Advances in Intelligent Systems and Computing 906

N. R. Shetty
L. M. Patnaik
H. C. Nagaraj
Prasad Naik Hamsavath
N. Nalini *Editors*

Emerging Research in Computing, Information, Communication and Applications

ERCICA 2018, Volume 2

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ERCICA 2018

The Fifth International Conference on "Emerging Research in Computing, Information, Communication and Applications," ERCICA 2018, was held during July 27–28, 2018, at the Nitte Meenakshi Institute of Technology (NMIT), Bangalore, and organized by the Departments of CSE and MCA, NMIT.

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Preface

The Fifth International Conference on "Emerging Research in Computing, Information, Communication and Applications," ERCICA 2018, is an annual event organized at the Nitte Meenakshi Institute of Technology (NMIT), Yelahanka, Bangalore, India.

ERCICA aims to provide an interdisciplinary forum for discussion among researchers, engineers and scientists to promote research and exchange of knowledge in computing, information, communication and related applications. This conference will provide a platform for networking of academicians, engineers and scientists and also will enthuse the participants to undertake high-end research in the above thrust areas.

ERCICA 2018 received more than 400 papers from all over the world, viz. from China, UK, Africa, Saudi Arabia and India. The ERCICA Technical Review Committee has followed all necessary steps to screen more than 400 papers by going through six rounds of quality checks on each paper before selection for presentation/publication in Springer proceedings.

The acceptance ratio is only 1:3.

Bangalore, India
July 2018

Prasad Naik Hamsavath
N. Nalini

Acknowledgements

First of all, we would like to thank Prof. N. R. Shetty who has always been the guiding force behind this event's success. It was his dream that we have striven to make a reality. Our thanks to Prof. L. M. Patnaik, who has monitored the whole activity of the conference from the beginning till its successful end.

Our special thanks to Springer and especially the editorial staff who were patient, meticulous and friendly with their constructive criticism on the quality of papers and outright rejection at times without compromising the quality of the papers as they are always known for publishing the best international papers.

We would like to express our gratitude to all the review committee members of all the themes of computing, information, communication and applications and the best-paper-award review committee members.

Finally, we would like to express our heartfelt gratitude and warmest thanks to the ERCICA 2018 organizing committee members for their hard work and outstanding efforts. We know how much time and energy this assignment demanded, and we deeply appreciate all the efforts to make it a grand success.

Our special thanks to all the authors who have contributed to publishing their research work in this conference and participated to make this conference a grand success. Thanks to everyone who have directly or indirectly contributed to the success of this conference ERCICA 2018.

Regards
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About the Conference

ERCICA 2018

The Fifth International Conference on "Emerging Research in Computing, Information, Communication and Applications," ERCICA 2018, is an annual event jointly organized by the Departments of CSE and MCA during July 27–28, 2018, at the Nitte Meenakshi Institute of Technology (NMIT), Yelahanka, Bangalore, India.

ERCICA 2018 is organized under the patronage of Prof. N. R. Shetty, Advisor, Nitte Education Trust. Dr. L. M. Patnaik, Technical Advisor, NMIT, and Dr. H. C. Nagaraj, Principal, served as Conference Chairs, and Program Chairs of the conference were Dr. Prasad Naik Hamsavath, Professor and Head, MCA, and Dr. N. Nalini, Professor, CSE, NMIT, Bangalore, Karnataka.

ERCICA aims to provide an interdisciplinary forum for discussion among researchers, engineers and scientists to promote research and exchange of knowledge in computing, information, communication and related applications. This conference will provide a platform for networking of academicians, engineers and scientists and also will enthuse the participants to undertake high-end research in the above thrust areas.

For ERCICA 2019, authors are invited to submit the manuscripts of their original and unpublished research contributions to ercica.chair@gmail.com (ERCICA Web site: http://nmit.ac.in/ercica/ercica.html). All the submitted papers will go through a peer review process, and the corresponding authors will be notified about the outcome of the review process. There will be six rounds of quality checks on each paper before selection for presentation/publication. Authors of the selected papers may present their papers during the conference.

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About the Editors

Prof. N. R. Shetty is the Chancellor of Central University of Karnataka, Kalaburagi, and Chairman of the Review Commission for the State Private University Karnataka. He is currently serving as an advisor to the Nitte Meenakshi Institute of Technology (NMIT), Bangalore. He is also founder Vice-President of the International Federation of Engineering Education Societies (IFEES), Washington DC, USA. He served as Vice Chancellor of Bangalore University for two terms and President of the ISTE, New Delhi for three terms. He was also a member of the AICTE's Executive Committee and Chairman of its South West Region Committee.

Prof. L. M. Patnaik obtained his Ph.D. in Real-Time Systems in 1978, and his D.Sc. in Computer Systems and Architectures in 1989, both from the Indian Institute of Science, Bangalore. From 2008 to 2011, he was Vice Chancellor of the Defense Institute of Advanced Technology, Deemed University, Pune. Currently he is an Honorary Professor with the Department of Electronic Systems Engineering, Indian Institute of Science, Bangalore, and INSA Senior Scientist and Adjunct Professor with the National Institute of Advanced Studies, Bangalore.

Dr. H. C. Nagaraj completed his B.E. in Electronics & Communication from the University of Mysore in 1981, his M.E. in Communication Systems from P.S.G College of Technology, Coimbatore in 1984. He was awarded Ph.D. (Biomedical Signal Processing and Instrumentation) from Indian Institute of Technology Madras, Chennai in 2000. Dr. Nagaraj has teaching experience spanning more than 35 years. He was the Chairman, BOS of IT/BM/ML of Visvesvaraya Technological University, Belagavi for 2010–13 and Member, Academic Senate of VTU for 06 years w.e.f. April 2010. Further extended for a period of three years w.e.f 02-06-2016. He has the credit of publishing more than 40 technical papers and has also published a book-"VLSI Circuits", Star-Tech Education, Bangalore in 2006. He has won the Best Student Paper Award at the 5th National Conference of Biomechanics held at I.I.T. Madras, Chennai in 1996 and Best Paper Award at the Karnataka State Level Seminar on "Introduction of Flexible System in Technical

Education" under Visveswaraiah Technological University in 1999 at P.E.S. Institute of Technology, Bangalore. Presently, he is the Dean, Faculty of Engineering, Visvesvaraya Technological University Belgaum, for three years from 2016 to 2019 and Member of the Court, Pondicherry University. He is the Member of Karnataka State Innovation Council, Government of Karnataka and Member of NAAC (UGC) Peer Team to assess the institutions for Accreditation. He has also visited as an Expert Member of the UGC, New Delhi for inspecting the colleges seeking Autonomous Status.

Dr. Prasad Naik Hamsavath is a Professor and Head of the Department of Master of Computer Applications at Nitte Meenakshi Institute of Technology, Bangalore. He completed his Ph.D. at Jawaharlal Nehru University, New Delhi, India. Dr. Prasad N H has more than 12 years of experience in different roles in both public and private sector enterprises, including the Ministry of Human Resource and Development, New Delhi, Government of India. He received the prestigious "Dr. Abdul Kalam Life Time Achievement Award" and also received a "Young Faculty" award at the 2nd Academic Brilliance Awards.

Dr. N. Nalini is a Professor at the Department of Computer Science and Engineering at Nitte Meenakshi Institute of Technology, Bangalore. She received her MS from BITS, Pilani in 1999 and her Ph.D. from Visvesvaraya Technological University in 2007. She has more than 21 years of teaching and 14 years of research experience. She has written numerous international publications, and **Received "Bharath Jyoti Award" by India International Friendship Society, New Delhi on 2012**, from Dr. Bhishma Narain Singh, former Governor of Tamilnadu and Assam. She received the **"Dr. Abdul Kalam Life time achievement National Award" for excellence in Teaching, Research Publications, and Administration by International Institute for Social and Economic Reforms, IISER, Bangalore on 29th Dec 2014**. She is also the recipient of "Distinguished Professor" award by TechNext India 2017 in association with Computer Society of India-CSI, Mumbai Chapter and "Best Professor in Computer Science & Engineering "award by **26th Business School Affaire & Dewang Mehta National Education Awards (Regional Round) on 5th September 2018, at Bangalore**. She is a lifetime member of the ISTE, CSI, ACEEE and IIFS.

Use of Blockchain for Smart T-Shirt Design Ownership

Ashley Alexsius D'Souza and Okstynn Rodrigues

Abstract This study aims to provide a reliable solution for the T-shirt designer to gain ownership of his design using the blockchain technology. As blockchain is a decentralized technology, it will provide authentication for the ownership of the artwork among various non-trusting members. In this research paper, we have explained how to resolve this issue for the designer as well as the customer. Using this method, a novel distributed application can be created.

Keywords Bitcoin · Blockchain · Smart contract · Supply chain

1 Introduction

On every online shopping site, it is a common behavior to download designs and use them as your own. If the original designer does not get any credit for his design, he is at loss and his business can be in trouble. The ability to manage the T-shirt design ownership in an easy manner and streamline the process for maximum efficiency can be achieved using blockchain. In this paper, we suggest how the owner of a design can gain ownership of his design using the blockchain technology. In Sect. 1, we introduce blockchain. In Sect. 2, we introduce smart contracts. In Sect. 3, we present our problem statement. In Sect. 4, we discuss how this problem can be solved using blockchain. In Sect. 5, we discuss how our solution will benefit the designers and customers. In Sect. 6, we give the future scope. We conclude in Sect. 7.

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1.1 What Is Blockchain

A blockchain is a digital ledger which is distributed in nature [1]. All the transactions carried out are recorded in a series of blocks. Multiple copies are made which are spread over multiple nodes (computers). Each block is made up of a time-stamped batch of transactions to be included in the ledger. Each blockchain block is uniquely identified by a cryptographic signature.

All the blocks in the blockchain are back-linked to each other, so they refer to the cryptographic signature of the previous block in the chain and that chain can be traced all the way back to the very first block that it created at the start.

Blockchain is a distributed public general ledger thus making it a perfect match for supply chain management.

1.2 History of Blockchain

Initially, blockchain is the original source code for Bitcoin, the first major blockchain innovation. Bitcoin is a digital currency, invented in October 2008. The source code was made open source in January 2009. Bitcoin really took off in 2013, as more and more Web sites started accepting this virtual currency [1]. Satoshi Nakamoto [2], the inventor of bitcoin (still his real identity remains unknown), coined the initial bitcoins. The interest of banks, businesses, and governmental organization in bitcoin has rapidly increased over years.

1.3 Advantages of Blockchain

Blockchain is a distributed database, which has multiple copies across multiple computers forming a peer-to-peer network, wherein there is no single, centralized database or server [3]. Rather the blockchain database exists across a network of machines which is decentralized in nature. The transactions on the blockchain are digitally signed, using the public key cryptography technique. This technique consists of two keys, public and private. The public key is used to sign and encrypt a message that is being sent. The recipient will use its private key to decrypt the message. If any other person other than the recipient tries to decrypt the message, it will be difficult for him to do so.

2 Smart Contracts in Blockchain

A smart contract is a computer program code that is capable of self-executing contracts with the terms of an agreement between the buyer and seller across a blockchain

network [4]. The transactions are transparent, traceable and irreversible. The agreements are carried out among anonymous parties without the need of a central authority or legal system. The agreements enforce themselves [5].

Smart contracts function as "Multi-Signature" accounts wherein funds are only spent if a certain percentage of people agree. They help manage agreements between users. Utility to other contracts is provided as well. They also store information about an application such as membership records or domain registrations. Smart contracts are autonomous and automatic [6].

3 Current Problem Statement

The designer designs a logo. He is the owner of his design. Another person uses the design and prints T-shirts with that design. The owner of that design does not receive any credit for his design. The royalty amount is, therefore, not credited to his account. He is at loss not only from a monetary point of view but also because the design which was designed by the owner is used by some other person for business purpose.

4 Solution Using Blockchain

Using blockchain, we will provide solution not only for the designer of the design but also for the customer.

4.1 Solution for the Designer

Using blockchain, we will provide individual owner with the ownership to his own design. The blockchain technology ensures that all the participants in a decentralized network share the identical view of the real world [7]. The owner can maintain his account where his identity is authenticated. The owner can claim his own design which cannot be copied by any other designer. If such a case arises, the original owner of the design can file a claim request and the owner can either sue the copier or ask for a royalty. Figure 1 shows the flow diagram for the designer.

4.2 Solution for the Customer

The customer will not be able to differentiate between an original design and a fake design. As market conditions change, he can verify autonomous and instantaneous

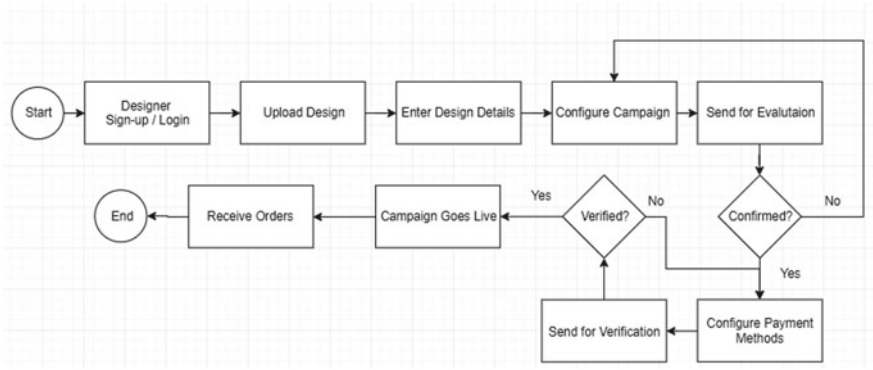

Fig. 1 Flow diagram for the designer

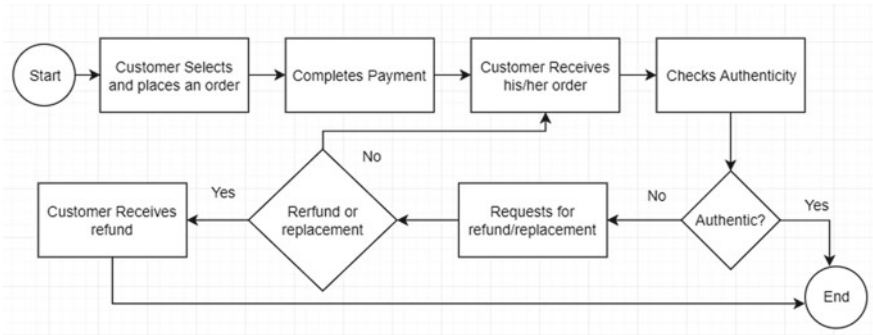

Fig. 2 Flow diagram for the customer

transactions across nodes [8]. So, using blockchain we are providing a solution to the customer wherein he will be able to differentiate between an original design and a fake design. Using identity verification, the customer can verify the origin of the design as this system is verifiable. He can, therefore, ensure for himself that he is purchasing an original product. Figure 2 shows the flow diagram for the customer.

5 Benefits

With the help of our blockchain technology, both the stakeholders will benefit the designer as well as the customer.

5.1 Benefits for Designer

The designer is the original designer of that design and he should get credit for his design. We will provide him with credit for his design using the blockchain technology. The blockchain application will track the origin of the design and the owner of the design will receive a notification. Every time a sale takes place a royalty amount is credited to his account. He will be able to track the number of sales his design has made. He can see each and every delivery being made at multiple locations [9]. Each transaction is automatically recorded in the blockchain ledger therefore making it possible for him to see every delivery made at different locations.

5.2 Benefits for Customer

The customer will now be able to differentiate between an original design and a fake design. He will not be cheated for the amount he pays to purchase the product with that design as he knows it is a genuine product and not a fake product. The customer will get value for the amount he pays for the product. The customer can monitor the transaction as well as see what is happening at every step [10]. This will give the customer satisfaction which in turn will make him a happy customer.

6 Future Scope

We plan to incorporate and resolve the issue of copyright for the original designer. Here the original owner of the design can copyright his design. If anybody else copies his design, he can file a copyright case against that person.

7 Conclusion

Using blockchain, the original owner of the design will benefit from our technology. He will be satisfied because his design has received recognition. He will receive the royalty amount he deserves. Using our blockchain technology, the customer will be happy because he has received value for the amount he has paid. He will be satisfied that he has not been sold a fake product but an original product. Therefore, our system is secure and reliable.

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A Feasibility Study and Simulation of 450 kW Grid Connected Solar PV System at NMIT, Bangalore

B. Smitha, N. Samanvita and H. M. Ravikumar

Abstract The consumption of energy can be reduced by efficiently using the available resources and effectively energy bill is reduced by considering photovoltaic system, which is most promising nowadays. In this paper, a feasibility study and simulation model on MATLAB/SIMULINK of 450-kW grid-connected solar PV system is considered for NMIT campus. The energy consumption at the campus is studied, and the number of billed units in kWh is considered for the last two years. The modelling of PV array, their integration with MPPT in SIMULINK environment are described. The deployment of available energy resources along with the incoming PV system is studied for effective usage of electricity. The simulation results are shown, the performance of the incoming PV system and its feasibility is described as obtained.

Keywords Fossil fuel · Solar PV system · MPPT · SIMULINK

1 Introduction

The fast-expanding economy and growing economic activities demanding for quality and quantity in energy sources. India is producing 66% of energy by using fossil fuels [1]. Coal, natural gas and oil are fossil fuels which consisting of hydrocarbons, produces carbon dioxide and other poisonous gases when they are burnt. These gases are the main reason for global warming. By using energy sources which gives clean energy or free from carbon dioxide or renewable energy sources, we can reduce our dependence upon the fossil fuels. As the sun is the major source of renewable energy, the generation of power from the solar PV system is fast developing in India.

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Nitte Meenakshi Institute of Technology (NMIT) an autonomous institute is spread in 23 acre of land in Bengaluru. The college is well equipped with laboratories and workshops, full-fledged central computation facility, a good library and other facilities. The hostels for Boys and Girls, Stationary Shop, Bakery, Canteen, Xerox shop, College Buses, Bank ATMS, Staff quarters, Temple, Open Air Theatre, Auditorium, Coffee Shop, Maggy station are available in the college campus.

The population density at NMIT is increasing yearwise and demands for increase in energy consumption. The college has consumed an average of 127,223 units per month in the academic year 2016 and 2017 and spent an average of Rs. 1,233,946 per month to the BESCOM. In order to meet this demand, the institute has planned to generate the power by installing the rooftop solar PV system to meet its energy demands.

In this paper, the feasibility study of the existing power system is discussed. The simulation model of 450 kW rooftop solar power plant using MATLAB/SIMULINK R17a is studied.

2 Related Work

Investigation at the Mu'tah campus was consuming 96 MWh/annum [2]. The authors had designed solar on-grid PV system of capacity of 56.7 kW, which produces the electricity of 97.02 MWh/annum to the grid, and they have evaluated the cost of the plant installation and payback period [2].

The feasibility study of grid-connected PV system at BVUCOEP campus, which consumes 49,000 units per month from the sanctioned load of 187 kWp, had estimated the payback period of the solar PV installation [3].

At MMUT, Gorakhpur the grid-connected solar PV system capacity of 100 kW has been modelled and simulated on MATLAB, by using MPPT technology to detect the peak power [4].

The simulation model of 100-kW grid-connected PV system based on the mathematical model developed at BRCM college with different aspects such as module temperature and shading done and found the simulated results which were very close to practical result [5].

3 Existing Power Supply Arrangement at NMIT

3.1 Bengaluru Electricity Supply Company Limited (BESCOM), Bangalore

BESCOM is supplying 11 kV to NMIT, which will be step down 415 V using a high-tension (HT) 500 kVA transformer. The college has taken the contract demand

Table 1 The monthly energy consumed in 2016 at NMIT

Month	No of billed units in kWh (2016)	Energy bill amount in Rs.
JAN	100,100	871,351
FEB	119,980	1,039,287
MAR	135,880	1,186,888
APR	149,360	1,387,372
MAY	108,920	1,011,537
JUN	86,860	695,269
JUL	84,180	784,741
AUG	90,520	843,646
SEPT	120,800	1,129,259
OCT	124,940	1,155,058
NOV	131,420	1,214,877
DEC	108,820	1,025,142

of 450 kVA from BESCOM. The billing is calculated based on 75% of the contract demand or recorded demand, whichever is higher. The demand charges are charged at Rs. 230/kVA of billing demand billed in BESCOM bill. The college has DG backup, which operates during the power outages.

3.2 Emergency Power Supply

The college campus has two DG sets of 500 kVA and 320 kVA capacity, which have been installed to provide the backup to the college. These DG sets have been connected to the whole campus. Depending on the load, change over switch that operate between 500 kVA and 320 kVA DG set. Currently, the college is using 500-kVA DG during the working hours and 320-kVA DG is used during the evening time and holidays.

3.3 Energy Consumption in the College

In this subsection, the monthly energy consumption in the academic years 2016 and 2017 is briefly discussed and corresponding monthly bills paid is presented in Tables 1 and 2 and corresponding energy consumed is shown in Fig. 1. Figure 2 shows the bill amount paid during 2016 and 2017.

Table 2 Monthly energy consumed in 2017

Month	No. of billed units in kWh (2017)	Energy bill amount in Rs.
JAN	109,440	1,016,551
FEB	110,300	1,025,826
MAR	153,020	1,417,800.86
APR	162,322	1,591,372
MAY	124,920	1,138,259
JUN	102,860	997,742
JUL	105,180	1,051,847
AUG	131,880	1,320,707
SEPT	143,580	1,436,865
OCT	133,840	1,338,440
NOV	125,400	1,234,806
DEC	123,936	1,237,141

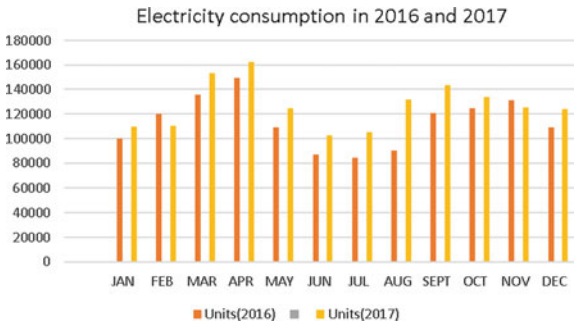

Fig. 1 Graphical representation of electricity consumption (Units) in 2016 and 2017

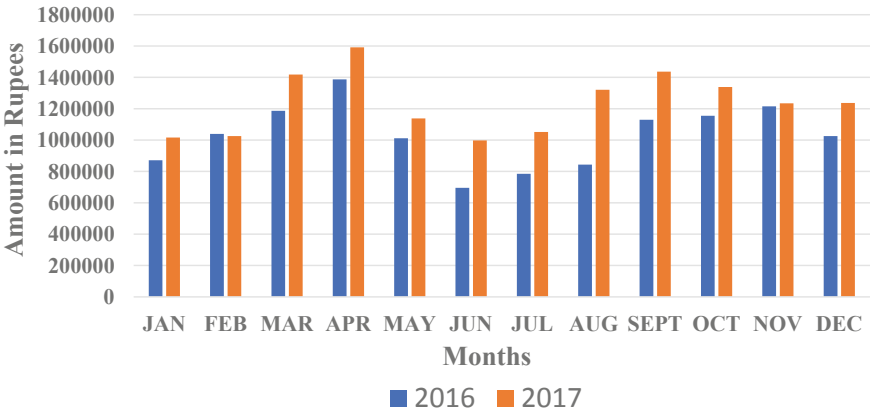

Fig. 2 Bill amount paid during 2016 and 2017

Table 3 Solar energy generation

Month	Solar radiation (kWh/m^2/day)	AC energy (kWh)
JAN	5.25	54,143
FEB	5.59	52,113
MAR	6.08	61,745
APR	5.53	54,930
MAY	4.86	50,313
JUN	4.83	49,076
JUL	4.58	47,990
AUG	4.24	44,606
SEPT	4.64	46,920
OCT	4.57	47,826
NOV	5.18	51.578
DEC	5.2	53,729

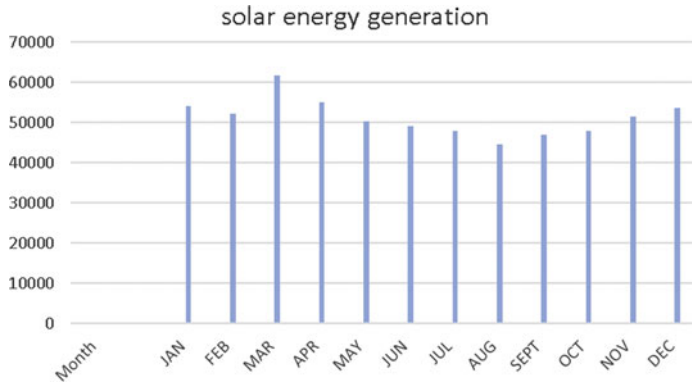

Fig. 3 Graphical representation of solar energy generation

The college is planned to install the solar rooftop PV system of 450-kWp capacity. The expected radiation and energy generation from PV Watts calculator by NREL [6] at NMIT for capacity of 450 kW shown in Table 3. The graphical representation of solar energy is shown in Fig. 3.

The monthly average consumption of energy (units) is 127,223.166 kWh.
The total amount paid to BESCOM, by considering actual energy consumed and 75% of the contract demand or recorded demand, whichever higher is Rs. 1,153,714.91.
The monthly average energy generation from solar system is 51,247.41 kWh.
The amount for 51,247.41 kWh is Rs. 279,298.42 @ Rs. 5.45/kWh.
If we reduce the BESCOM contract demand from 450 kVA to 300 kVA, after solar system installation, the amount for 225 kVA (75% of contract demand) is Rs. 51,750 per month has to pay.