 issues)	**1000/-**

We are interested in subscribing the Journal **S & T Review - An International Journal of Science & Technology.** A BankDraft/ Chque bearing number.....dated..... for Rs. .....drawn in favour of Teerthanker Mahaveer University, Moradabad, payable at Moradabad towards the subscription is enclosed.

Name.....

Mailing Adress.....

City.....PIN/ZIP.....Country.....

Phone No.....mobile no.....Fax.....

E-mail.....

Signature and date

Mail to:
Prof. (Dr) R. K. Dwivedi [Principal & Director, FoE & CS, TMU]
Editor-in-Chief
S & T Review - An International Journal of Science & Technology
Faculty of Engineering & Computing Sciences
Teerthanker Mahaveer University
NH-24, Moradabad- 244001, U.P., India
Emial Id: principal.computers@tmu.ac.in

Placement@FOE&CS

To actively reach out to the corporate world for facilitating the best placements for TMU graduates, a full-fledged department, T&P Cell is maintained. This department has evolved a well designed concept of achieving this objective by closely working with the three stakeholders -- the students, the companies, and the university. Before bringing students and the companies face to face, the students are provided a number of services to groom them for enhancing employability.

2600+ • Students Placed • Entrepreneur • Higher Studies	**70+** Companies Visited	**28 LPA** Highest Package Offered	**82%** Placement	**23000+** Alumni worldwide

TEERTHANKER MAHAVEER UNIVERSITY

Faculty of Engineering & Computing Sciences

Delhi Road, Moradabad, Ph. 0591-2476805, 2360500

Mob. : 9568516000, 9568517000, 7351418000

9568316000, 9568317000

E-mail : principal.computers@tmu.ac.in

admission@tmu.ac.in,

Website : www.tmu.ac.in

Toll-Free-No.: 1800-270-1490