PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)

Pratibha: International Journal of Science, Spirituality, Business and Technology (IJSSBT) is a research journal published by Shram Sadhana Bombay Trust's, COLLEGE Of ENGINEERING & TECHNOLOGY, Bambhori, Jalgaon, MAHARASHTRA STATE, INDIA. Founder Chairperson of the college is Honourable
Sau. Pratibha Devisingh Patil, the former President of India.

College is awarded as **Best Engineering College of Maharashtra State** by Engineering Education Foundation, Pune in year 2008-09.

The College has ten full-fledged departments. The Under Graduate programs in 4 courses are accredited by National Board of Accreditation, All India Council for Technical Education, New Delhi for 2 years. QMS of the College conforms to ISO 9001:2008 and is certified by JAAZ under the certificate number: 1017-QMS-0117.The college has been included in the list of colleges prepared under Section 2(f) of the UGC Act, 1956 vide letter number F 8-40/2008 (CPP-I) dated May, 2008 and 12(B) vide letter number F. No. 8-40/2008(CPP-I/C) dated September 2010.UG courses permanently affiliated to North Maharashtra University are: Civil Engineering, Chemical Engineering, Computer Engineering, Electronics and Telecommunication Engineering, Electrical Engineering, Mechanical Engineering, Information Technology. Two years Post Graduate courses are Computer Engineering (Computer Science and Engineering)and Electrical Engineering (Electrical Power System). Civil Engineering Department, Mechanical, Biotechnology, Electronics and Telecommunication Engineering and Chemical Engineering Department laboratories are recognized for Ph.D. Programs. Spread over 25 Acres, the campus of the college is beautifully located on the bank of river Girna.

The International Journal of Science, Spirituality, Business and Technology (IJSSBT) is an excellent, intellectual, peer reviewed journal that takes scholarly approach in creating, developing, integrating, sharing and applying knowledge about all the fields of study in Engineering, Spirituality, Management and Science for the benefit of humanity and the profession.

The audience includes researchers, managers, engineers, curriculum designers administrators as well as developers.

EDITOR(s)-IN-CHIEF

Journal Indexing

COSMOS IMPACT FACTOR

PUBLICATION COMMITTEE

Prof. Dr. SANJAY P. SHEKHAWAT
Vice Principal,
S.S.B.T.'s College of Engineering and Technology,
Bambhori, Jalgaon.

Mr. SUHAS M. SHEMBEKAR
Assistant Professor
Electrical Engineering Department

RESEARCH REVIEW COMMITTEE

Dr. K. S. Wani
Principal
S.S.B.T.'s College of Engineering and Technology, Bambhori, Jalgaon

Dr. M. Husain
Department of Civil Engineering

Dr. I. D. Patil
Department of Bio-Technology

Dr. K. S. Patil
Department of Applied Science

Dr. V. R. Diware
Department of Chemical Engineering

Dr. S. R. Suralkar
Department of Electronics & Telecommunication Engineering

Dr. P. V. Thakre
Department of Electrical Engineering

Dr. S. B. Pawar
Department of Civil Engineering

Dr. M. P. Deshmukh
Department of Electronics & Telecommunication Engineering

Dr. S. D. Suryawanshi
Department of Mechanical Engineering
B.S. Deore College of Engineering, Dhule

Dr. S. I. Kolhe
Department of Mechanical Engineering
J.T.Mahajan College of Engineering Faizpur

Dr. A. M. Vaidya
Principal
Gangamai College of Engineering,
At Post Nagaon, Tal.& Dist. Dhule

Dr. Madhuri Bhavsar
Professor,
Institute of Technology, Nirma University,
Ahmedabad, Gujrat

Dr. S. P. Shekhawat
Department of Mechanical Engineering

Dr. G. K. Patnaik
Department of Computer Engineering

Dr. P. J. Shah
Department of Electrical Engineering

Dr. U. S. Bhadade
Department of Information Technology

Dr. V. S. Rana
Department of Business Administration

Dr. H. A. Salunkhe
Department of Business Administration

Dr. R. A. Modiyani
Department of Business Administration

Dr. K. P.Adhiya
Department of Computer Engineering

Dr. P. G. Damle
Department of Mechanical Engineering

Dr. R. B. Barjibhe
Department of Mechanical Engineering
S.S.G.B. College of Engineering and Technology, Bhusawal

Dr. V. U. Edlabadkar
Department of Applied Science
PES Modern College of Engineering, Pune

Dr. R. N. Khairnar
Chartered Accountant Jalgaon

Dr. S. V. Bansod
Mechanical Engineering Department
Prof Ram Meghe Institute of Technology & Research, Badnera

Dr. V. H. Patil
Associate Professor,
Godavari College of Engineering, Jalgaon

INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY
(IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21)

Table of Contents

Volume 8, No.1, April 2021

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

A REVIEW ON PRESENT AND CLEFIA LIGHT WEIGHT CRYPTOGRAPHIC ALGORITHM

Atul H. Karode[1], Dr. Shekhar R. Suralkar[2]
Research Scholar1, Professor2
1 Department of E&TC, SSBT's College of Engineering and Technology, Bambhori Jalgaon (India)
atulkarode@gmail.com1,
2Department of E&TC, SSBT's College of Engineering and Technology, Bambhori Jalgaon (India)
shekhar_srs@rediffmail.com2

ABSTRACT

The important paybacks of light weight algorithm are Smaller block sizes, Smaller key sizes, Simpler rounds, Simpler key schedules, Multifaceted key schedules increase the memory, time delay and the power requirement of implementations therefore, most of the lightweight block ciphers use simple key lists that can uses sub-keys.

Ciphers like AES, DES would result in high hardware that make them tedium for small-scale real-time applications so now a day it is necessity to design a light weight algorithm for small wireless network with least execution time with high security. This paper describes the performance analysis of light weight algorithm PRESENT and CLEFIA. These two algorithms that got adopted as the ISO/IEC (29192-2P:2012) standards for lightweight cryptography.

Keywords- Light Weight, Cryptography, key size, PRESENT, CLEFIA

I.INTRODUTION

PRESENT and CLEFIA are two algorithms that got accepted as the ISO/IEC (29192-2P:2012) standards for lightweight cryptography.

The Block Cipher algorithm PRESENT is an illustration of substitution–permutation-network [33] and it consists of 31 rounds. The block size of

64 bits and two key lengths of 80 and 128 bits is operative as key input.

CLEFIA is a possessor related block cipher algorithm, developed by Sony company. CLEFIA name is resulting from the French word clef meaning "key". The block size used is of 128 bits and the key size may be 128-bit, 192 bit or 256 bits**.**

The objective of this paper is to focus on cryptography algorithm for light weight network compare and to concentrate on to minimize the encryption and decryption time.

II.LIGHTWEIGHT CRYPTOGRAPHY ALGORITHM

For secured devices, normal cryptography algorithms can be too slow, too large or too energy-intense devices. Light-weight cryptography is generally defined as cryptography for resource-guarded devices, for which RFID tags and WSN are typically mentioned as examples.

The important benefits of light weight algorithm are Smaller block sizes, Smaller key sizes, Simpler rounds, Simpler key lists. Complex key schedules rise the memory, time delay and the power requirement of hardware for implementations therefore, most of the lightweight block ciphers or algorithm use simple key schedules that can generate sub-keys.[17]

A. PRESENT

PRESENT is lightweight block cipher designed to achieve less dense area and power restrictions. PRESENT light weight algorithm has innovative in Light Weight Cryptography with several light-weight designs. It was developed in 2007.

PRESENT is best right SPN (substitution permutation network) structure. PRESENT has a 64-bit block size, 80 or 128-bit key size and PRESENT performs 31 rounds. In this algorithm every round consists three steps, these are Add round key step, Substitution step, and Permutation step.

B. CLEFIA

CLEFIA is a 128-bit block cipher with its key length being 128, 192 and 256 bits, this algorithm is well matched to AES. CLEFIA consists of two parts a data processing part and a key scheduling part. CLEFIA hires a generalized Feistel structure is a symmetric structure used in the construction of block ciphers, with four data lines, with width of 32 bits. Also, here are key whitening parts at the beginning and the end of the cipher key. The term whitening is a technique intended to increase the security of an iterated block cipher. It consists of steps that combine the data with portions of the key. The numbers of rounds perform by CLEFIA algorithm are 18, 22 and 26 for 128-bit, 192-bit and 256-bit keys, respectively.

CLEFIA operates on 128-bit block size with three different key sizes: 128-bit, 192-bit, 256-bits.

III. PERFORMANCE RESULTS

A. Performance Results of PRESENT

Table 1 summarize implementation results and provides details about all implemented profiles. It compares the implementation results of speed optimized implementation of encryption and decryption to other software implementations in Table 1

To calculate the throughput, number of cycles taken by the encryption process is first calculated after this value is divided with the block size of the algorithm to get total encryption cycles per bit.

$$Encryption\ (cycles/bit) = \frac{Number\ of\ cycles}{Block\ size}$$

So to calculate no of cycle

10,089 X 2 = 20178 (Refer table 1)

Therefore 20178 / 128 =157.64

Table 5.10: Performance results of PRESENT-80 on the 8 bit ATmega163 microcontroller.

enc/ dec	opt. goal	Profile	ROM [bytes]	RAM [bytes]	Cycles	Cycles/bit	Throughput @4MHz [Kbps]
enc	speed	I	1,494	272	10,089	157.64	25.4
		V	2,398	528	9,595	149.92	26.7
	size	II	854	16	646,272	10,098	0.4
		VI	1,474	32	646,166	10,096	0.4
dec	speed	III	1,532	280	10,310	161.1	24.8
		V	2,398	528	9,820	153.44	26.1
	size	IV	948	40	634,823	9,919	0.4
		VI	1,474	32	634,614	9,916	0.4
better is:			less	less	less	less	more

Table 1 Performance results of PRESENT-80 on the 8-bit ATmega163 microcontroller [16].

Since the Micro Controller Unit runs under 4MHz operating frequency which means that there can be 4,000,000 cycles getting executed a teach second. So, the throughput of the encryption purpose of each lightweight block ciphers are calculated as follows.

$$Throughput = \frac{CPU\ Speed}{Encryption\ (cycles/bit)}$$

$4*10^6/157.64 = 25.4$

The execution time for PRESENT 128 algorithms is calculated as

Time required for 1 bit = $157.64/4 \times 10^6 = 0.0394$ mili second.

For 512 bytes (Plain text) time required is
0.0394 mili second x512 x 8= 161.42 mili second

The time required to execute 512-byte plain text for PRESENT Algorithm is 161.42 mili second.

As for controlled devices, normal cryptography algorithms can be too slow, too large or too energy-consuming. Light-weight cryptography is nothing but cryptography for devices which has limited development and storage abilities, like

RFID tags and WSN are typically mentioned as examples. So, from this table it is seen that for PRESENT 80algorithm the encryption and decryption cycle or time the memory required in bytes is less and for the same throughput is more.

B. Performance Analysis of CLEFIA

In this section the parameters like execution time; throughput of the CLEFIA is briefly discussed.

I. Speed of the operation -Speed of the operation or the execution time is one of the key metrics used to evaluate the performance of the block ciphers. For each block, as the plaintext size increases, key list is also performed and included in the execution time [22]. The results are as shown in Figure 1.

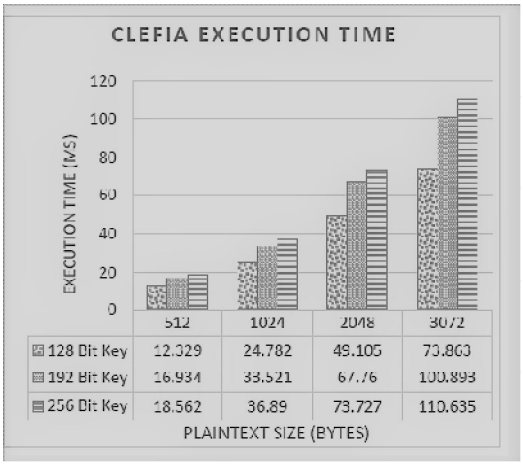


Figure 1 CLEFIA encryption execution time [22].

CLEFIA algorithm is executed for 128-bit, 192 bits, and 256-bit Keys for plaintexts of size 512 Bytes, 1024 Bytes, 2048 Bytes, and 3072 Bytes respectively and the average values were intended and tabulated as shown in Figure 1.

From the result it is seen that, the encryption time is growing exponentially as the plaintext size increases. This happen because of the block cipher consists of two feistal function and two diffusion matrixes. While the decryption follows a similar procedure as encryption so with only changes made to the order of round keys and whitening keys selection.

II. Throughput - Throughput is nothing but the term used to measure amount of data a hardware system can ideally process in a given span of time.

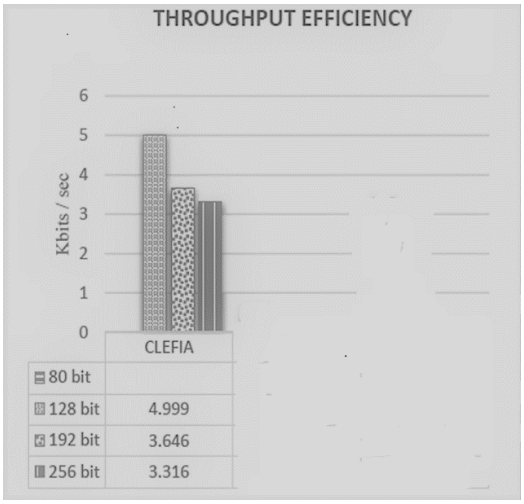


Figure 2 Throughput for CLEFIA [22]

From Figure 2, It is seen that CLEFIA which has block size of 128, 192,256-bit keys have the highest throughput with an average throughput of 4Kbps.

C. Comparison between PRESENT and CLEFIA lightweight block ciphers]

The following table 2 shows comparison between two light weight Algorithm.

Block cipher	Key size (bit)	Block size (bit)	Rounds	Execution time for plain text size of	Throughput for 128 key (Round base architecture)	Attacks
CLEFIA	128-bit	128	18	12.329 [22]	711.11kb [13,22]	High immunity against attack
		192	22			
		256	26			
PRESENT	80,128	64-bit	31	161.42 [16]	200 kbps [13,16,]	Low immunity

Table 2: Comparison between PRESENT and CLEFIA lightweight block ciphers [22,16]

From this table it is observed that for the CLEFIA 128 algorithm it has less execution time, a smaller number of rounds as well as it has good throughput as compared to PRESENT- 128 algorithm. Also, immunity against attacks for CLEFIA is higher so in maximum light weight applications CLEFIA is preferred.

D. CONCLUSION

From this review study it is concluded that Conventional cryptography algorithm is not suitable for constrained devices because of large key size such as RSA. In addition to this, it is necessary to generate the suitable small key in public-key crypto systems that are secure the data transmission. When Wireless Sensor Networks are implemented in inaccessible areas, the probability of occurring different types of attacks is very high. So, the security of WSN becomes extremely important. As sensors have limited processing power, limited storage, low bandwidth, and energy etc. traditional security measures designed for these networks are not suitable. In presence of such limitations it. becomes necessary to use lightweight cryptographic algorithm for Wireless Sensor Networks, Also PRESENT and CLEFIA lightweight block ciphers have less execution time for plain text size of 512 bytes

REFERNCES

1] AvinashKak “Some Basic Vocabulary of Computer and Network Security and a Brief Review of Classical Encryption Techniques Lecture Notes on Computer and Network Security,Purdue University 18 April 2018.

[2] Sattar B.Sadkhan, Akbal O. Salman “A Survey on Lightweight-Cryptography Status and Future Challenges”, International Conference on Advances in Sustainable Engineering and Applications (ICASEA), Wasit University, Kut, Iraq. IEEE Conference proceeding, ISSN 978-1-5386-3540-7/18/31.00$©2018 IEEE, 2018. pp.105-108. June 2018.

[3] Thomas Eisenbarth Sandeep Kumar Christof Paar and Axel Poschmann “A Survey of Lightweight-Cryptography Implementations” IEEE proceeding on IEEE Design & Test of Computers, Co published by the IEEE CS and the IEEE CASS, ISSN 0740-7475/07/$25.00 G 2007 IEEE, pp 1-12,4 October 2017.

[4] Yulong Zou, Jia Zhu, XianbinWang and Lajos Hanzo, “A Survey on Wireless Security Technical Challenges, Recent

Advances, and Future Trends” Proceedings of the IEEE Volume 104, No. 9, Digital Object Identifier: 10.1109/JPROC.2016.2558521, pp 1727-1765 September 2016.

[5] Gaurav Bansod, NishchalRaval and Narayan Pisharoty “Implementation of a New Lightweight Encryption Design for Embedded Security ” IEEE Transactions On Information Forensics And Security, Vol. 10, No. 1, ISSN 1556-6013 © 2014 IEEE,DOI10.1109/TIFS.2014.2365734, pp,142-151,January 2015.

[6] Pradeep Semwal ,Mahesh Kumar Sharma “Comparative Study of Different Cryptographic Algorithms for Data Security in Cloud Computing” ISSN 978-15090-6403-8/17/$31.00 © 2017 IEEE pp.1-7, 2017.

[7] Sarika Y. Bonde ,Dr. U. S. Bhadade, “Analysis of Encryption Algorithms (RSA, SRNN and 2 key pair) for Information Security” ISSN 978-1-5386-4008-1/17/$31.00 ©2017 IEEE. pp. 1-7 ,2017.

[8] Ahmer Khan Jadoon , Licheng Wang , Tong Li , and Muhammad Azam Zia ,”Review Article Lightweight Cryptographic Techniques for Automotive Cybersecurity ”, Hindawi Wireless Communications and Mobile Computing Volume 2018, Article ID 1640167, doi.org/10.1155/2018/1640167, pp 1-15, 26 June 2018.

[9] Shehnaz T. Patel,Nita H. Mistry,”A Survey: Lightweight Cryptography in WSN” IEEE International Conference on Communication Networks (ICCN) 2015, IEEE Proceeding ISSN 978-I-S090-00S 1-7I 1S/$3 1.00©2015 IEEE, DOl 1O.l 109/ICCN.20IS.3. pp 11-15,2015.

[10] Oscar Delgado-Mohatar , Amparo Fúster-Sabater, Jose M. Sierra ,”A light-weight authentication scheme for wireless sensor networks” , Journal of Elsevier B.V, ISSN 1570-8705/$. doi:10.1016/j.adhoc.2010.08.020, pp 727-735, 8 September2010.

[11] Khalid Mahmood , Shehzad Ashraf Chaudhry , Husnain Naqvi Taeshik Shon , Hafiz Farooq Ahmad “A lightweight message authentication scheme for Smart Grid communications in power sector” , Journal of Elsevier B.V Computers and Electrical Engineering ,0045-7906/©2016 Elsevier Ltd .pp 1-11,07 March 2016.

[12] Rajani Devi.T, "Importance of Cryptography in Network Security", IEEE Proceeding ISSN 978-0-7695-4958-3/13 $26.00 © 2013 IEEE, IEEE Computer Society, DOI 10.1109/CSNT.2013.102,pp 462-467, 2013.

[13] Masanobu Katagi and Shiho Moriai, "Lightweight Cryptography for the Internet of Things", White paper by Sony Corporation, pp 1-4.

[14] Lara-Ni, Carlos Andres, Morales-Sandoval, Miguel and Dıaz-Perez "An evaluation of AES and PRESENT ciphers for lightweight cryptography on smart phones", IEEE Proceeding ISSN 978-1-5090-0079-1/16/$31.00 ©2016 IEEE, pp 87-93, 2016.

[15] CharalamposManifavas , George Hatzivasilis , Konstantinos Fysarakis , and Konstantinos Rantos "Lightweight Cryptography for Embedded Systems - A Comparative Analysis" White paper by Dept. of Applied Informatics & Multimedia, Technological Educational Institute of Crete, Heraklion, Crete, Greece, pp 1-10.

[16] Axel York Poschmann Bochum, "LIGHTWEIGHT CRYPTOGRAPHY -Cryptographic Engineering for a Pervasive World " Thesis ,Faculty of Electrical Engineering and Information Technology RuhrUniversity Bochum, Germany.pp 1-5, February 2009.

[17] Kerry A. McKay,LarryBassham, MeltemSonmezTuran , Nicky Mouha "Report on Lightweight Cryptography" NISTIR 8114,National Institute of Standards and Technology U.S. Department of Commerce, Internal Report 8114, pp-1-14 March 2017.

[18] Tetsu Iwata "The 128-bit Block cipher CLEFIA Design Rationale" Report on development of CLEFIA by Sony Corporation, Konan, Minato-ku, Tokyo 108-0075 Japan June 1, 2007.

[19] Madhumita Panda "Performance Analysis of Encryption Algorithms for Security" International conference on Signal Processing, Communication, Power and Embedded System (SCOPES)-2016 IEEE Proceeding ISSN 978-1-5090-4620-1/16/$31.00 ©2016 IEEE,pp 278-284, 2016.

[20] Chaitra B, Kiran Kumar V.G, Shatharama Rai "A Survey on Various Lightweight Cryptographic Algorithms on FPGA" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 12, Issue 1, Ver. II, pp 54-59, Jan.-Feb. 2017.

[21] Jaber Hossein Zadeh,AbbasGhaemiBafghi "Evaluation of Lightweight Block Ciphers in Hardware Implementation: A Comprehensive Survey"2016 1st International Conference on New Research Achievements in Electrical and Computer Engineering.

[22]LeventErtaul, SachinKattepuraRajegowda "Performance Analysis of CLEFIA, PICCOLO, TWINE Lightweight Block Ciphers in IoT Environment" International Conference on Security and Management SAM'17, ISBN: 1-60132-467-7, CSREA Press ©,pp 25-31.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Real Time Security System Using Web Camera

Dipak Vijay Rajput
Department of Computer Science and Engineering, Shram Sadhna Trust's College Of Engineering and Technology, Bambhori, Jalgaon Maharashtra , INDIA-425003,
Kavayitri Bahinabai Choudhari North Maharastra University, Jalgaon-425003

ABSTRACT:

The topic of the project is "Real Time Security System Using Web Camera". From the topic, everyone may know that the target of the project is using "web camera" to achieve the target of the "motion detection". In the application, there are many web cameras attached to the computer. When any motion is occurred in the room or any suspicious activity is performed then our project take a picture and stored in server and Google Drive

Keywords: Web-based Surveillance System

INTRODUCTION

Motion Detection Application is basically created or Developed As respect to time. And Also for Security Major. In that We are Use Image Processing technique. In this Project Webcam detect motion Automatically when some motion is occurred. Also in this project we are provide the complete solution for College and School. And Our Goal is to save the money and time of people.

SYSTEM CONFIGURATION

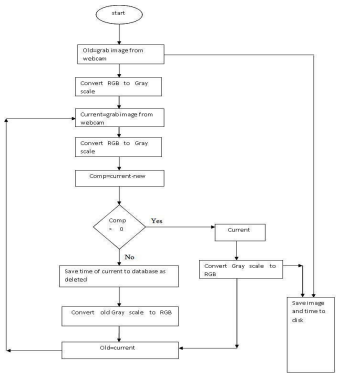


Fig- System Configuration

The main objective of the proposed approach is to reduce the storage size by storing only the frame having motion instead of the whole video. This paper presents related works and problems of our previous surveillance system, at first. An overview of the new version of our surveillance system and its functions are described in the next section. For comparison process there are many approaches but here frames are converted from RGB format to GRAY scale format and then compared. Again, the frames are converted back to RBG format before storing The gray scale conversion is done to decrease the pixel values. Whereas the frames are compared pixel by pixel. The difference in the frame gives only the moving objects on the frame.

ARCHITECTURE

In this project Web Cam Simply Capture the image when Some Motion is occurred.
As per the above architecture Capture module follow the image comparison algorithms.
Means Captured image Compared to previous image when some difference is there then stored

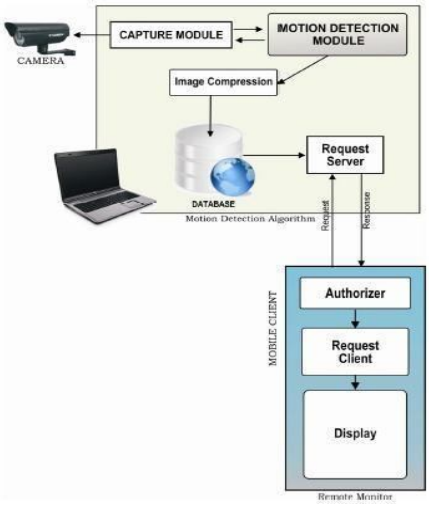


Fig- Architecture

this current image to server and Cloud. And When no any movement is occurred then camera goes to idol state. Data store on Server and on Drive. You can access from Anywhere from Drive. And In our system we provide alarm system. Suppose any one type Wrong password till 3 times then alarm is

play. Its indicate some suspicious activity performed with system. And No required to extra setup for this you can use this project on any laptop or Computer. So its Time saving Application.

And We are Capture the image Rather than video. So Its Save Time and Also Disk Space. Also no required to

Conclusions

We have described Real Time Security System Using Web Camera

REFERENCES

Collins, A.Lipton, H.Fujiyoshi, and T.Kanade, "Algorithms for cooperative multisensor surveillance," in the IEEE Conf., vol. 89, pp.1456-1477,Oct. 2001

F.W. Mounts. A video encoding system with conditional picture-element replenishment. Bell Systems Technical Journal, 47, no. 7:2548–2554, September 1969.

B.Gelbord and G.Roelofsen, "New surveillance techniques raise privacy concerns," Com. ACM, vol. 45, no. 11, pp. 23-24, Nov. 2002.

T.Kanade, R.Collins, and A.Lipton, "Advances in cooperative multi-sensor video surveillance," in DARPA Image

Understanding Workshop, pp. 3–24, Nov. 1999.

ISO/IEC 15333-1. JPEG 2000 image coding system, 2001

D. Taubman. High performance scalable image compression with EBCOT. IEEE on Image Processing, 9(7):1157–1150, July 2000.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Preprocessing Techniques For Crowd Image Analysis

Hemant Ingale[1], S. R. Suralkar[2] and Anil J Patil[3]
[1]*DEPARTMENT OF E&TC ENGG, SSBT'S COET,BAMBHORI, INDIA*
hetui@rediffmail.com
[2]*DEPARTMENT OF E&TC ENGG, SSBT'S COET, BAMBHORI, INDIA*
shekhar_srs@rediffmail.com
3SSGI's COE, Belhe, Pune, INDIA
anilj48@gmail.com

ABSTRACT

Traditionally, three processing steps involve in crowd analysis, and these include pre-processing, object detection and event / behavior recognition. Meanwhile, the common process for analysis in video sequence of crowd information extraction consists of Pre-Processing, Object Tracking, and Event / Behavior Recognition.

In this paper, contrast adjustment, histogram equalization and adding Gaussian Noise and using averaging filter is used for preprocessing. The canny edge detection is also used. Morphological operations on crowd images is also discussed.

Keywords: Crowd analysis, pre-processing, averaging, morphological operations

INTRODUCTION

In fields like planning for urban development, managing smart city, securing public safety, ready for risk assessment, etc. crowd analysis is of high importance. People come together in a places such as markets, temples, stadiums, subways, religious festivals, public demonstrations, procession, concerts, football/cricket matches, races, sport events, etc. For peaceful event organization and minimum causalities or injured in a Stampede, war or accident in public or religious places, it is important to monitor and analyze the crowd. Therefore, crowd management should be used for crowd safety. Different attributes are used to analyze the crowd. These attributes are crowd behavior detection, crowd density estimation, crowd counting and crowd scene analysis. [1]

The at the early stage of image processing, original images must be preprocessed because Unique pictures gained from the picture obtaining framework are influenced by various conditions, for example, lopsided brilliance and commotion [2]. The motivation behind picture upgrade is to improve the picture impact, eliminate the foundation commotion, extend the contrast between various item includes in the picture, and improve the picture quality [3]. Li and Liu utilized an improved picture preprocessing strategy in which, picture size standardization, middle sifting, and picture upgrade are embraced to accomplish picture denoising and upgrade [4].Li et al. proposed another new picture preprocessing technique. This strategy assesses the slant, obscure, and harmed pictures brought about by different reasons and improves picture impact than the customary preprocessing technique [5]. In any case, the techniques in these writing examines are on the whole the advancements of the customary preprocessing strategy. They just consider the adequacy of the strategies as far as picture impact without considering the handling speed requirement [6].

Crowd analysis can be carried out in three steps: i) pre-processing ii) object tracking and iii) event and behavior recognition.

Preprocessing:-The features extraction, object-detection and classification can be done in this steps. Segmentation, background subtraction are used for preprocessing. Gaussian blurring approach as the noise removal from image. Preprocessing techniques can drastically improve the presentation of picture preparing strategies like Image Transform, Segmentation, Feature extraction [1]

Contrast Enhancement

Contrast Enhancement is a technique of enhancing the contrast level of the images such that the brightness of the image is preserved.

Contrast enhancement for gray-level images, implemented in terms of histogram transformations is one of the fundamental processes which facilitate subsequent higher level operations such as detection and identification.

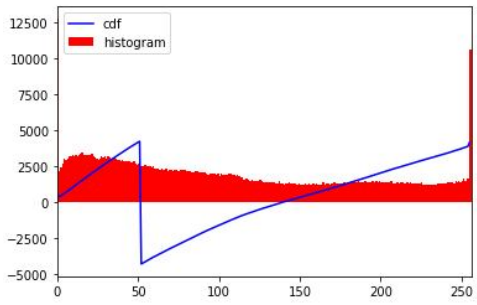
The conventional approach to enhance the image contrast is to manipulate the gray-level of individual pixels to the required value by constructing and transforming an intensity histogram. However, the maximization of the information content carried in the image should be taken into account when constructing the histogram.

Equalization of a Histogram

Histogram equalization is a method to process images in order to adjust the contrast of an image by modifying the intensity distribution of the histogram. The objective of this technique is to give a linear trend to the cumulative probability function associated to the image.

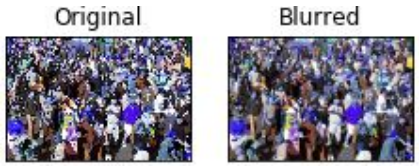
The processing of histogram equalization relies on the use of the cumulative probability function (cdf).

The idea of this processing is to give to the resulting image a linear cumulative distribution function. Indeed, a linear cdf is associated to the uniform histogram that we want the resulting image to have.



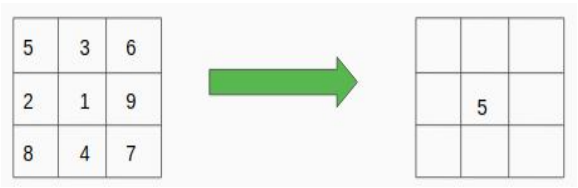
Gaussian Filter

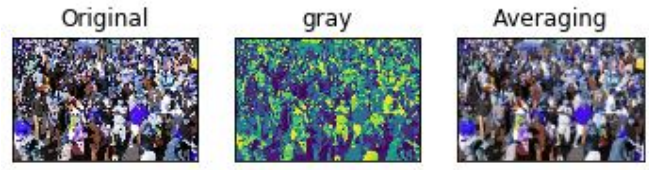
In **image processing,** a **Gaussian** blur is obtained by adding a **Gaussian** function in an **image** by (named after mathematician and scientist Carl Friedrich **Gauss**). It is a generally used to reduce noise in an **image.**



Averaging Filter

Mean filter is a simple sliding window that replace the centre value with the average of all pixel values in the window. The window or kernel is usually a square but it can be of any shape.





Segmentation Techniques

Segmentation partitions a picture into minor parts. Discontinuities in pixel values in an image are detected using [7].An edge represents a set of same valued pixels lying at edges. Edges represents boundaries of an image. Edges have significant intensity changes. Edge in an image reduces the amount of information and channels out unwanted data, while safeguarding the important properties in an image [8].

To highlight useful edge point, the variation in grey level associated with it should be enough significant than its background. By means of threshold, the significance of it is identified [9].

Edge thickness is described by the length of the ramp. The variant of the sign indicates nearby maxima at the discontinuities and it is minimum at

dark level. The first derivative is positive at the into and out of the ramp; and is minimum in regions of consistent dark level. Thus, the amount of the major variant is utilized to identify the presence of an edge at a point in a picture for example to decide whether a point is on the incline [10].

EDGE DETECTION TECHNIQUES

A. Sobel Operator: A couple of 3×3 convolution kernels as indicated by Fig. is used in Sobel operator. One kernel is actually the other rotated by 90° [11].

-1	0	1
-2	0	2
-1	0	1

G_x

1	2	1
0	0	0
-1	-2	-1

G_y

Fig. Sobel mask

These kernels are superimposed to vertical and horizontal edges as per pixel lattice structure, one kernel for every directions. The kernels can be applied independently to the input image. This gives separate estimations of the slope segment toward every path (call these gx and gy). The magnitude and direction of gradient is obtained by combining these all. The amount of gradient is given by:

$$|G|=|Gx| +|Gy| \quad (1)$$

The point of direction of the edge offering ascend to the spatial angle is given by:

$$\theta = \arctan (Gy/Gx) \quad (2)$$

B. Prewitt's operator: Vertical and flat edges in images are identified by Prewitt operator. It is an efficient technique for edge detection interms of magnitude and direction. The prewitt operator is havind limitation of 8 potential bearings. This operator is examined in the 3x3 neighborhood for all major directions. All the eight convolution masks are found. The maximum one is used. The convolution masks of the Prewitt detector are given beneath in fig.

1	1	1
0	0	0
-1	-1	-1

-1	0	1
-1	0	1
-1	0	1

C. Canny Edge Detector: The smoothed image are dealt in this. Local maxima at these points are high and are recognized as edges. There is a distinction among detection and localization– the more exact the indicator the less precise the restriction and the other way around [12].

By smoothening first noise is eliminated. After that it finds the image gradient to feature districts with high spatial subordinates. The process at that point tracks along these parts and ignores any pixel that isn't at the greatest.

The points having greatest intensity are set apart. Gradient for every pixel is determined by applying Sobel operator. For each pixel, partial gradient towards x and y direction is determined respectively by applying the kernels given in fig.

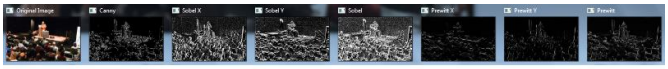
1	1	1
0	0	0
-1	-1	-1

G_x

1	2	1
0	0	0
-1	-2	-1

G_y

In this stage, the noisy image acquired from the image smoothing stage is convolved with a 3x3 Sobel operator. It comprises of two 3x3 kernels for figuring the level and vertical slopes individually.



Morphological Operations

Numerous imperfections may found in binary image. The image obtained may have faces as well as hands of people in the image. Morphological operations are performed for eliminating the non-facial regions. Morphological operations include erosion, dilation, opening and closing which are used to make the regions smooth for further processing. Generally human faces are circular or elliptical in shape [13]. Dilation attach pixels to the boundaries of objects in a image, while erosion

eliminates pixels on object boundaries. Another morphological operation is Opening [14] which opens up the gap between objects connected by a thin bridge of pixels so that either can be easily processed further.

1. CONCLUSION

Use of contrast adjustment, Histogram equalization and averaging filter are adopted in pre-processing of crowd images. Canny edge detector identifies greatest number of edges particularly for recognition of even and vertical edges, round edges and edges at the corner.

REFERENCES

[1] VishakhaBansod, Asha Ambhaikar, "Crowd Analysis System for Images of CCTV Camera", *International Journal of Recent Technology and Engineering (IJRTE)* ISSN: 2277-3878, Volume-8 Issue-5, January 2020.

[2] B. Qi, H. Shi, Y. Zhuang, H. Chen, and L. Chen, "On-board, real-time preprocessing system for optical remote-sensing imagery," *Sensors*, vol. 18, no. 5, pp. 1328–1330, 2018.

[3] C. Bradley, "Automated surface roughness measurement," *The International Journal of Advanced Manufacturing Technology*, vol. 16, no. 9, pp. 668–674, 2000.

[4] Z. Li and W. M. Liu, "Research on license plate image preprocessing in vehicle license plate recognition system," *Science and Technology and Engineering*, vol. 8, pp. 2081–2084, 2011.

[5] D. F. Li, Y. F. Ding, and X. Y. Qiu, "Research on license Plate Image preprocessing method based on VC++," *Electron Mass*, vol. 11, pp. 35–37, 2011.

[6] Xuguo Yan, Long Wen, and Liang Gao "A Fast and Effective Image Preprocessing Method for Hot Round Steel Surface"Volume 2019

[7] Meghana D. More and G.K.Andurkar, "Edge detection techniques :a comparative approach," World Journal of Science and Technology 2012, 2(4):142-145 ISSN: 2231 – 2587

[8] Pakhira, Malay K,"Digital image processing and pattern recognition,"PHI Learning.

[9] A. Amali Asha S.P. Victor A. Lourdusamy, "Performance of Ant System over other Convolution Masks," International Journal of Computer Applications (0975 – 8887) Volume 16– No.3, February 2011

[10] P. MadhaviLatha, J.Ravi ,Y Sangeetha," IRIS Recognition and Identification System," IJCSET |January 2012| Vol 2, Issue 1,848-857

[11] Er. Harsimran Singh, Er. Tajinder Kaur, " Empirical Study of Various Edge Detection Techniques for Gray Scale Images," International Journal of Advanced Research in Computer Science and Software Engineering Volume 3, Issue 8, August.

[12] N.P.Revathy, S.Janarthanam, DrT.Karthikeyan, "Optimal Edge Perservation in Volume Rendering Using Canny Edge Detector," International Journal of Scientific & Engineering Research, Volume 4, Issue 6, June-2013.

[13] MamtaJuneja ,Parvinder Singh Sandhu, "Performance Evaluation of Edge Detection Techniques for Images in Spatial Domain," International Journal of Computer Theory and Engineering, Vol. 1, No. 5, December, 2009.

[14] RajniNema, Dr. A. K. Saxena, "Edge Detection Operators on Digital Image," International Journal of Engineering Sciences &ResearchTechnology [Nema, 2(6): June, 2013.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Automation In Agriculture Using IoT And Machine Learning Algorithms

Kranti G. Sapkal [1], Avinash B. Kadam[1]
[1]*Research Scholar, Sant Gadge Baba Amravati University, Amravati*
E-mail:krantisapkal2006@gmail.com
[2]*Assistant Professor, Sant Gadge Baba Amravati University*
E-mail:avinashkadam28@gmail.com

ABSTRACT:

Agriculture automation is an emerging need as the population of world is increasing rapidly. To fulfil the need of food for growing population, it becomes mandatory to make enhancements in agricultural practices. Automation techniques such as Internet Of Things and machine learning proving helpful for farmers to make precise decisions regarding crops and obtain maximum profit. This paper discusses about different machine learning algorithms to deal with the major challenge presented by IoT is how to analyse the large amount of collected data. This paper also talks about sensors like soil , humidity to collect crop related data with the help of Raspberry pi .Combination of IoT and machine learning can lead a great future for agriculture.

Keywords: Internet of Things, Machine learning, Agriculture, Sensors, Raspberry pi.

I. INTRODUCTION

IoT has really exploded over the past years, demonstrating its potential in applications ranging from wearable and automated cars to smart homes and smart cities, creating an impact everywhere[1]. According to recent research by Gartner, there are around 16 billion devices connected to the IoT now and this is expected to rise to 25 billion by 2020. All such connected devices generate a massive amount of information that needs to be monitored and analysed, so that they learn continuously from the available sets of data and improve themselves without any manual intervention[2]. That‘s how IoT devices are becoming smarter. There are different ML algorithms and techniques that are implemented to easily analyse massive amounts of data in a short span of time, increasing the efficiency of the IoT. Different ML techniques such as decision trees, clustering, neural and Bayesian networks, help the devices to identify patterns in different types of data sets coming from diverse sources, and take appropriate decisions on the basis of their analysis [3]. The IoT using machine learning is set to push the future of farming to the next level. Smart agriculture is already becoming more commonplace among farmers, and high tech farming is quickly becoming the standard thanks to agricultural drones and sensors. In countries such as China and Japan, wide-scale deployments of smartphones and internet of things (IoT) systems have led to a rapid adoption of precision agriculture solutions [4].

II. LITERATURE REVIEW

To enhance the efficiency and safety of production and management of modern agriculture in China, based on the new generation of information technology (IT), an integrated framework system platform incorporating the Internet of Things (IoT), cloud computing, data mining, and other technologies is investigated. The design of combining Internet of Things, cloud computing, big data and modern agriculture is proposed. In addition, a hybrid data storage scheme based on NoSql database DynamoDB, relational database Oracle, and _le object storage Amazon S3 is designed. Using open source hardware raspberry pie, a low-cost, a stable and highly scalable intelligent gateway for IoT [1].To analyse the information and data collected from different datasets, machine learning techniques plays a big role[2]. In the cloud, machine learning based real-time analytics is performed to predict the future condition of the crops based on its past data. Limitations of the system are capturing correct data from large data set and security [3].The research deployed a sensing network to gather the field data of some crops (Potatoes, Tomatoes, etc.), then fed these data to a machine learning algorithm to get a warning message finally displaying both the data and the warning message through a Graphical User Interface (GUI) [4]. The few technologies like machine learning, deep learning, IoT, cloud computing in some developed countries and developing countries were discussed and also mentioned the differences between them [5]. The field data collected from the deployed sensors (air temperature, air humidity, soil moisture, soil temperature, radiation) and the weather forecast data from the Internet are used for predicting the future soil moisture. Multiple ML techniques are analysed for predicting future soil moisture and the results obtained using GBRT are quiet encouraging. The proposed techniques could be a crucial research front for optimizing the water usage in irrigation[6]. The R. Kamath et al.[7] described the monitoring of

paddy crop for weeds using Raspberry Pi. Visual sensor nodes send data to base station using Bluetooth 4.0 and it is forwarded to remote station using IEEE 802.11 a/b/c/d standard. At the remote station, images were preprocessed to remove soil background and different shape features were extracted. Random forest and support vector machine classifiers were used to classify the paddy crop and weed based on the shape features[7]. Using NodeMCU and several sensors connected to it; temperature, humidity and soil moisture level is monitored. Also, a notification in the form of SMS will be sent to farmer's phone using Wi-Fi about environmental condition of the field [8]. The robotic arm helps in unwanted plant elimination. The heart of system is microcontroller which controls the entire operation. The K. S. Santhosh et al [9] prototype model has been implemented so that it can be scaled up for development of the larger systems. O. Elijah et al [10] proposed work on Cloud platform, sensors and camera, communication technology can be beneficial to increase productivity of crop yield.

III. PROPOSED WORK

In this paper, data collection through IoT and data analytics using machine learning for automatic agriculture is proposed.

A. Data collection using IoT sensors.

Farmers can monitor various conditions like soil moisture, water level, light, humidity, obstacles, and motion from anywhere by combining sensors, motion detectors, button camera, and wearable devices. The IoT-based smart farming automates the irrigation system and is highly efficient as compared to the conventional operations [11]. This concept can help farmers to do farming in ultramodern way in era of manpower scarcity & very busy lifestyle. It is easy to follow the trends in organic farming, family farming, group farming etc.

1.Soil Sensors

The use of soil sensors can help farmers to manage seasonal water application, applying less early and late in the season. If sensors are deployed in several areas of the field, they can direct differential irrigation rates, creating uniform soil moisture, reducing water use, and improving overall yield.

The soil sensors [9], which are at uniform distances across the farmland, can alert farmer to any irregular conditions like high acidity or low moisture. The farmers can get an accurate soil data either by the dashboard or a customized mobile application.

2.Temperature and humidity sensor

DHT22 is a low cost digital sensor that uses a thermistor to measure the air in the surrounding and also a capacitive humidity sensor to measure humidity. A capacitive humidity sensor measures relative humidity with the placement of a thin strip of metal oxide between two electrodes [11-12].

3. Ultrasonic Ranging sensors

Sensors of this category are considered a good choice being low cost, potential to operate in a variety of applications, and ease of use and adjustability, such as the sampling rate. Common uses are tank monitoring, spray distance. When combined with a camera, these sensors can then be used for the weed detection [12], where the heights of plants are identified using the ultrasonic sensors and the camera determines the weed and crop coverage.

B. Data analytics using Machine Learning algorithms.

Machine learning is a subfield of type of AI which gives machines the ability to learn from past experience. Machine learning algorithms uses computational methods to learn directly from datasets without depending on predetermined equations as a model. As the available number of training samples increases the algorithms progressively adapt to enhance their performance [13]. The ultimate view point of ML is to automate the data analysis process with the help of algorithms that are enabled with continuous learning skill. Hence ML refers to the set of techniques meant to deal with huge data in the most intelligent way in order to derive actionable insights. The ML algorithms can be classified into three categories; supervised, unsupervised, and reinforcement learning algorithms,[14] .

Supervised Learning*:* In Supervised Learning, the data is first labelled and training is performed on labelled data. It tries to identify automatically rules from available datasets and define various classes, and finally predict the output (objects, individuals, and criteria) to a given class[15].

Unsupervised Learning: In unsupervised learning, the references can be drawn from the datasets consisting of input data without labelled data. Unsupervised Learning algorithms identify the data based on their densities, structures, similar segments, and other similar features [14].

Reinforcement Learning: Reinforcement Learning is a feedback-based Machine learning technique in which an agent learns to behave in an environment by performing the actions and seeing the results of actions. It is greatly inspired by learning behaviours of humans and animals. Such behaviours make it an attractive approach in highly dynamic applications of robotics in which the system learns to accomplish certain tasks without explicit programming[14].

1. Current methods in machine learning

Regression—It is a Supervised Learning task where output is having continuous value. Mainly, there are two types of regression algorithms: linear and nonlinear. Linear models rely on the assumption of a

linear relationship between independent and dependent variables [16].

Decision tree (DT).—Decision tree works by splitting the dataset into two or more sets depending on the best attribute classifier. It is used for classification and regression which can be applied to categorical and continuous variables. DT works by following the decisions in the tree from the root down to a leaf node [14].Decisions trees are the most powerful algorithms that falls under the category of supervised algorithms.

NaïveBayes Algorithm.—Naïve Bayes algorithm is a supervised learning algorithm, which is based on Bayes theorem and used for solving classification problems. Bayesian models (BM) are based on of probabilistic models which make analysis within the context of Bayesian inference. Following equation represents the Bayes' Theorem. This equation is used to calculate the posterior probability using the prior probability and the information from the data collected. $P(A|B)$ is the posterior probability that we wish to calculate. P(A) is the known prior probability. $P(B|A)$ is known as the likelihood of the observation B[17].

$$P(A|B) = P(B/A)\frac{P(B)}{p(A)}$$

Support vector machine (SVM).—Support vector machines (SVMs) are powerful and flexible supervised machine learning algorithms which are used both for classification and regression .It is suitable for high-dimensional data where a large number of predictor variables exist. An SVM model is basically a representation of different classes in a hyper plane in multidimensional space [18].

Artificial neural network (ANN).—Artificial neural network is an learning system that works based on the biological neural networks system. A neural network is characterized by 1) its pattern of connections between the neurons called its architecture, 2) its method of determining the weights on the connections called algorithm, and 3) its activation function. The general architecture of the ANN algorithm consists of input units, single or multi-layer hidden units, and output. ANN can be used for regression and classification problems. Commonly implemented ANN learning algorithms include the radial basis function, perception algorithms, back-propagation, and feed forward Propagation [19].

IV. Conclusion

It is proposed to monitor some system parameters like soil pH, soil temperature, soil moisture, water level, growth of crops using IoT and machine learning techniques and algorithms. To accomplish this task on the implementation level the first requirement is to review and implementation of existing methods and techniques of machine learning in the field of agriculture. IoT in combination with machine learning will help to improve the quality and increase the farm yield without human intervention. By utilizing the idea of IOT framework can be more effective[20]. In future, farmer can also capture the disease photo and upload photo, via machine learning farmer can get disease information and solution to disease.

REFERENCES

[1] R. Varghese and S. Sharma, "Affordable Smart Farming Using IoT and Machine Learning," in Proceedings of the 2nd International Conference onIntelligent Computing and Control Systems, ICICCS 2018, 2019.

[2] S Liu, L. Guo, H.Webb, X.Yaa, X.Chang (2019),"Internet of things monitoring system of modern eco-agriculture based on cloud computing", IEEE Access, 7, 37050–37058.

[3] Balducci, Fabrizio & Impedovo, Donato & Pirlo, Giuseppe. (2018), "Machine Learning Applications on Agricultural Datasets for Smart Farm Enhancement", 6. 38. 0.3390/machines6030038.

[4]A. A. Araby et al., "Smart IoT Monitoring System for Agriculture with Predictive Analysis," 2019 8th International Conference on Modern Circuits and Systems Technologies (MOCAST), Thessaloniki, Greece, 2019, pp. 1-4.

[5] I. Z. Ramdinthara and P. Shanthi Bala, "A comparative study of IoT technology in precision agriculture", in 2019 IEEE International Conference on System, Computation, Automation and Networking, ICSCAN 2019, 2019.

[6] G. Singh, D. Sharma, A. Goap, S. Sehgal, A. K. Shukla, and S. Kumar, "Machine Learning based soil moisture prediction for Internet of Things based Smart Irrigation

System", in Proceedings of IEEE International Conference on Signal Processing,Computing and Control, 2019.

[7] R. Kamath, M. Balachandra, and S. Prabhu, "Raspberry Pi as Visual Sensor Nodes in Precision Agriculture: A Study", IEEE Access, 2019.

[8] M. S. D. Abhiram, J. Kuppili, and N. A. Manga, "Smart Farming System using IoT for Efficient Crop Growth", in 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science, SCEECS 2020, 2020.

[9]K. S. Santhosh, M. Anusha, M. Junaid, K. C. Anju, and Meghana, "IoT Based Agriculture Using AGRIBOT", in 2019 4th IEEE International Conference on Recent Trends on Electronics, Information, Communication and Technology, RTEICT 2019 - Proceedings, 2019.

[10] O. Elijah, T. A. Rahman, I. Orikumhi, C. Y. Leow, and M. N. Hindia, "An Overview of Internet of Things (IoT) and Data Analytics in agriculture: Benefits and Challenges", IEEE Internet Things J., vol. 5, no. 5, 2018.

[11]L. Abhishek and B. Rishi Barath, "Automation in agriculture using IoT and machine learning", Int. J. Innov. Technol. Explor. Eng. 2019.

[12] Mekonnen, Yemeserach et al. 2020. "Review—Machine Learning Techniques in Wireless Sensor Network Based Precision Agriculture." Journal of The Electrochemical Society.

[13] U. S. Shanthamallu, A. Spanias, C. Tepedelenlioglu, and M. Stanley, "A brief survey of machine learning methods and their

sensor and IoT applications," in 2017 8th International Conference on Information, Intelligence, Systems and Applications, IISA 2017, 2018.

[14] K. Sumathi, K. Santharam, and N. Selvalakshmi, "Dataanalytics platform for intelligent agriculture," in Proceedings of the International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud), I-SMAC 2018, 2019.

[15]Chlingaryan, Anna, Salah Sukkarieh, and Brett Whelan. 2018. "Machine Learning Approaches for Crop Yield Prediction and Nitrogen Status Estimation in PrecisionAgriculture: A Review." Computers and Electronics in Agriculture.

[16]Praveen Kumar, D.Tarachand Amgoth, and Chandra Sekhara Rao Annavarapu. 2019. "Machine Learning Algorithms for Wireless Sensor Networks: A Survey." InformationFusion.

[17]Pathan, Misbah, Nivedita Patel, Hiteshri Yagnik, and Manan Shah. 2020. "Artificial Cognition for Applications in Smart Agriculture: A Comprehensive Review." Artificial Intelligence in Agriculture.

[18] Sardal, Nihar, Ankit Patel, and Vinaya Sawant. 2021. "Smart Farming." In Advances in Intelligent Systems and Computing.

[19] Shafi, Uferah, Rafia Mumtaz, José García-nieto, and Syed Ali Hassan. 2019. "Precision Agriculture Techniques and Practices :" Sensor.

[20] Vij, Anneketh et al. 2020. "IoT and Machine Learning Approaches for Automation of Farm Irrigation System." In Procedia Computer Science.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

CYBER SECURITY: NEED FOR SOCIETY

Patil Mayur Jagdish[1], Dr. Krishnakant P. Adhiya[2]
[1]*Assistant Professor, Department of Computer Engineering,*
R.C.Patel Institute of Technology, Shirpur, Maharashtra, India
mayurpatil.rcpit@gmail.com
[2]*Professor, Department of Computer Engineering,*
SSBT COET, Bambhori, Jalgaon, Maharashtra, India
kpadhiya@yahoo.com

ABSTRACT:
Today, if we talk about the computer system then everyone focus on the security. What is security? How we secure our information in this digital world? So many questions are in front of us. Basically, security is a process, not an end state or we can say that security is a process of maintaining an acceptable level of perceived work. Whenever anyone who talk about the word Cyber Security, then he/she always represent the information in the security perceptions. In today's digital world Cyber Security is the most emerging topic or area where most of organizations try to make their platform very secure.

Keywords: Cyber Security, Cyber Crime, Cyber Space, Information Security.

1. Introduction

When we deal with Cyber Security, there are two more terms which are directly or indirectly related with Cyber Security, they are Cyber Space & Cyber Crime. Cyber Space is environment where all the communication are carried throughout the computer network. In the network everybody is connected with everybody or with single one. Cyber Crime is crime which actually involves a computer or computer network [1].There are three aspects of Security,

1. Confidentiality
2. Integrity
3. Availability

In short, Security is totally depends on CIA Triangle.

Fig.1. CIA Triangle

Confidentiality: - Data should be access only by authorized users and processes. In other word we can say that protection of data from unauthorized access and misuse. We can keep our data confidential using [2]

- Encryption
- Password
- Two Factor Authentication
- Biometric Verification

Integrity: - Nobody should tempered the data either accidentally or maliciously. Data should always represent in correct format. We can maintain data integrity using [2],

- Encryption
- Access Control
- Backup Procedure
- Error Detection Programs

Availability: - Data should be available only for authorized users or process whenever they need. We can keep information availability using [2],

- Disaster Recovery Tool
- Redundancy
- Virtualization

- Server Mirroring

2. What is Cyber Security?

According to International Telecom Union (ITU), the definition of Cyber Security is as follows,

Cyber security is a collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies, that can be used to protect the cyber environment and organization and users assets.

Organizations and user assets includes connected computing devices, personnel, infrastructure, applications, services, telecommunication systems and the totality of transmitted and/or stored information in the cyber environment. Cyber security strives to ensure the attainment and maintenance of the security properties of the organizations and user assets against relevant security risks in the cyber environment.

This paper will give the basic idea about the importance of the cyber security in our day to day life.

2.1 Cyber Security vs Information Security

Table 1. Cyber Security vs Information Security

Cyber Security	**Information Security**
It is the way of providing protection to the data from intruders.	It is the way of providing protection to the information from unapproved user, illegal access and data tempering.
It gives idea about the protection of network from different type's cyber-attacks.	It gives the idea about the protection of information from any type of illegal activity.
Cyber security is used to defend anything in the area of network.	Information security is only focuses on information irrespective of network.
Cyber Security provides the way for controlling the malicious activity over the network.	Information security provides the way for defending the information against the vulnerability.
Mainly focus on Cyber Crime, Cyber Fraud, and Law Enforcement.	Mainly focus on Unauthorized access, modification and tempering of the information.

2.2 Cyber Security vs Network Security

Table 2. Cyber Security vs Network Security

Cyber Security	**Information Security**
According to literature, Cyber Security is a subgroup of Information Security.	According to literature survey, Network Security is a subgroup of Cyber security.
It deals with protection of data which is directly stores on network devices and different servers.	It deals with data which travels around the network.
In Cyber security phishing, vishing, key-logger etc. are included.	Basically in network security viruses, warms, malware etc. are included.
Cyber Security	Network Security

mainly focuses on digital data.	basically focuses on transit data.
Cyber security provides the way to secure data from malicious activity over the network.	Network security provides the way to protect the data which send and receive across the network.

3. Attacks in Cyber Security

Basically, the term cyber-attacks defined as try to gaining the unauthorized access to someone's computer to do a malicious activity. Actually the Cyber-attacks are inexpensive, expedient and less risky as compared with the attack which involves the physical presence [4].

A cyber-criminal needs very basic things beyond the Machine or Computer and the internet connectivity. They are uncontrolled by location and by area. They are very arduous to recognize or point out and prosecute due to anonymous nature of the Internet [4].

In April 2012, Symantec published a report in which they says that, cyber-attack cost US$114 billion each year. Number of cases regarding cyber-attacks are also increased. Symantec conducted a survey by interviewing 20,000 people across 24 countries, out of which 69% people sufferer from the cyber-attack in their life time. According to survey conducted by Symantec, in every second total 14 adults are suffer from cyber-attacks or more than one million attack per day [4].

Some of the international literature includes the definitions of cyber-attack, cyber-crime and all are focus on Confidentiality, integrity and availability of the information. Increasing the research in the field of technology, also causes the progress in the cybercrime, therefore the intruder or hacker or attacker are always try to find out the new way for attack, penetrate the target and remain unidentified.

Following are the list of different types of attacks that have been defined and explained in the international literature,

- Man in the middle attack
- Brute force attack
- DDOS Attack
- Malware
- Phishing
- Social Engineering

Man in the middle attack is nothing but a type of cyber-attack, in which attacker or intruder put himself or herself in between two device i.e. sender and receiver or we can say that in the middle of server and client. Therefore all the messages that passes or travel between server and client will reaches the attacker before reaching to its original destination. With the help of this attack the attacker will get unauthorized access to sensitive information and chances to change the original information before reaching to its original destination by the intruder or attacker [5].

Brute force attack is a traditional method to guess or to crack the password. It is also used to find out the conceal pages and content in the web application. This attack takes longer time with higher success rate. Dictionary attack is the most common example of brute force attack to guess the password. A password dictionary is used by attacker which contains millions of words that can be used as a password. The attacker will get full access of target machine if and only if dictionary contains the correct password. Following is the list of some of the popular tools used for Brute force attack such as [5],

- Aircrck-ng
- John the Ripper
- Rainbow Crack
- LophtCrack
- OphCrack
- Hashcat
- DaveGrogl
- NCrack

A distributed denial of service (DDOS) attack is attack in which the flood of internet traffic is redirected to the targeted machine or to the targeted network infrastructure. This attack is used to disturb the regular flow of network traffic. In this attack the network traffic comes from multiple sources so it is impossible to stop the attack by blocking the single source [5].

Malware is nothing but Malicious Software, which basically focus on Virus, Worm, Trojans and other malicious program which affect the computer system and with the help of these an attacker gain the unauthorized access to sensitive information [5].

Phishing is a type of cyber-attack which get the personal information of victim by masquerading as trustful source. Phishing is nothing but a deceitful try to obtain the important information or data such as username, password, and credit/debit card details by personate himself or herself as a reliable entity in an electronic communication media. Sometime phishing directs the victim to enter his/her personal details at duplicate or we can say that fake website which is exactly matches the look and feel of the original website [5][6].

Social Engineering is the very basic concept which is used to gain the control of unauthorized access to the victim's machine with the help of human interactions. Basically it is a psychological manipulation which is used by the attacker and due to this the victim makes the security mistakes or giving away sensitive information [7].

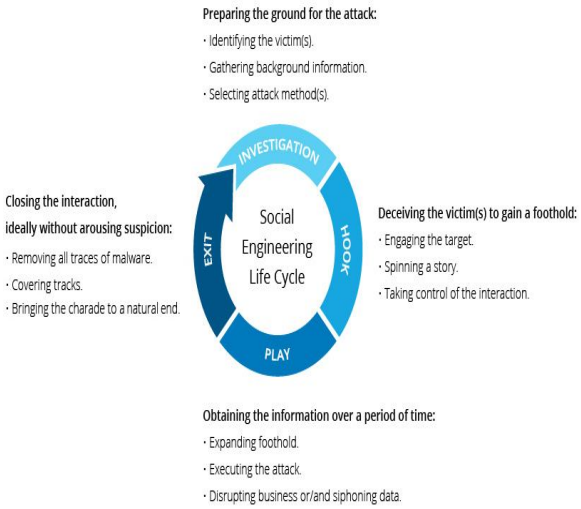


Fig. 2 Social Engineering Attack Life Cycle [7]

To reduce the cyber-attack risk & protects against the unauthorized exploitation of systems, networks & technologies an effective cyber security is required. The myth about cyber security is that it makes system 100% secure or safe but actual fact is that cyber security reduces the risk of a system to an extent. For protecting our cyber assets & critical data a cyber security is essential. In real world scenario any device which is connected with internet to communicate with other devices can be affected by security loopholes or security violations. Following are the example of some system which are affected due to some security loopholes,

Communication System

- Email
- Phones
- Text Messages

Transportation System

- Traffic Control System
- Car Engine System
- Airplane Navigation System

Government Database

- Aadhar Card Details
- Licenses database
- Tax Record

Financial Systems

- Bank Accounts
- Loan Record

Medical System

- Medical Records
- Equipment's
- Ex. Pacemaker:- IOT device connected to monitor which shows the heartbeats.

Educational Systems

- Grades
- Report Card
- Research Information

And many other systems which can be affected by security loopholes [8].

4. Significance of Cyber Security

In today's digital era every computer system or every network connected device is at a risk of cyber-attack, because everything is rapidly done over the network connected systems or devices. Actually the cyber attacker target the system loopholes or in more technically we can say that cyber attacker target the system vulnerabilities, they don't target individual or business [8].

Cyber-attacks are nothing but computerized, they continuously looking for system loopholes or vulnerabilities. Like the character in terminator movie which is known as Cyborg*, Cyber attacker never stop [8].

Cyborg is nothing but a fictional or hypothetical person whose physical abilities are extended beyond normal human limitations by mechanical elements built into the body [9].

Cyber security now a days is very important and crucial factor in our day to day life and it is very important to know the need of cyber security when we deal with digital era. It is very necessary to protect our personal credential or to protect ourselves from online fraud. Not any individual but institutes like government, education and financial can also be affected or can also be targeted by cyber attacker. While dealing with online environment it is the responsibility of each and every one that to learn about the security measures. The continuously change in technology is big challenge in front of cyber security experts. However the actual security understanding and measures can actually help us to protect ourselves in this digital era. Mainly the cyber attacker target the central, state or local governing body because they hold very large, confidential and sensitive information in the digital form. Due to the lack of awareness, funding, insufficient network infrastructure the government body faces so many problems to protect their valuable data. It is the responsibility to the government body to provide the trustworthy service to society, make healthy communication between citizens and government body, and last but not the least to protect their confidential and sensitive information which is in digital form [10].

5. Conclusion

This paper gives the basic idea about the cyber security domain. The paper then explain the need of cyber security for the society and also explain the different types of attacks which can be steal the users personal information like credit and debit card details, username, password credentials etc. This paper also gives the main difference between Cyber Security and Information Security also gives the difference between Cyber Security and Network Security. So the cyber security is not just for security but it is also related with making healthy environment between user, cyberspace and the digital world.

6. References

[1] Rossow von Solms, Johan van Niekerk, "From information security to cyber security", Journal of Computers and Security, 2013, vol. 38, PP. 97-102,http://dx.doi.org/10.1016/j.cose.2013.04.004

[2]https://smarteyetechnology.com/confidentiality integrity-availability-basics-of-information-security/

[3]https://www.itu.int/net/itunews/issues/2010/09/pdf/201009_20.pdf

[4] Jullian Jang Jaccard, Surya Nepal, A survey of emerging threats in cyber security, journal of Computer and System Sciences, volume 80 issue 5, Aug 2014, PP 973-993.

[5] Cyber Attacks: Trends, Pattern and Security Countermeasures, Andreea Bendovschi, December 2015, Procedia Economics and Finance, Vol 28, PP 24-31.

[6] ww.en.wekipedia.org/wiki/phishing

[7]www.impreva.com/learn/applications ecurity/social-engineering-attack

[8] Cyber Security Course by Amity University, Online available on https://learningweek.amityfutureacademy.com.

[9]https://www.lexico.com/definition/cyborg

[10]Rajesh Kumar Gautam, "Importance of Cyber Security", International Journal of Computer Apllications (0975-8887), Volume 111, No. 7, PP. 14-17, February 2015.

[11] Santosh Kumar Mourya, Nagendra pratap Bharati, "Cyber Security; Issue and Challenges in E-Commerce", Indian Journal of Research, volume 5, Issue 1, January 2016.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Chronic Occupational Disease: A study of IT sector professionals in India

Neha Saini
Research Scholar, University School of Applied Management, Punjabi University Patiala, Punjab, India
Dr. Parampreet Singh
Assistant Professor, Sri Guru Teg Bahadur Khalsa College, Sri Anandpur Sahib, Punjab, India

ABSTRACT:
Every organization in the world achieves their goals by using human resources. Most of the employees are facing chronic health problems in IT sector. Representatives working in IT industry are inclined to build up a great deal of medical issues because of constant physical and mental worry of their work. For the purpose of this research a number of 5 viable IT firms were selected and 200 IT professionals were selected as a sample. Research has found that there is a very strong positive relationship between health facilities and employees' satisfaction.

Keywords: IT professional's health, Employee satisfaction and IT firms

I. INTRODUCTION

As India is a developing country the growth of the country depends upon the industrial profile of the nation. Data Technology (IT) industry in India has an enormous lift because of globalization of Indian economy and good government approaches. IT and IT related experts are at a steady strain to convey benefits proficiently and must be practical

Representatives working in IT industry are inclined to build up a great deal of medical issues because of constant physical and mental worry of their work. Sicknesses are either initiated, continued or exacerbated by pressure. The basic medical issue because of stress is corrosive peptic infection, liquor abuse, asthma, diabetes, weakness, pressure cerebral pain, hypertension, sleep deprivation, touchy inside condition, psychoneurosis, and skin maladies, for example, psoriasis, lichen planus, urticaria, pruritus, neurodermatitis and so forth. In this research, the purpose is to analyze employee's health and safety and the impact on their job satisfaction. For this purpose, the IT sector professionals has been selected as a population because they are facing more health issues in the workplace due to long working hours. Globalization and privatization have brought new work connections, work weakness, instability with respect to future working conditions and quick out of date quality of abilities are reasons for pressure. The IT industry has become one of the quickest developing enterprises in India. The purpose behind picking especially IT is that the degree of stress these workers face is similarly higher than workers from other sectors. Any sort of work has targets, and a worker becomes focused when the person is allocated with unachievable targets and can't deal with a given circumstance which will lead to chronic occupational diseases

II. MEANING OF CHRONIC OCCUPATIONAL DISEASE

According to the International labor organization "Occupational disease refers to

any disease contracted as a result of exposure to factors arising from work activity".

Two main mandatory elements which are understood from the definition.

1. The causal relationship between exposure in a specific working environment or work activity and a specific disease and
2. The fact that the disease occurs among the group of exposed persons with a higher frequency rate than in the rest of the population, or in other worker populations.

- **TYPE OF DISEASE**

After some time, expanded periods at the PC can negatively affect our wellbeing. The following are the major constant illnesses endured by the IT experts.

- **Lower Back Pain:**

  This is the most common problem faced by the IT experts. Around 80% of individuals have to sit over 8 hours before a PC which can prompt over weight on bone joints and ligaments of back prompting back pain. Employees are not taking successive breaks in the middle of the work. Since a long time ago run tireless pressure and strain on the bone and tendons prompts basic changes in the spine in this manner prompting an incessant back torment.

- **Carpal Tunnel Syndrome (CTS):**

  Carpal passage disorder is where a nerve known as the middle nerve that goes through the wrist gets packed because of steady yet limited development of the wrist joint. The ligament aggravation coming about because of dreary work, for example, continuous composing, can cause carpal passage side effects. Carpal passage disorder from dull moves like continuous composing has been alluded to as one of the dreary pressure wounds.

- **Pressure and Nervousness:**

  Targets and cutoff times, hearing these two words is sufficient to instigate pressure and nervousness in the vast majority of IT experts.

- **Heart Diseases:**

  Research has found that sitting for a long duration of time without giving importance to various health concerns, including obesity and metabolic disorder. Number of health issues arises that includes high blood sugar, high blood pressure, excess stomach fat and high cholesterol levels. An excess of sitting also seems to expand the danger of life from cardiovascular disease.

- **Sleeping Disorder:**

  A sleeping disorder or trouble in sleeping is one of the regular problems seen in software professionals. This is more recognized in IT sector professionals working in late night shifts, as their ordinary sleep time is disturbed andtheir day time rest is poor & inadequate due to some or other reasons.

- **Deep vein thrombosis:**

  Deep vein thrombosis is a condition where blood clusters form in the deeper veins in the legs. It is one of the typical health problems in software experts. Generally, the impure blood in the legs is pumped back to heart and afterwards lungs for purification; this is a regular continuous process; sitting for extended hours without any movement can make blood deteriorate in the blood veins of our legs which lead to clot development. This can prompt advancement of a condition known as Deep vein thrombosis.

- **Cancer**

  In addition to heart disease and thrombosis, a recent medical examination has found that there is a link between physical inactivity and certain cancers, particularly colon and breast cancer.

III. NEED OF THE STUDY

Research has found that employee's health directly affects work performance of the employee and the profitability of the company. For the success of any business, it is important to have those who work for the organization fit, healthy and happy.

It is very important to know what type of diseases are associated with the work of the employees. Nowadays the Information Technology sector plays an important role in the development of an economy. So, it has become so important to take care of the main warriors who can directly or indirectly be associated with increasing the GDP of the country. The present research will be conducted to find the answers of the following questions

1) Why there is an alarming increase in chronic diseases even after the adoption of so many wellbeing programs by the organizations?
2) What is the status of the employees about the awareness of the chronic diseases symptoms at the initial stages?

The Present study will be a significant endeavor in articulating how the awareness about the early detection of disease helps in curing the chronic diseases.

IV. OBJECTIVES OF THE STUDY

1. To identify the impact of chronic health issues suffered by employee on employee's productivity and organization's profitability.

2. To examine the level of awareness among the Information Technology sector employees for the health benefits.

V. RESEARCH METHODOLOGY

Research methodology can be defined as a particular procedure or technique used to identify, select, process and analyses information about a topic. Research methodology helps to evaluate the validity and reliability of the study

A. RESEARCH PROBLEMS

The foremost step in research is formulation of the research problem. A

research problem can be defined as a specific issue, contradiction that will be addressed in the research. It will provide a clear purpose and justification to the research. Under this research the main problem is associated with the work-related diseases that turn out chronic with the passage of time.

1)To what extent employee health facilities by the employer and Government are provided in the IT Sector

2)Are the employee health & safety facilities having an impact on employee's job satisfaction?

3)What factors causes employee health & safety problems?

B. TARGET POPULATION

Target population refers to the entire group of individuals who are helpful in achieving the effective results for this study. Employees with the experience of minimum 2 years and age between 27 to 45 years are considered, both male and female are included and 200 employees were selected based on the provided selected criterion.

C. RESEARCH DESIGN

The research under study is a combination of both exploratory and descriptive research design. The exploratory will include techniques like reviewing available literature and data sources.

Description design will be used to study the symptoms, experience and type of the job associated with the respondent and draw inference and gain new insights in research work.

D. DATA COLLECTION TECHNIQUES

In this research, the data is mainly collected through primary sources. Employees of the IT sector are the major sources of primary data collection. This data has been collected by sending online self-structured questionnaires to employees of five viable IT firms in India. Each sample was selected on the basis of a simple random sampling method.

VI. CONCLUSIONS

Most of the employees who are working in the IT sector, face health problems due to above mentioned reasons. Though, organizations has taken necessary actions from time to time to reduce or eliminate the problems associated directly with the work of the employees. According to findings, there is a negative relationship between work stress and employees' satisfaction. Further, there is a positive relationship between health facilities and employee's satisfaction. If employees' health facilities provided by the organization increase, employee's satisfaction also will be increased. So, organizations need to consider employees' health and safety facilities to

achieve their objective effectively and efficiently.

VII. FUTURE SCOPE

This study is constructed for identifying the relationship between employees' health, safety facilities and employees' satisfaction. Even though other factors, such as employer and employee relationship, salary, incentives, leaves emoluments, perks etc. that can affect the employees' satisfaction are considered. So, on the basis of the research conducted it can't be concluded that only health and safety are related to the satisfaction of employees. So, further researchers have to consider other factors than considered factors.

VIII. REFERENCES

1. Amanda M, Zuniga F, Cote JN. Effects of dual monitor computer work versus laptop work on cervical muscular and proprioceptive characteristics of males and females. Human Factors: The Journal of the Human Factors and Ergonomics Society. 2017 January; 13(1): 339-47.
2. Hayes JR, Sheedy JE, Stelmack JA, Heaney CA. et al. Computer use, symptoms, and quality of life. Optom Vis Sci. 2007 Aug;84(8):738-44
3. Talwar R, Kapoor R,Puri K, Bansal K, Singh S. A study of visual and musculoskeletal health disorders among computer professionals in NCR Delhi. Indian Journal of Community Medicine. 2009 December; 34 (4): 326-328
4. Sharma G, Srivastava V, Singh PK. Computer vision syndrome: A holistic approach through Trataka yoga. International Journal of Green Pharmacy. 2017 Jan-Mar; 11(1): p. 7-10.
5. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in Chennai. Ann Med Health Sci Res. 2014 Mar;4(2):179-85. doi: 10.4103/2141-9248. 129028
6. Shrivastava SR, Bobhate PS. Computer related health problems among software professionals in Mumbai: A cross-sectional study. International Journal of Health & Allied Sciences. 2012 Apr-Jun; 1(2): 74-78
7. Bhanderi D, Choudhary SK, Parmar L, Doshi V.Influence of psychosocial workplace factors on occurrence of musculoskeletal discomfort in computer operators. Indian Journal of Community Medicine. 2007 Jul 1;32(3):225
8. Ali KM, Sathiyasekaran BW. Computer professionals and Carpal TunnelSyndrome (CTS). Int J OccupSaf Ergon. 2006; 12(3): 319 25. DOI:10.1080/10803548. 2006. 11076691
9. Sharma AK, Khera S, Khandekar J. Computer related health problems among information technology professionals in Delhi. Indian Journal of Community Medicine. 2006 Jan1;31(1):36.
10. Mallik D, Gahlot A, Maini A, Garg S. Prevalence of dry eye amongst computer workers in Kanpur. International Journal of Community Medicine and Public Health. 2017 July; 4(7): p. 2308-2311.
11. Bisht D, Bakhshi R. Knowledge of computer ergonomics and incidence of musculoskeletal disorders among students of Punjab Agricultural University, Ludhiana, India. Journal of Applied and Natural Science. 2018 March; 10(1): p. 323-329.
12. Sharma AK, Khera S, Khandekar J. Computer related health problems among information technology professionals in Delhi. Indian Journal of Community Medicine. 2006 August; 31(1): p. 36-38.
13. Dessi A, Adane F, Nega A, Wami SD, Chercos DH. Computer Vision Syndrome and Associated Factors among Computer Users in Debre Tabor Town, North west Ethiopia. Journal of Environmental and Public Health. 2018 September; 2018 (Article ID 4107590): p. 1-8.
14. Saleem M, Priya S, Govindarajan R, Balaji E, DivaharAnguraj A, Shylendra Babu PG, et al. A cross sectional study on work related musculoskeletal disorders among software professionals. International Journal of Community

Medicine and Public Health. 2015 November; 2(4): p. 367-372.

15. Prasad MA, Wagh V, Mudey A. Study of prevalence of health problems among computer professionals in selected information technology (IT) company in Nagpur district of central India. Innovative Journal of Medical and Health Science. 2014 May-June; 4 (3): p. 96-98.
16. Sharma AK, Khera S, Khandekar J. Computer related health problems among information technology professionals in Delhi. Indian Journal of Community Medicine. 2006 August; 31(1): p. 36-38.
17. Dessi A, Adane F, Nega A, Wami SD, Chercos DH. Computer Vision Syndrome and Associated Factors among Computer Users in Debre Tabor Town, North west Ethiopia. Journal of Environmental and Public Health. 2018 September; 2018 (Article ID 4107590): p. 1-8.
18. Saleem M, Priya S, Govindarajan R, Balaji E, DivaharAnguraj A, Shylendra Babu PG, et al. A cross sectional study on work related musculoskeletal disorders among software professionals. International Journal of Community Medicine and Public Health. 2015 November; 2(4): p. 367-372.
19. Prasad MA, Wagh V, Mudey A. Study of prevalence of health problems among computer professionals in selected information technology (IT) company in Nagpur district of central India. Innovative Journal of Medical and Health Science. 2014 May-June; 4 (3): p. 96-98.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Synchronization of Grid Tied Inverter Using Dq-PLL

Ms. Prajakta R. Narkhede[1], Dr.P.J.Shah[2]
[1]*Department of Electrical Power System, North Maharashtra University, India*
E-mail: narkhedepraju30@gmail.com
[2]*Department of Electrical Power system, North Maharashtra University, India*
E-mail: shah.paresh@sscoetjalgaon.ac.in

ABSTRACT :
In order to meet today's electricity demand we should go towards the electricity generation from renewable energy sources. But the electricity produced from renewable energy sources are preferred to transfer to electric grid instead of storing in batteries. Because if we store it in batteries its usability and efficiency decreases. Therefore to transfer this electricity produce from renewable energy sources to grid we need synchronization between inverter and grid. To achieve proper synchronization the phase angle and amplitude of grid voltage must be determined accurately and fast. So grid synchronization is the most important factor in utilization of renewable energy sources. Synchronization is the minimization of difference in voltage, frequency and phase angle between the corresponding phases of the inverter output and grid supply. Here we are using grid tied inverter scheme. Grid tied inverter is a special type of inverter which is used to convert direct current electricity into alternating current electricity for renewable energy sources. For controlling of inverter SPWM technique is used. In this paper PLL method is used for synchronization.

Keywords:

Grid Synchronization, PLL, SPWM, THD

1. INTRODUCTION

As in the present days utilization of electrical energy is increasing as compared with the generation of electrical energy. Hence, it is necessary to go towards the generation of electricity from renewable energy sources [1]. Water, air, solar irradiation, etc are the renewable energy sources use for power generation. These renewable energy sources are available in huge amount in the nature and hence their adoption in the electricity generation is increasing throughout the world. The main problem in the electricity generation with the renewable sources is that they are fluctuating in nature. Hence, their characteristics should be changed before connecting to the grid. The choice of equipment's used to change the characteristics depend on the type of generation. Solar and wind energy is available in large amount in India amongst all renewable energy sources. As the solar energy has stationary structure it is becoming popular choice among installers. Its control is also easy by using various equipment's such as charge controller, inverter etc. As in case of solar system the generated energy is DC inverter control plays very important role. The main objective of this design is to synchronize incoming DC signal with grid in phase and magnitude. For analysis of grid-tied inverter transformation of three phase signals into direct and quadrature axis is done. Phase Locked Loop (PLL) block is used to obtain the phase angle signals. The abc-dq transformation makes it easy to synchronize the inverted signal with grid by using this phase angle signals. This signals are given to the PWM generator. The PWM signals gives pulse to the MOSFET switches as per the input signals. The block diagram of proposed system is shown below in Fig. 1. The PLL is non-linear feedback system. In this system the output AC signal of inverter is maintained and synchronized with grid [2]-[4].

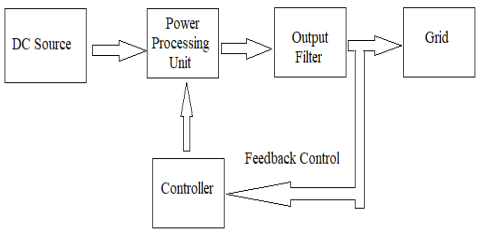


Fig. 1. Block Diagram of Proposed system

2. METHOD USE FOR INVERTER GRID SYNCHRONIZATION

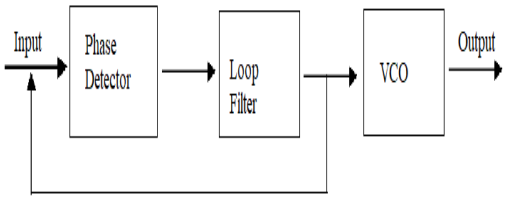


Fig. 2. Block Diagram of conventional PLL

PLL is a feedback control system. It automatically matches the phase of output signal with the phase of input signal. To obtain unity power factor PLL synchronizes the instantaneous phase angle of inverter voltage with the phase angle of grid voltage. The block diagram of conventional PLL is given in fig. 2[5].

2.1 PHASE DETECTOR

The function of phase detector (PD) is to generates a voltage. This voltage represents the phase difference between two signals. In a PLL, there are two inputs are given to the phase detector, one is reference input and the another is feedback from the VCO. The output voltage from the PD is used to control the VCO. This control can be done in such way that the phase difference between the two inputs is held constant, making it a negative feedback system.

2.2 FILTER

It is also called as PLL loop filter. Generally it has two distinct functions. This are as:

It checks the stability by observing the loop response to disturbances, such as changes of the feedback divider, changes in the reference frequency or at startup.

The second function is to limit the amount of reference frequency energy (ripple) obtained from the phase detector to the input of VCO .This frequency modulates the voltage controlled oscillator.

2.3 OSCILLATOR

All phase-locked loops consist of an oscillator element with variable frequency capability. The output from VCO is given to the PI controller.

3. PLL ALGORITHM

The PLL algorithm is a closed-loop servo system. It synchronizes the phase of Voltage Source Inverter output voltage and the utility grid voltage. It also determines the phase angle of the grid voltage. The PLL block diagram which is designed in dq synchronous-rotating system is shown in fig. 3. As shown in figure, the three-phase grid voltagesV_a, V_b&V_c are measured and converted into the stationary reference voltages V_α and V_β. This stationary reference voltages are again converted into rotating reference voltages V_d and V_q .V_d and V_q are the DC quantities. The PI can be worked as a loop filter of PLL. Its function is to control V_q parameter. But under ideal grid conditions such as no harmonics, balanced grid voltages, the value of V_q is zero and $V_d$is the grid voltage. On the other side, the output of PI controller is the grid frequency. This frequency is obtained by adding feed forward angular frequency of the grid.

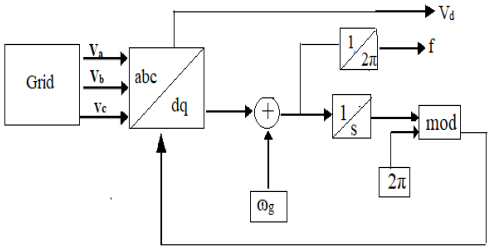


Fig. 3. Basic block diagram of the dq-PLL

The calculated phase-angle is given back to the αβ-dq transformation block. The grid voltage frequency, f is also determined during this system [7],[8].

4. METHOD USE FOR INVERTER CONTROL

The sinusoidal PWM technique is use to control the voltage source inverter. This inverter has the DC input voltage of constant magnitude. There are two functions of voltage source inverter. First is to control the frequency and second is to control the magnitude of DC to AC converted output. For the control of inverter, modulation strategies are used. This strategy determines the

efficiency parameter of inverter like switching losses and harmonic reduction. The main objective of SPWM technique is to control the inverter output voltage and frequency. In SPWM technique each period has constant amplitude pulses and different duty cycles[8]. Therefore to reduce the harmonic content and to regulate the output voltage, width of the pulses are modulated. In SPWM technique to obtain the PWM pulse, three sine waves and a triangular carrier wave is used. The triangular carrier wave has high frequency. The phase difference between sinusoidal waves are120 deg .

Out of all waves the wave with high frequency is selected as triangular wave. The comparison between sinusoidal wave and triangular wave is done. After comparison of this two waves, switching signal is to be generated. When the voltage of sinusoidal wave is greater than the voltage of triangular wave, comparator generates a pulse. This pulse is use to trigger the inverter switches. In this way can regulate the voltage and reduces the harmonics. But the SPWM technique is not efficient to reduce the harmonics with several orders. Therefor LC filter is use to reduce the higher order harmonics. Fig. 4 shows the block diagram of pulse width modulation technique. Comparator compares the carrier wave with reference wave and produces PWM pulse.

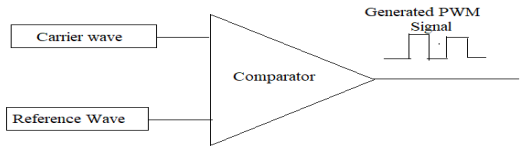


Fig. 4. Block diagram of Pulse Width Modulation

5. CONTROLLING OF VOLTAGE SOURCE INVERTER

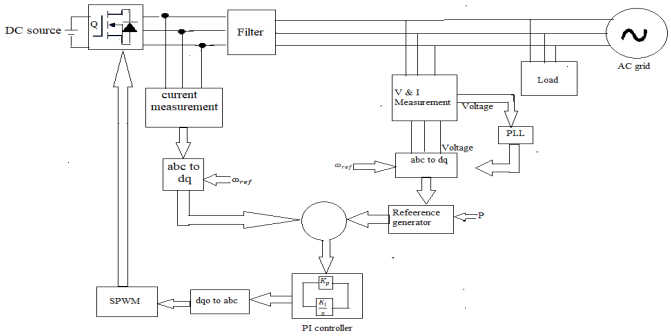
The Proportional Integral controller used for controlling of voltage source inverter is as shown in fig. 5. The main function of PI controller is to reduce the error. The output of PI controller is SPWM pulse. Means it produces pulse. Here current measurement block fetch the current quantities at filter input side and V-I measurement block fetch the current & voltage quantities at filter output side. Filter is used to reduce the harmonics. The PLL block is use for synchronization. PLL locks the phases and for locking of phases it needs voltage, frequency and phase sequence should be same. Here current quantities before filter & current quantities after filter are analyzed. Therefore inverter current and grid current is given to PI controller. Here also abc-dq conversion takes place. But for this conversion one reference angle ω_{ref} is required. This reference angle is obtained from the PLL block. In reference generator it will generate reference current signal (i_{dref} andi_{qref}). Then these reference signals are compared with the actual current signals.[10]

The active power (P) and reactive power (Q) transferred from inverter to grid in synchronous reference frame can be given as

$$P = 1.5(V_{od} i_d + V_{oq} i_q) \quad (1)$$

$$Q = 1.5(V_{od} i_q + V_{oq} i_d) \quad (2)$$

Where the V_{od}, V_{oq},i_d, i_q are the voltages and currents after the filter in dqo reference frame and P is the active power and Q is the reactive power respectively.



1) *Fig. 5. Proportional Integral controller block diagram*

Assume

V_{oq} = 0, and hence (1) and (2) can be written as

$$P = 1.5(V_{od} i_d) \quad (3)$$

$$Q = 1.5(V_{od} i_q) \quad (4)$$

i_d= 2P/3V_{od}(5)

i_q= 2Q/3V_{od}(6)

These dq reference frame current signals are compared with actual current quantities and given to the PI controller. These signals are again converted into abc reference frame by using inverse parks transformation. These abc quantities are given to SPWM block. SPWM block generates a pulse which is given to inverter switches.

6. SYSTEM CONFIGURATION

Simulation of the entire system that's the facility electronics interface of renewable energy with grid and therefore the control methodology is completed using Simulink. The renewable energy is modeled by a DC voltage source which is converted into AC voltage employing a Voltage Source Inverter .To get rid of high frequency switching components from the inverter output LC filter is employed. The filtered output of inverter is totally synchronized with grid and is therefore connected with grid. Phase locked loop and dq current controller using PI controller also are implemented in Simulink. Figure 6 shows the simulink model of Grid Tied Inverter. Here the PI controller is used to reduce the error. Two loads are connected after the V- I measurement block. The V-I measurement block measures the three phase voltage and current. The system parameters utilized in simulation are listed in Table1.

7. SIMULATION RESULTS

Figure 7 shows the inverter output and grid voltage on same axis. Yellow line indicates the inverter voltage whereas pink line indicates the grid voltage. From waveform it is observed that the voltage of inverter and grid are same both in magnitude and phase. This is the condition for inverter grid Synchronization. Therefore by using dqPLL method proper Synchronization can be achieved. Figure 8 shows the inverter output wave for. Initially the breaker which is connected in series with first R-L load is open. Therefore the current is small upto 0.4 sec. But after 0.4 Sec the breaker will be closed. Therefore second load is added to he system and load current increases after 0.4 sec.

According to IEEE standard 519 the THD value should be less than 5%[11]. Figure 9 shows the THD value of inverter output voltage after synchronization. The THD value is 0.76%.

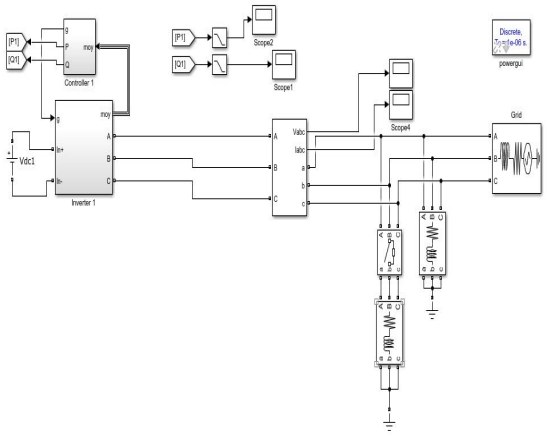


Fig. 6. MATLAB simulink model of grid tied inverter

Sr. No.	Parameters	Value
1	Three phase peak voltage	330V
2	DC supply	650V
3	Supply frequency f_s	50HZ
4	Filter Inductance L_f	3mH
5	Inductor internal resistance R_f	0.05Ω
6	Filter capacitance	30μF
7	Capacitor resistance	0.5Ω
8	Load 1	R=30Ω, L=75mH
9	Load 2	R=10.29Ω, L=25.86mH

Table 1: Simulation Parameters

8. CONCLUSION

In this paper the method use for synchronization i.e. dq-PLL method, SPWM technique & PI controller is discussed. From this paper the simulation results of inverter filtered output voltage, inverter non-filtered output voltage, active and reactive power supplied by inverter to grid, inverter grid synchronized voltage and current are observed. The simulation of simple voltage source inverter is studied and observed with its harmonic analysis. The simulation result shows that initially the voltage waveform is not pure sinusoidal but when filter is use, we get pure sinusoidal waveform. Then we used PI controller and SPWM Technique for controlling of inverter. The advantage of PI controller is that there is no remaining steady state error after a set point changed. The advantages of SPWM are easy to implement and control, Lower power dissipation, lower switching losses etc. The dq PLL method is used for real time following of grid phase angle and voltage. All simulation results confirmed that the output voltage of the SPWM controlled grid tied inverter are balanced with the grid and grid synchronization is successfully achieved.

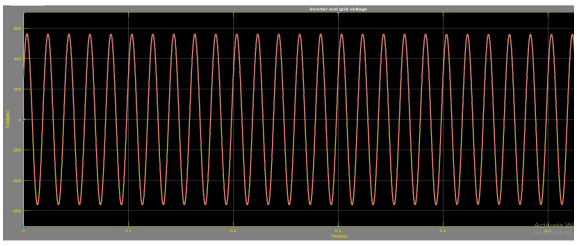


Fig. 7. Grid and inverter output voltages on same axis

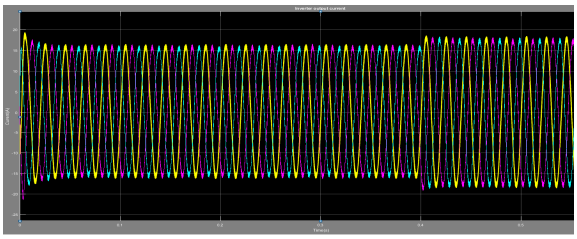


Fig. 8. Inverter output current

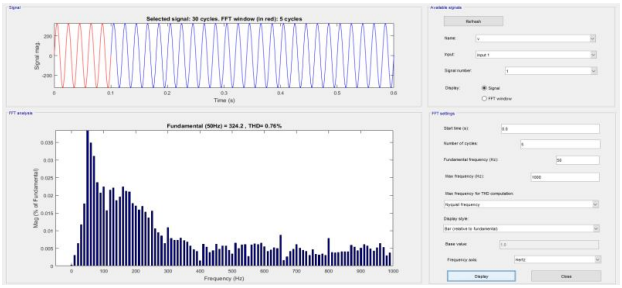


Fig. 9. THD analysis of inverter output voltage after synchronization

REFERENCES

1.Miss. Prajakta R. Narkhede and Dr. Paresh J. Shah, "Performance Analysis of dq-PLL Based Controller for Synchronization of Grid Tied Inverter," Journal of Engineering, Computing and Architecture,India,Vol.10, pp.70-74, 2020.

2.S.A. Khajehoddin, M.K Ghartemani, P. K. Jain and A. Bakhshai, "A control design approach for three phase gridconnected renewable energy resources" IEEE Transactions on Industrial Electronics, Vol.2 ,No. 4, p. 423-432, October 2011.

3.Mr. Shantanu Chatterjee and Dr. Saibal Chatterjee, "Simulation of Synchronous Reference Frame PLL based Grid Connected Inverter for Photovoltaic Application," IEEE 1st Conference on Power, Dielectric and Energy Management at NERIST (ICPDEN), Itanagar, pp.1-6, 2015.

4. Soumya Das, Pradip Kumar Sadhu and Alok Kumar Shrivastav, "Synchronization and Harmonic Reduction of A Grid Connected Photovoltaic Generation System," IEEE International Conference on Energy, Power and Environment: Towards Sustainable Growth (ICEPE), Shillong, pp.1-5, 2015.

5. Sinan Kaya, İbrahim Alisar and Gurkan GOK, "Advanced PLL Structure for HVDC Transmission under Unbalanced Grid Conditions," 6th International Istanbul Smart Grids and Cities Congress and Fair (ICSG), pp. 197-202, 2018.

6. K.M.S.Y Konara, M.L. Kolhe and W.G.C.A. Sankalpa," Grid Synchronization of DC Energy Storage Using Voltage Source Inverter with ZCD and PLL Techniques," IEEE 10th International Conference on Industrial and Information Systems (ICIIS), Peradeniya, pp. 458-462, 2015.

7. Prasad Magdum, SurajYadav and P.N.Joshi,"Simulation of Three-Phase Grid Tied Inverter," IEEE 2nd International Conference for Convergence in Technology (I2CT), Mumbai, pp.1136-1139,2017.

8. M.A.J.Priya, B.Ashok Kumar and S.Senthilrani, "Phase Locked Loop for controlling inverter interfaced with grid

connected solar PV system,"IEEENational Power Engineering Conference (NPEC), Madurai, pp.1-6, 2018.

9.Neha G.L and Dr. BasavarajaBanakara, "Power quality enhancement in smart grid by synchronizing SPWM inverter and LC filter," 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, pp. 633-637,2017.

10. Borole Amit Suhas and V. S. Rajguru, "Various Control Schemes for Voltage Source Inverter in PV grid interfaced system (PI, PR controller)," IEEE International Conference on Energy Systems and Applications, pp.441-445, 2015.

11. Toomas Vinnal, MarekJarkovoi and LauriKutt, "Harmonic Currents and Voltages in LV Networks of Estonia," IEEE 59th International Scientific Conference on Power and Electrical Engineering of Riga Technical University (RTUCON), Riga, Latvia, pp.1-7,2018.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Optimization of Parameters in 8-Bit ALU Circuit With Clock Gating Technique

PREETI SAHU[1], Dr. SANTOSH KUMAR AGRAHARI[2]
[1]Research Scholar, [2]Associate Professor,
[1]preetisahu146@gmail.com, [2]Santosh.agrahari@poornima.edu.in
Department of Electrical and Electronics Engineering, Poornima University, Jaipur

ABSTRACT:

Nowadays, the VLSI technology fuelled the all thing, because of technology there are advances of this VLSI used, which has much huge equipment, very power consuming, expensive and sometimes unreliable. Now all these things are smaller, smaller and smaller. Along with that comes affordability, reliability power dissipation, everything is improved. This paper concentrates to design an 8-bit ALU with Low power concept. Designing of an ALU circuit represents the fundamental building block of central processing unit in VLSI digital design system which is used to perform arithmetic and logic operations. In VLSI system designed many digital systems to use in computer applications, communication and network applications. In this paper optimized Power efficient digital design with a clock gating technique. The clock gating scheme proves very effective solution for reducing dynamic power in logic circuits. Also the ALU design implemented with improved XOR gate based clock gating technique which requires less area than all type of clock gating. Improved technique results shown that 71% to 78% of clock delay reduced, area improved with 23% and power improved with 66.67%.

Keywords: ALU circuit, Clock Gating Technique, optimization of parameters, Digital design VLSI.

I. Introduction:

At now days VLSI has important role in many applications such as DSP, RF, communications network, microwave applications, MEMS, and Space application, Robotics etc. A process to create integrated circuits chips by combining number of 1000s of transistors or logic blocks on a single chip is called as VLSI system design. An electronic circuit that consist of elements, which may be a transistor, diodes or resistors combined in such a manner that they perform a logic operation called gate circuit which are known as basic building blocks of a digital system. There are 3 main parameters in VLSI digital design: Power, Area, and Delay. In this paper dynamic power reduction in 8-bit ALU circuit is discussed.

Generally power consumption is increased in the electronic system and the integrated circuits in particularly manner because of their complexity due to large number of circuits on a single chip. So there is needed design a circuit with low power consumption. We have needed low power designing due to following reasons:

- By a single battery cell provided a lower value of supply voltage.
- Design low stand DC power consumption circuits by using logic design styles.
- By size or area reduction design smallest device which increases complexity of circuit.
- Customization of circuits.

II. Power dissipation:

The power is defined as rate of energy is delivered to the circuit. Power dissipation is explained as the process of rate of electric energy transferred in terms of heat energy. The optimization is described in terms of generating the best design according to goal. In VLSI system designing mostly three sources of power dissipation discussed namely as, Dynamic or circuit-switching power, Static Power and Short-circuit Power. Dynamic power is a very simple approach to estimate energy consumption in a CMOS circuit. Dynamic power is caused by switching activities of the circuit. Increment of dynamic power in circuit is depends on the higher operating frequencies which leads more frequent switching activities in the circuit. Dynamic power of circuit is

described as given expression, where energy consumption in CMOS circuits is estimated by the capacitance to be switched. The charging and discharging of capacitance is known as most significant source of dynamic power dissipation in VLSI circuits.

$$P_d = C.V^2.f$$

Static power is related to the changes in states of the circuits, means that the static power is due to the changing of circuit states that are 0 to 1 or 1 to 0 rather than switching activities. In CMOS circuit leakage power is only source of static power dissipation. Low power consideration should be applied in digital CMOS technology at all levels of design abstraction and design activities. A low power design system also affects other features such as reliability, design cycle time, testability and design complexity. Chip area and speed are the major trade off considerations in designing of VLSI system.

III. Related Work:

As earlier research various techniques studied for low power designing in VLSI system. In this paper clock gating technique is used to designing of ALU circuit. Clock gating is popular technique to reduce power dissipation in clock circuits. Clock gating saves more power to adding more logic to the clock circuitry. A clock circuit is consumed part of the clock energy by the internal clock, and control the transaction gates by using buffers. With clock gating design the difference is that gating function is derived within the circuit without external control signal. Working principle of Clock gating is based on taking enable conditions to attach to resistors and uses them to generate gated signal for the clocks. In order to use and benefit from clock-gating, a design must be contains these enable condition. The clock signal is derived to the resistors only when EN is 1, so that power consumption reduced which related to switching activity of clock. Therefore, clock gating technique is widely used technique for dynamic power reduction in digital CMOS IC circuits. Clock gating is achieved with Flip-flops, latches, AND/OR gate in the clock signal and a control signal to form of gated clock signal, then applied to different components of circuit.
Exception to Power, There are two other parameters also optimized in 8-bit ALU circuit i.e. Area and Delay are reduced with Clock delay.

IV. Proposed system:

The paper explained clock gating technique, which is used to achieve low power dissipation in 8-bit ALU circuit. ALU circuit is designed with clock gating techniques. The ALU block has a very important role in IC design for computation of arithmetically and digitally operations. ALU is considered an arithmetic unit, a logic unit and output multiplexers in a block. Data is loaded to arithmetic and logic unit through input registers and the output is delivered to an output resister. The gated clock controlled the data in the registers from the clock gating circuitry. This paper considered about the all related work with clock gating technique, also here two types of clock gating techniques used to propose the design of ALU, namely as AND gate based clock gating and XOR gate based clock gating technique and comparing their results for area analysis of the circuit.

V. ALU circuit:

ALU has been designed to perform operation addition, subtraction, multiplication, shift operation and logical operations. We have implemented following 8 functions using ALU,

- Full Adder
- Full Sub-tractor
- Right Shifter
- Left Shifter
- Logical AND, NAND, OR, NOR, EX-OR, EX-NOR
- Multiplier

The block diagram of an 8-bit ALU can be shown in fig.1 as below, it is designed with AND gate based clock gating technique. There are gated clock generated with AND gate and it controlled the data from all input registers.

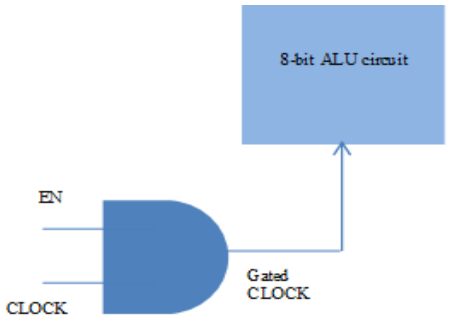


Fig1. 8-bit ALU design with AND gate based clock gating technique

A. *Arithmetic unit*

Arithmetic unit is designed to perform four types of arithmetic operations only which are follows addition, subtraction, increment, and decrement. The 8-bit ALU consider 8-bit inputs A and B and carry input. Inputs A and B are applied through registers and selected by carry input. There are A and B controlled through registers by the gated clock signal from the clock gating circuit. Hence, the arithmetic unit is performed operation only when required and other remains inactive. Operations performed in ALU with arithmetic unit are shown in a tabular form as below.

TABLE 1: Operations performed in ALU

A	B	C_{in}	Operations
0	0	0	A+B
0	0	1	A-B
0	1	0	NOT
0	1	1	A NAND B
1	0	0	A NOR B
1	0	1	A AND B
1	1	0	A OR B
1	1	1	A XOR B

B. *Logic unit*

The operands A and B enter the logic unit through controlled signal by the gated clock to perform logical operations. Operations performed in logic unit are shown in tabular form is below. There are AND, NAND, NOR, and XOR operations performed by ALU logical unit.

TABLE 2: Operations performed in LOGIC unit

A	B	Operations
0	0	AND
0	1	NAND
1	0	NOR
1	1	XOR

C. *Registers*

The computed outputs are fed into the output register from the arithmetic and logic units and i.e. controlled by the clock gated signal.

VI. Experimental Analysis:

ALU circuit designed in XILINX-ISE-13.1 design suite by using VHDL programing, and implemented on Vertex-6, FPGA. The simulation of circuit is performed by using ISIM simulator with a clock period 50ns.
First, The VHDL coding is done for an 8-Bit ALU circuit using the concept of Clock Gating technique with AND gate and XOR gate and their implementations are shown in the fig.

A. RTL schematics

There are RTL schematics of an 8-Bit ALU circuit shown in below without and with using concept of Clock Gating technique.

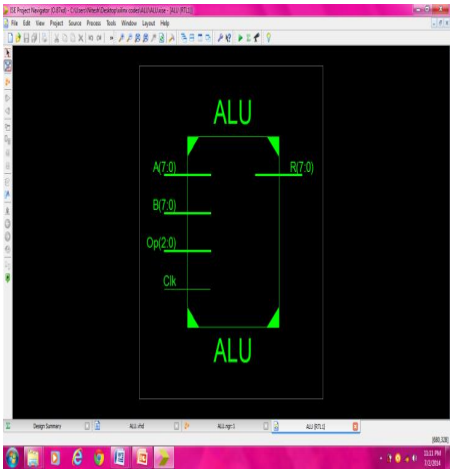


Fig 2: RTL schematic diagram of 8-bit ALU

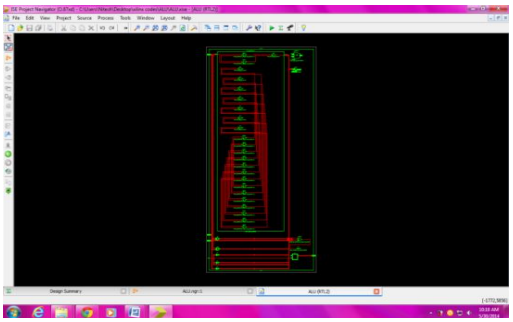


Fig 3: Coventional deisgn of 8-Bit ALU circuit

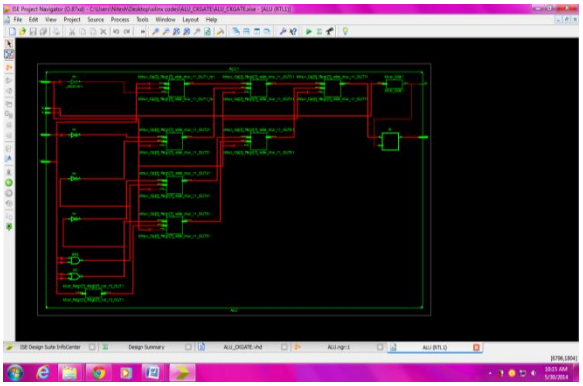


Fig 4: Clock Gating implementetion of 8-Bit ALU circuit

A simple RTL schematic of ALU shown in fig.2, a conventional design of proposed system designed at vertex-6, shown in fig.3, and finally the implemented ALU design with Clock Gating technique is shown in fig.4.

As below, the simulation performed by I-SIM simulator and timing diagram of ALU circuit without using Clock Gating in fig.5, and with using Clock Gating in fig.6.

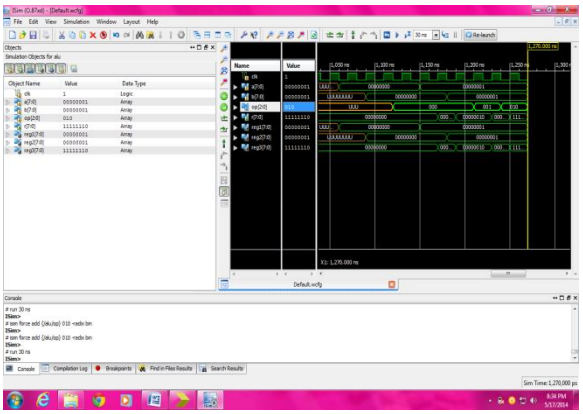


Fig 5: Simulation results without Clock gating concept

There are timing diagram and synthesis report generated after the simulation of proposed system, which referred as simulation results and help to calculated Delay and Area of the circuit.

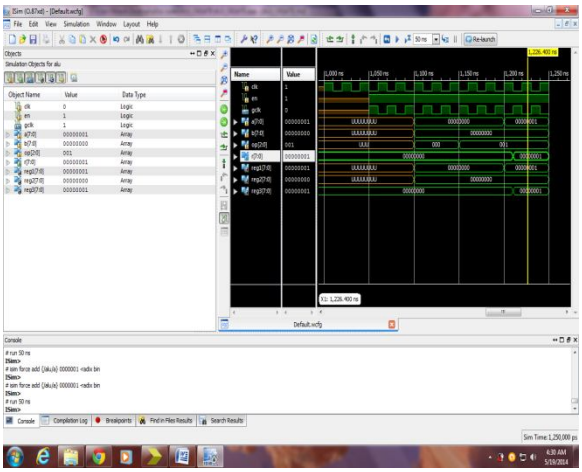


Fig 6: Simulation results with Clock Gating concept

VII. Results and Discussion:

In this section the results of the dissertation are presented in the form of table showing delay, area and power for various combinations of experiments carried out.

A. Delay Optimization with Clock Gating

With the synthesis report optimization of delay in the circuit is obtained and shown in Table 3 as given below, hare the delay is defined at logic levels of the circuit by gate delay and net delay with interconnections in the circuit.

TABLE 3: Delay reduction with Clock Gating

Parameter		**Value (At Input Vector 111)**	
Logic Levels		***Without CLOCK GATING***	***With CLOCK GATING***
Logic level 1	Gate delay	6.102 ns	1.064 ns
	Net delay	2.789 ns	0.811 ns
Logic level 2	Gate delay	6.863 ns	0.361 ns
	Net delay	0.420 ns	0.279 ns
Logic level 3	Gate delay	---	0.098 ns
	Net delay	---	0.696 ns

B Area Optimization in ALU with Clock Gating:

With the synthesis report optimization of area in the circuit is obtained and shown in Table 4 as given below. There are area optimization is defined in the form of number of components as input-output ports, number of flip-flops, number of using multiplexers and total memory uses. With using Clock gating concept always area will be increased due to add external circuitry of clock network. Here comparison between AND gate based clock gating and XOR gate based clock gating is performed and results shows by given table, where area less in XOR gate based clock gating as compare to AND gate based clock gating technique.

TABLE 4: Area reduction with Clock Gating

Device summary	**Without Clock Gating**	**AND gate based Clock-Gating**	**XOR gate based Clock-gating**
No. of I/O	28	30	30
No. of Bells	80	32	32
No. of LUTs	88	17	17
Input Buffers	19	21	21
Output Buffers	8	9	9
Clock--Buffers	1	0	0
No. of MUXs	31	7	7
No. of Flip-flops/ latches	16	16	16
Total memory used	253832k bytes	328580k bytes	257736k bytes

C Power Optimization in ALU with Clock Gating:

With the synthesis report optimization of area in the circuit is obtained and shown in Table 5 as given below, here dynamic power is calculated by the Spice simulation and the result shows that the power minimized in the ALU with proposed technique.

TABLE 5: Power reduction with Clock Gating

Power Synthesis in ALU circuit with Clock Gating technique		
Dynamic Power of original ALU circuit	**Dynamic Power of Clock Gated ALU circuit**	**Total Power Reduction in ALU circuit using Clock Gating**
6.236 kilo watts	2.234 kilo watts	66.67%

The design of 8-bit ALU circuit is examined at different input vectors by using XILINX-ISIM simulating tool. The observed results are explained in graphical form in Fig. 7 and Fig. 8.By observing the results, it has been shown that by using Clock Gating in 8-Bit ALU circuit the delay reduced by 70% to 75% and power consumption is reduced by 66.67%.

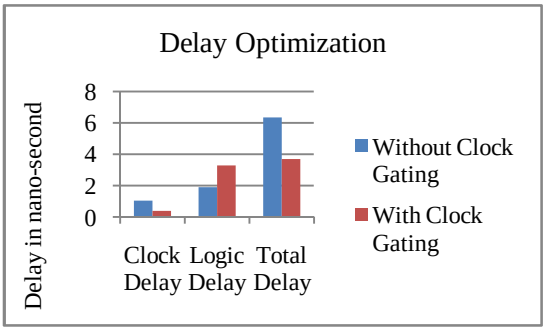


Fig7. Delay optimization in 8-bit ALU

Thus Clock Gating technique achieves significant reduction in the delay and power. Also, there is area reduction will achieve with reduction in number of stages. There are discussion about results of delay and power optimization has been made as graphical presentation in fig. 7 & 8 respectively.

There is also area reduction possible with reduction of logic levels 14 to 11, and 21.56% of total area reduced with XOR clock gating than AND gate based clock gating technique.

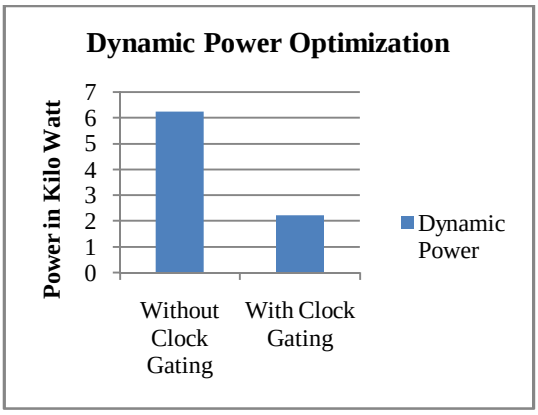


Fig8. Power Optimization in 8-bit ALU

Results of Power and Area compared with AND based Clock Gating technique and XOR gate based Clock Gating technique. 50% to 70% of the power reduction is possible with AND gate based Clock Gating technique whereas 66.7% of power reduction is possible with XOR gate based Clock Gating technique. With AND gate based Clock Gating technique Area increased due to external Clock Gating circuitry which can be reduced 21.56% with XOR gate based Clock Gating technique.

VIII. Conclusion:

This paper considered the Clock Gating technique for reduction of delay and dynamic power in CMOS logic circuits. There is an 8-Bit ALU circuit implemented using Clock Gating technique which gives better result. Here 95% of delay reduced with Clock Gating technique also 98% of power reduced in the circuit. However, for maximum operation frequency the additional clock skew may be lower. On the basis of its triggering action analyzed the behavioral descriptions of a clock. The behavior circuit simulation proved that the derived gated clock signal is capable to reduce power dissipation in the circuit in this work. There is also shown compared results of area where, XOR gate based clock gating has an advent on AND gate based Clock Gating.

References:

[1] Paliwal, P., Sharma, J. B., &Nath, V. (2019).Comparative study on FFA architectures using different multiplier and adder topologies. Microsystem Technologies, 1-8.
[2] S. Daboul, N. Hahnle, S. Held, and U. Schorr, “Provably Fast and Near Optimum Gate Sizing,” in IEEE Trans. on Computer-Aided Design ofIntegrated Circuits and Systems, vol. 37, no. 12, Dec. 2018, pp. 3163–3176.
[3] Barman, J., & Kumar, V. (2018, May). Approximate Carry Look Ahead Adder (CLA) for Error Tolerant Applications. In 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI) (pp.730-734).IEEE.
[4] EAI Endorsed Transactions on Industrial Networks and Intelligent Systems 06 2018 - 09 2018, Volume 5, Issue 15.
[5] International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE) Vol 4, Issue 9, September 2017.
[6] D. Gluzer and S. Wimer, "Probability-Driven –multi-bit Flip-Flop Integration with Clock Gating,"in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. 25, no. 3, pp. 1173-1177, March 2017.
[7] Jingwei Lu, Wing-Kai Chow, and Chiu-Wing Sham, “Fast Power- and Slew-Aware Gated Clock Tree Synthesis”, IEEE Trans. On VLSI systems, Vol. 20, No. 11, NOVEMBER 2012.
[8] JagritKathuria, M. Ayoubkhan, Arti Noor, “A Review of Clock Gating Techniques”, MIT International Journal of Electronics and Communication Engineering Vol. 1, No. 2, AUG 2011.
[9] Young-Won Kim, Joo-Seong Kim, Jae-Hyuk Oh, Yoon-Suk Park, Jong-Woo Kim, Kwang-II Park, Bai-Sun Kong, and Young-Hyun Jun, “Low-Power CMOS Synchronous Counter With Clock Gating Embedded Into Carry Propagation”, IEEE Trans. On Circuits and Systems-II, Vol. 56, No. 8, AUGUST 2009.
[10] Walter Aloisi and Rosario Mita, “Gated-Clock Design of Linear-Feedback Shift Register”, IEEE Trans.On circuits and system—II, VOL. 55, NO. 6, JUNE 2008.
[11] Hai Li, SwarupBhunia, Yiran Chen, KaushikRoy,”DCG: Deterministic Clock-Gating for Low-Power Microprocessor Design ”, IEEE Trans. On VLSI Systems, Vol. 12, No. 3, MARCH 2004.
[12] Jaewon Oh and MassoudPedram, “Gated Clock Routing for Low-Power Microprocessor Design”, IEEE Trans. On computer aided design of integrated circuits and system, VOL. 20, NO. 6, JUNE 2001.
[13] J.F. Wakerly, Digital Design: Principles and Practices, Prentice-Hall, New Jersey, USA, 2000.
[14] L. Benini, A. Bogliolo, G. De Micheli, A survey on design techniques for system-level dynamic power management, IEEE Trans. VLSI Syst. 8 (3) (2000)
299–316.
[15] D. Garrett, M. Stan, A. Dean, “Challenges in clock gating for a Low power ASIC methodology”, in International Symposium on Low Power Electronics and Design, 1999, pp. 176 – 181.
[16] L. Benini and G. De Micheli, “Symbolic techniques of clock-gating logic for power optimization of control-oriented synchronous networks,” in *Proc. European Design Test Conf.*, Paris, France, 1997, pp. 514–520.
[17] M. Pedram, “Power minimization in IC design: Principles and applications,” *ACM Trans. Design Automation*, vol. 1, no. 1, pp. 3–56, Jan.1996.
[18] E. Tellez, A. Farrah, and M. Sarrafzadeh, “Activity-driven clock design for lowpower circuits,” in *Proc. IEEE ICCAD*, San Jose, CA, Nov. 1995,pp. 62–65.
[19] G. Friedman, “Clock distribution design in VLSI circuits: An overview,”in*Proc. IEEE ISCAS*, San Jose, CA, May 1994, pp. 1475–1478.
[20] M. Alidina and J. Monteiro*et al.*, “Precomputation-based sequentiallogic optimization for low power,” *IEEE Trans. VLSI Syst.*, vol. 2, pp. 426–436, Dec. 1994.

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Ambulance Detection in Heavy Traffic by using HAAR Cascade Approach.

Shailja[1], Jawahar thakur[2]
[1]*Department of Computer Science, Himachal Pradesh University, INDIA,* E-mail: shailja872@gmail.com
[2]*Department of Computer Science, Himachal Pradesh University, INDIA,* E-mail: jawahar.hpu@gmail.com

ABSTRACT :

Traffic congestion is the main problem in populated countries leading many problems such as accidents, emergency vehicle stuck, fuel consumption etc. Traffic congestion is characterized by slower speed, longer vehicular queuing, that often leads to bottlenecks. Sometimes ambulances get caught up in traffic and in many cases the patient is in danger of life due to time delays. It seems difficult for traffic police to clear traffic when it comes from every side. This situation also requires more man power. Whereas most of the traditional traffic control systems could not detect presence of emergency vehicles. Therefore we need some medium that can monitor traffic 24 hours without any hindrance and can detect ambulance, so that people can get convenience. To solve the problem of emergency vehicle stuck, a system is needed which automatically detects ambulance in vehicular traffic. In this paper, a system is proposed which automatically detects the presence of ambulance in road traffic using computer vision.

This method will provide the vision to existing traffic management system so that it can locate the ambulance in traffic. HAAR cascade approach is used for ambulance detection. This approach works in four stages HAAR feature selection, creating integral image, Ada Boost training and cascading classifier. It is a supervised machine learning approach provides better accuracy and results on image sensing.

Keywords: Computer vision, Traffic management, HAAR cascade

B. I.INTRODUCTION

Traffic management is main issue on roads. Traffic on roads increase the waiting time of vehicles because of this emergency vehicle get stuck and delayed. When ambulance has to wait on roads patient may lose their life due to lack of treatment at time [1]. In this paper a method is proposed which automatically detects the presence of ambulance in road traffic using computer vision. Computer vision is a field of computer science which deals with how computer visualize, understand, collect information from digital images, videos and real world environment through camera. It trains to computer to find, recognize, classify the objects and then infer what they have seen through camera. Computer vision helps in building and replicating human vision with the help of computer hardware and software [14].

A human mind can recognize things easily but continuously it cannot pay attention for more than an hour. This situation also requires more man power when traffic hits from every side and also the traffic control systems in

India based on fixed time period leads to more traffic on roads. Therefore we need some medium that can monitor traffic 24 hours without any hindrance, so that people can get convenience. As the population increases demand of transportation also increases which cause many traffic related problems on road.

Today's traffic monitoring systems are working on fixed time sequence and could not detect presence of emergency vehicles. During traffic jam, the High Priority Vehicle such as fire brigade, ambulance and police stuck in traffic jam usually at the junction and delayed in reaching their destination. The problem of ambulance detection in traffic is solved by taking a video of road containing vehicles and then detecting ambulance in it. Here we use HAAR cascade object detection approach to detect an ambulance on road.

C. II.RELATED WORK

Adu-gyamfi [2] presented a system for automated recognition of vehicles by using deep convolutional neural network. The proposed system performs two main tasks that are localization and classification of vehicles. CNN is used for extract feature descriptor and SVM is used for classify the region. Passenger cars and SUVs are detected with 95% precision whereas single-unit, single-trailer, and double-trailer trucks precision is ranged from 92% to 94%. Kumari and Manjunatha [3] proposed a system for smart detection of emergency vehicles. This system use character recognition for emergency vehicle detection, edge detection algorithm is used for detection of words. The implementation is done by using MATLAB and Arduino Uno tool.

Yadav et al. [4] designed a smart traffic light system that automatically manages the time slots for traffic signals. This system uses image processing and scheduling algorithm for the management of traffic signals. It also prioritizes the emergency vehicle in traffic where location of ambulance is traced by GPS. Garg et al. [5] proposed emergency vehicle detection system. Convolutional neural network and audio detection technology is used for ambulance detection. Support vector machine is used for audio detection.

Loganathan et al. [6] describes how we can decrease waiting time of emergency vehicle in traffic. This system uses image processing and audio detection approach for locating ambulance. Roy [7] presented a traffic surveillance system that automatically detects emergency cars from CCTV videotape. Convolutional neural network is used for the training of the model. Model is trained over COCO dataset and YOLO-V3 architecture is used for object detection.

Srinivasan et al. [8] designed a model which detect vehicle through images and also prioritize the emergency vehicles stuck in traffic. The purpose of the model is to calculate vehicular density, regulate the traffic single durations and presenting a method to locate emergency vehicle. This system includes Bluetooth module to detect the ambulance.

D. III. PROPOSED AMBULANCE DETECTION SYSTEM

The purpose of paper is to provide a system which automatically detects emergency vehicle in traffic. Here we consider ambulance as an emergency vehicle. The work is started with collection of image dataset i.e model is trained over image dataset. Dataset has been divided into two parts, training dataset and test dataset. Training dataset was used for model training consisting of image samples that further classified into two samples. First one was positive image samples that contained the images we want to detect. Second was

negative image samples that contained images other than positive images. Figure1 demonstrate overall implementation strategy for ambulance detection system. The test dataset has been used to test the outcomes, to find out whether the model is able to correctly detect ambulance or not? Haar cascade approach is used for the training of model and the results are stored as xml file. The model has been tested over video dataset. The model accuracy was checked after every training procedure and the data set was modified accordingly to get better results. The model was trained until it could locate ambulance in video.

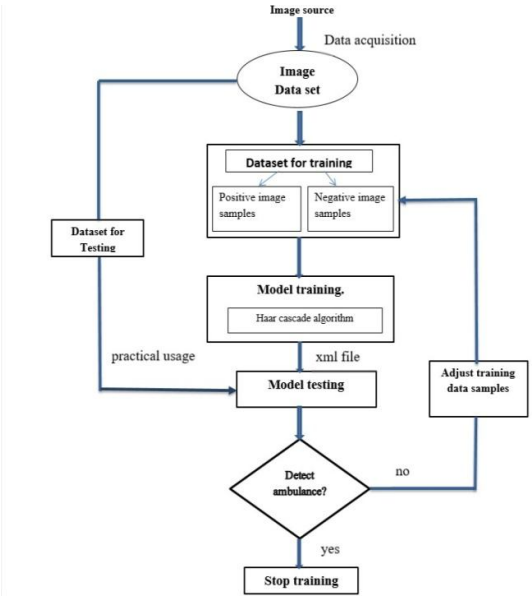


Fig No 1. : Block diagram of proposed system

A. *FEATURES*

First step in model training is feature selection. A HAAR feature takes adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This HAAR cascade approach uses three main HAAR features given below in the table 1 [9] ,where figure (a) describes edge feature, figure (b) shows line features and figure shows four rectangle features.

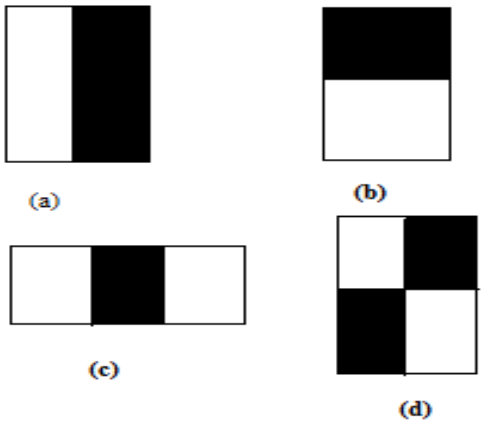


Fig No 2: Haar features. Edge features shown in figure (a) (b), figure (c) shows three rectangle features and figure (d) four rectangle features.

Table No 1: features used in model training.

Sr.no.	Features	Description
1.	Two-rectangle feature (edge features)	The difference between the sum of the pixels within two rectangular regions. The regions have the same size and shape and are horizontally or vertically adjacent.
2.	Three-rectangle feature (line features)	This computes the sum within two outside rectangles subtracted from the sum in a center rectangle
3.	Four-rectangle feature	This Computes the difference between diagonal pairs of rectangles

B. *DETECTION TECHNIQUE*

We have applied HAAR cascade approach in computer vision to train model for ambulance detection. HAAR Cascade is a machine learning object detection algorithm which was proposed by Paul Viola and Michael Jones in their paper, “Rapid Object Detection using a Boosted Cascade of Simple Features” in 2001. A HAAR Cascade is basically a supervised learning approach which is used for object detection. The HAAR cascade is trained by taking image dataset as an input and produce desired output. This approach works in four stages.

- HAAR Feature Selection.
- Creating Integral Images.
- AdaBoost Training.
- Cascading Classifiers.

HAAR Feature Selection*:*

First step in model training is feature selection. HAAR cascade algorithm use main three features edge feature, line feature and four rectangle feature as shown in table 1.

Integral image:

Integral images are used to make superfast calculation of HAAR features. This is image representation technique which increases execution speed and reduces computational complexity when used in object detection algorithms. The value of integral image at any place in an image is the sum of all pixels to the left and above of it, including itself [10].

AdaBoost Training:

All the features that are calculated are not relevant. AdaBoost or adaptive boosting learning algorithm is used to select the important features and train a classifier by combining multiple weak classifiers. As a result each stage of the boosting process, which selects a new weak classifier, can be viewed as a feature selection process [9]. AdaBoost yield a strong classifier and improve the performance.

Cascading Classifiers:

The last step is to combine the classifiers into a cascade structure.

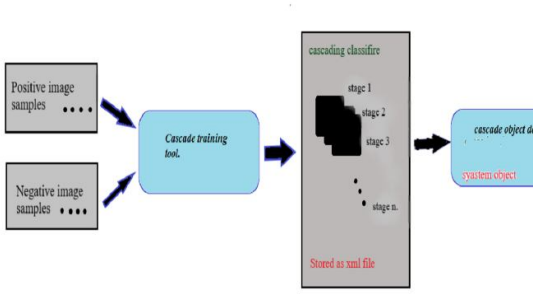


Fig No 3: Procedure to cascading classifier

E. IV.DATA COLLECTION AND ANALYSIS

Data collection by definition is a process of gathering information from different resources to find the solution to the research problems, test the hypothesis and evaluate the results [11]. The first step towards ambulance detection is data collection i.e. collecting images from different sources for model training. The images are downloaded from Google and captured manually

A. DATASET FOR AMBULANCE DETECTION

For learning feature of model to detect ambulance and distinguish it from other things, image dataset is divided into two categories. First one is samples of ambulance and second is images other than ambulance. After that we have make two directories to store training samples:

- Positive images directory. (p)
- Negative images directory. (n)

Positive images: (p)

Positive image directory contain those objects that we want to detect. For example if we want to detect book it contains pictures of books only. Here we want to detect ambulance so it contain training samples for ambulance i.e all images of ambulance and then named this directory as p.

Fig No 4: Positive samples for model training.

Negative images. (n)

Negative images directory contain the objects that we don't want to detect i.e images other than positive images. It contains pictures of bus, truck, car, cycles etc. other than ambulance and name directory as n.

Fig No 5: negative samples for model training.

B. DATA AUGMENTATION

Model training require large amount of data as input for better results. This is an important task that we should enlarge our data set so we can eventually build a better trained model. Therefore data augmentation is an approach used to augment data without actually collecting new data. Data augmentation is the technique of increasing the size of data used for training a model. For reliable predictions, the deep learning models often require a lot of training data, which is not always available. Therefore, the existing data is augmented in order to make a better generalized model. Although data augmentation can be applied in various domains, it's commonly used in computer vision [12]. Before data augmentation we have only 70 samples of ambulance, after applying data augmentation we can create more than 1000 images from few images. That is how we enlarge our data size using this technique.

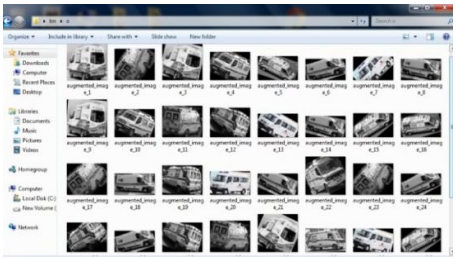


Fig No 6: Augmented samples of image dataset.

C. MODEL TRAINING

Object detection is a computer vision technique which is used to identify the existence of objects with bounding box in digital image and videos. The HAAR classifier is used for the detection of ambulance which is a machine learning approach where model is trained over image dataset both positive and negative which was proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001 [13] . A HAAR Cascade is basically a classifier which is used to detect the object for which it has been trained for, from the source. The HAAR Cascade is trained by overlaying the positive image over a set of negative images as shown figure 3.

```
+----+---------+---------+
| N |    HR   |    FA   |
+----+---------+---------+

|  1|        1|        1|
+----+---------+---------+

|  2|        1|        1|
+----+---------+---------+

|  3|        1|        1|
+----+---------+---------+

|  4|        1|    0.736|
+----+---------+---------+

|  5|        1|    0.432|
+----+---------+---------+

END>

Training until now has taken 0 days 0 hours 8 minutes 36 seconds.
```

FigNo7: Model under training

The HAAR classifier involves list of stages, where each stage comprises of a list of weak learners. Better results are obtained by using high quality images and increasing the amount of stages for which the classifier is trained. Features are added to every stage until the target results and false positive rates are met [9]. Figure shows training of model where each row signifies feature that is being trained and give some output about its HR (hit ratio) and FR (false alarm ratio).

After completion of training we get am XML file in classifier folder which is a combined cascade of all weak learner. Figure shows xml file created after training of model. This XML file is used for detection of ambulance.

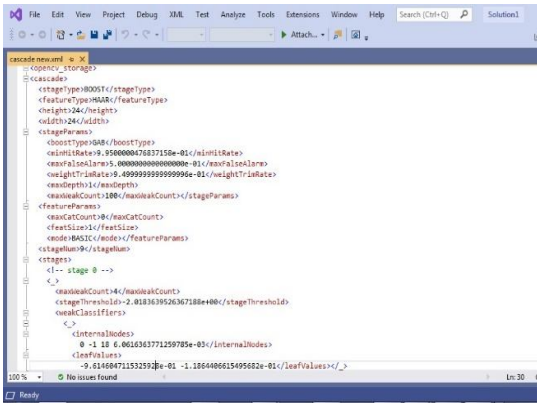
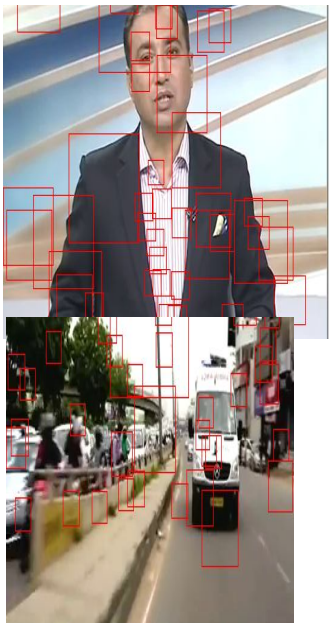


Fig No 8: Small excerpt from xml file.

F. V. RESULTS AND PERFORMANCE

Before the training of model it detected each and every object in video as shown in figure. The results got improved when we trained model over few stage. After increasing the number of stages it gave us better results than the previous trained model as shown in figure c.



FigNoa: Results of undertrained model

FigNob: Results, when model is trained over less number of stages.

Fig c: Results, when training completed successfully.

Fig 9: The images show whether an ambulance is being detected by the model or not. Figure b show the model is also recognizing other items when trained on less number of stages. Where figure c show when no of stages increased the model only recognize ambulance.

The ambulance detection system has been tested on video. In the video there are many vehicles like buses, cars, scooters etc. along with ambulance. In the video where the ambulance arrives, the model creates n rectangle on the ambulance at the time of detection. The Model is able to detect ambulance with over 80% accuracy. The accuracy of model also depends on the location where the camera is placed. If the vehicles are clearly visible and differentiable better results would be obtained.

1) VI.CONCLUSION

In this paper we have proposed a model that can easily detect ambulance in traffic. National institute of emergency medicine reported that more than 20% of patients die due to traffic delays when emergency vehicles are stuck in traffic. This is due to improper management of traffic because most of the traffic systems do not detect the presence of vehicle. The model will solve this problem and no human interaction will be required to clear the traffic. Model is trained by using HAAR cascade approach. It is a supervised learning approach which takes some image dataset as an input to train a model. Model is trained in four stages, Feature selection, basically three kind of feature described in table1. Creation of integral images, which is an image representation technique. Adaptive boosting, this algorithm selects important features from the large set of feature and also train classifier. Last step is cascading classifier structure as shown 12 in figure 3. After the training process model has been tested on video which contain more vehicles like car scooter bus and many other objects along with ambulance. Model accurately detected ambulance when it appears in video as shown in figure 9. The model has attained better results with low wrong detection rate.

REFERENCES

[1] N. P. Bhensadadiya and D. Bosamiya, “Survey on Various Intelligent Traffic Management Schemes for Emergency Vehicle.

[2] . Y. O. Adu-gyamfi, “Automated Vehicle Recognition with Deep Convolutional Neural Networks Automated Vehicle Recognition with Deep Convolutional Neural,” 2017.

[3] N. Kumari and M. Manjunatha, “SMART DETECTION OF EMERGENCY VEHICLES IN,” no. 4, pp. 15–18, 2018

[4] H. Yadav, G. G. Iranna, J. Nimalesh, K. K. B, and B. Archana, “Smart Traffic Light,” no. 5, pp. 67–71, 2019.

[5] A. Garg, A. K. Gupta, D. Shrivastava, Y. Didwania, and P. J. Bora, “Emergency Vehicle Detection by Autonomous Vehicle,” vol. 8, no. 05, pp. 190–194, 2019.

[6] C. Loganathan, J. A. N. Delcy, S. S. Kumar, R. Hariharan, and M. Suresh, “Ambulance Detection by Image Processing Using PLC : Colour and Sound Based Approach,” no. 10, pp. 3–5, 2018.

[7] S. Roy, “Emergency Vehicle Detection on Heavy Traffic Road from CCTV Footage Using Deep Convolutional Neural Network,” no. February 2019, 2020.

[8] I. O. P. C. Series and M. Science, “Smart traffic control with ambulance detection,” 2018.

[9] P. Viola, “Rapid Object Detection using a Boosted Cascade of Simple Features,” 2001.

[10] S. Ehsan, A. F. Clark, N. Rehman, and K. D. Mcdonald-maier, “Integral Images: Efficient Algorithms for Their Computation and Storage in Resource-

Constrained Embedded Vision Systems," pp. 16804–16830, 2015.

[11] S. Muhammad and S. Kabir, "Methods of data collection," no. June, 2018.

[12] C. Shorten and T. M. Khoshgoftaar, "A survey on Image Data Augmentation for Deep Learning," J. Big Data, 2019.

[13] S. Soo, "Object detection using Haar-cascade Classifier," pp. 1–12.

[14] Jason Brownlee, "A Gentle Introduction to Computer Vision", Machine Learning Mastery, March 19, 2019, Accessed on: July 1, 2020. [Online] Available: https://machinelearningmastery.com/what-is-computer-vision/

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Blockchain Technology - Ensure the Trust of Covid-19 Vaccine from Inception to Injection

Mrs. Shilpa Naresh Agarkar
Research Scholar, SJJT University, Churela, Rajasthan, India
shilpa.agarkar@gmail.com

ABSTRACT:

While everyone in the world is busy with searching vaccine, successful vaccine test and its approval made everyone hopeful. But next major challenge is its proper distribution. As about more than ¾ of U.S. population is bothered about safety and vaccine effectiveness, proper distribution of the vaccine is needed. All that is needed in vaccine distribution is that it must be rapid, responsible and luculent.

With Blockchain, vaccine distribution can be very transparent, reliable and verifiable. Manufactures can monitor all obstructive events along with recall management. Distributors can monitor all real-time activities and minimize the response time. Better inventory and safety measures can be possible for Dispensers. All this can result into gaining and strengthening confidence among all stakeholders.

Benefits

- End-to-end traceability –
  The cryptography based block chain technology has broken the barriers of transaction speed, made it reliable and verifiable throughout the vaccine distribution chain i.e. from manufacturing to dispense.

- Reduced Risk –
  Enhanced safety and traceability along with real time support reduce the risk of intruders, fraud, spoilage or other unexpected events and maintain vaccine integrity goal.

- Safety and efficacy assurance – Observing peripheral conditions during transport and storage along with timely retrieval of reliable distribution information throughout the lifetime history of vaccine can help to ensure that the vaccine is safe.

Solutions:

Open governance pharmaceutical network - a permissioned, open source data exchange platform will unite diverse, localized vaccine management strategies into a single integrated view, while enabling participants to continue using their preferred systems of record and systems of interaction.

Keywords: #Blockchain, #COVID-19VACCINE, #SAFETY, #HyperledgerFabric

1. INTRODUCTION

With the adoption of new federal laws - The Drug Supply Chain Security Act (DSCSA), 2013 improved patient safety by building electronic, interoperable systems by November 2023 and enhanced transparency and trust in increasingly complex pharmaceutical supply chains. In this proposed system, tracking and tracing of drug from manufacturing to dispense it is supposed to be possible for all the stakeholders of distribution chain in the United States. Many experts from renowned organizations along with Government entities came together to ensure highest quality ingredients, reliable and verifiable supply that are safe and efficacious for all stakeholders, especially patients.

Under the Operation Warp Speed,[2] the U.S. federal government has tie ups with numerous pharmaceutical companies, also investing billions of dollars to support the development of COVID-19 vaccine. The goal is to deliver 300 million vaccine doses by January 2021. The strategy is to expedite development, manufacturing and distribution of Vaccines, therapeutics and diagnostics.

While this silver bullet is getting ready, some experts are concerned about the challenges in its distribution.

Due to the pandemic situation, the global supply chain has taken a huge hit over the last few months which results in slowing down distribution channels, heightened labor shortages and delay in product deliveries. That’s the reason, companies

need to rethink their strategies and abilities around manufacturing, production and inventory management.

The vaccine supply chain involves- vaccine manufacturing, its storage and packaging components, proper transit, shipping (domestic and global), strategy for distribution and storage. Pharmaceutical companies may use blockchain to make systems more transparent and improve communication with vendors. Pharmaceutical companies can use blockchain for transparent Supply chains like tracking vaccine distribution and improve communication with vendors and ensure a fair and equitable process - especially as limits on raw material and making sourcing more complicated.

2. CHALLENGES FOR PHARMA /BIOPHARMA INDUSTRY DURING COVID-19 PANDEMIC

- Shortage of drug and personal protective equipment (PPE) throughout the pandemic.
- Some companies increased the production of the drugs, which were, at first, found helpful in fighting the virus, but then found dangerous by the FDA, which result in overburden of dead stock in the market.
- Shortage of manpower due to infection and lockdown measures imposed by the government.
- Shortage of container for transportation as they redirected for more critical distribution.

All these challenges [3] combined together affected the entire industry to a great extent and then out to the population at large.

2.1 CONNECTING ALL THE DOTS IN THE SYSTEM TO REACH FULL TRACEABILITY

Blockchain is designed to create immutable records and is easy to integrate with existing supply chain and traceability systems. The blockchain enabled system demonstrates how patient's safety in real time can be enhanced by supply chain transparency. Easy and timely retrieval of reliable information (within seconds)among distribution channels demonstrates the strength of blockchain technology.

3. ABOUT BLOCKCHAIN

Blockchain's [4] innate ability to work on large scale like data, multiple dimensions like users, transaction volume and type of product and Consensus (Smart Contracts) among network members can enhance system accuracy.

Blockchain network is designed to establish permanent records (immutable) and can be integrated with the existing system to maximize the benefits. As records are distributed over the network, anyone in the network can easily verify the product or check the system without the help of any intermediary. With Blockchain network, Artificial Intelligence, IoT, and other network stakeholder, digital replica of the vaccine can be established. With this digital replica, current location (geolocation) / status, temperature of the vaccine can be easily checked. This leads to product safety and validity and can be used to avoid any fraud or irrelevant activity.

3.1 ROLE OF BLOCKCHAIN IN THE PHARMACEUTICAL SUPPLY CHAIN - VACCINE DISTRIBUTION

- Blockchain-based COVID-19 pharmaceutical supply chain would be a private and highly controlled environment. It is trustworthy, safe and reliable and efficient in this time of workforce challenges.
- This blockchain based Supply chain would include tracking of components that they order as well as the components that they developed.
- As all the data / records are immutable, tamper proof everyone from chain (right from pharmaceutical supply chain, doctors, recipients of vaccines) would enable confidence on blockchain since it has been verified along every step

Blockchain - A distributed cryptography-based technology (using HASH algorithm) for immutable (permanent) records for transparency of data with full data privacy and integrating data from various stakeholders along with the capacity of confirming real time transactions. Following are few potential benefits of implementing Blockchain technology

- Shared Ledger - Distributed system accessible to everyone in the network
- Smart Contracts - Business laws embedded in the database to validate the transaction.
- Privacy - transactions are kept private and identities are not linked with transactions.
- Permissioning- ensuring authentication for transaction security
- Trust - Network consensus ensure trust among participants
- Modular - autonomy in decision making within a distributed network.

In all this technology [4] will win the race due its capability of reduced cost, automation, transparency among trading partners.

4. USE CASE:

The Pilot Project Program (March 2019) [5] is the result of the collaboration of industry giants like Walmart, Merck, IBM and KPMG which resulted into compliance of DSCSA 2023 interoperability requirements with the help of blockchain based solution. Blockchain based solution can enable every member of supply chain to verify, track and trace the drug in distribution chain, which ensures patient safety from fraud and can improve recall process to remove harmful drugs from pharmaceutical supply chain.

The Pilot Project is valued beyond compliance to demonstrate business value of enhancing the medication recall process. As already mentioned, Pilot is solution formed with the collaboration of IBM whose role is Solution Partner delivered end-to-end blockchain based solution, KPMG is a solution provider and subject matter expert, Merck is a Manufacturer in pharma industry and Walmart pharmacy is well known dispenser.

4.1 KEY OBJECTIVES FOR THE PILOT TEAM:

- To design a blockchain-enabled solution that complies the U.S. Drug Supply Chain Security Act requirements to assist the drug supply chain stakeholders.
- Increase transparency in distribution, prompt alerts in every state of distribution chain.

4.2 REQUIREMENT RELATED TO KEY SOLUTION FUNCTIONALITIES:

- Track and trace – identify and trace certain drug from end-to-end transaction i.e. from manufacturing to dispense
- Verify – to validate the drug
- Recall –retrieval of reliable distribution information specific to manufacturer to generate recall
- Alert – transmit real time prompts about validation, investigation, ship, dispense etc. status to stakeholders

User	User Interface	Description	Key capabilities
Supply Chain Analyst	Event Actions	Distributes product across ecosystem partners	• Ship • Receive • Dispense
Quality Analyst	Product Security	Sends and receives product alerts during investigation of product lot	• Verify product status • Flag products for investigation or recall • View product alerts
Serialization Analyst	Drug Provenance	Views whether the drug product has been shipped, received and/or dispensed	• Trace the provenance of a drug product

Fig. 1- User and associated capabilities in Pilot Program

Figure depicts the interaction of each user in the Pilot Program and how the product movement is recorded in an immutable ledger on the blockchain.

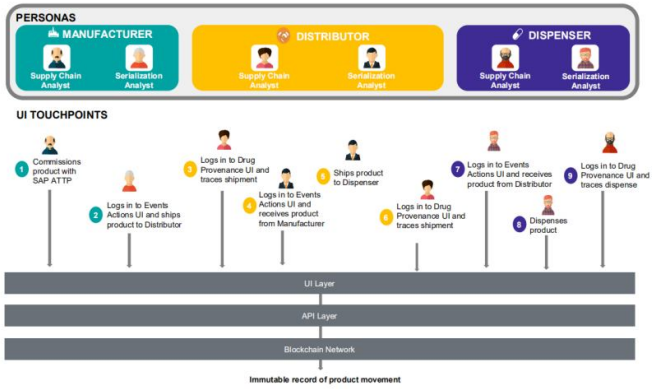


Fig. 2- Fig shows various functionalities like commission, ship, receive, dispense and trace during product distribution.

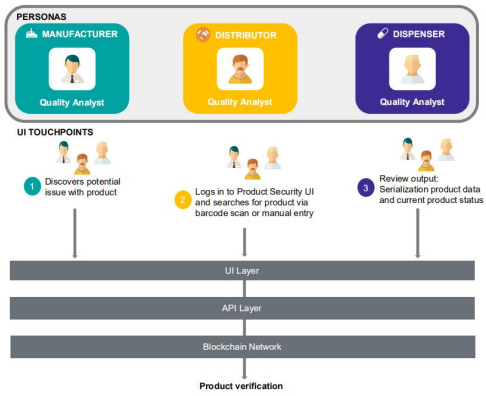


Fig 3- fig shows real time status alerts to all stakeholder during quality analysis of product.

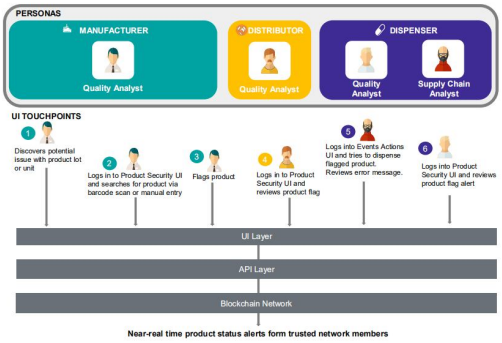


Fig 4- fig shows how real time alerts stop further steps like ship and dispense as discovered potential issue with product.

4.3 SOLUTION ARCHITECTURE

The Blockchain based distributed Pilot Solution supports three user-facing web application for manufacturer, distributor and dispenser associated with their respective roles.

UI Event Actions – A web application for product movement – ship, receive, dispense

UI Drug Provenance–A web application for validation of drug product

UI Product Security – A web application for verification of product and to send real time alerts.

The Pilot Solution (Fig- 5) is permissioned Hyperledger Fabric (Permissioned Blockchain) which is developed to advance cross-industry blockchain technologies. The Hyperledger Fabric – IBM Food Trust (IFT) on IBM cloud connects with Merck's SAP ATTP system and API (Application Program Interface – to get and post data) extension layer with web application, publishes commission products to the blockchain.

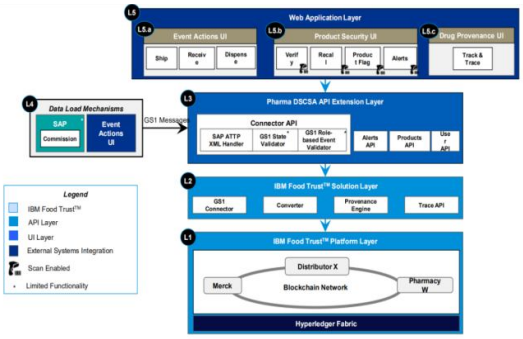


Fig 5- Solution architecture diagram of all components.

4.4 FUTURE SCOPE OF THE PROJECT:

Future scope of Pilot includes – expansion on number of users, products and complexity like Decommission, reverse distribution and returns. Along with these processes ensure speed and scalability with high number of transactions per second. Future enhancement also includes:

- Aggregation, dis-aggregation and related inference
- Trading partners licensing
- product returns
- Interoperability between various blockchains developed to support DSCSA compliance.

REFERENCES:

1. https://www.fda.gov/drugs/drug-supply-chain-integrity/drug-supply-chain-security-act-dscsa
2. https://www.hhs.gov/coronavirus/explaining-operation-warp-speed/index.html
3. https://www.pharmasalmanac.com/articles/the-covid-19-pandemic-magnifies-pharmaceutical-supply-chain-issues
4. https://www.sciencedirect.com/science/article/pii/S200103701830028X
5. https://www.ibm.com/downloads/cas/9V2LRYG5
6. IBM/fabric-contract-attribute-based-access-control: A repo to demonstrate how to implement attribute-based-access-control in Hyperledger Fabric for a supply-chain use case using IBM Blockchain Platform VSCode extension. (github.com)
7. Fact Sheet: Explaining Operation Warp Speed | HHS.gov
8. https://www.fda.gov/drugs/drug-supply-chain-integrity/drug-supply-chain-security-act-dscsa

9. Introduction — hyperledger-fabricdocs master documentation (hyperledger-fabric.readthedocs.io)
10. https://www.ibm.com/blockchain/use-cases/success-stories/
11. https://newsroom.ibm.com/A-Groundbreaking-Vaccine-Will-Need-a-Groundbreaking-Supply-Chain
12. https://www.ces.tech/Articles/2020/August/How-Blockchain-Helps-Get-Us-the-Vaccine.aspx

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

"Image-Moderation And Vr Based" Smart Multilingual AI Chatbot in Tourism

Sushmita Vashisht[a], Tripti Atri[b] and Deewakar Vashisht[c]

[a] *Digital Marketing Consultant at SpiceJet&NSE Certified Data ScientistatDigiAIntelligence, India*
E-mail: sushmitavashisht89@gmail.com
[b]*Digital Marketing Expert at Accenture &AI Consultant atDigiAIntelligence, India*
E-mail: triptiatri.kripa@gmail.com
[c] *AI Chatbot Specialist at DigiAIntelligence*
E-mail: deewakarvashisht99@gmail.com

ABSTRACT :

We consider the smart solution for the tourism industry. The solution of finding and processing the information related to the famous tourist spots of the country while planning visit or during visit through a Serverless "Image – moderation and VR Based" AI Chatbot is significantly a key discriminator in meeting up the tourist's expectations. Considering the language barriers or several other features while travelling to the tourist place, our AI Chatbot will provide the ease by giving the information to the travel enthusiast in one's own language of understanding. The effectiveness of the Serverless technology provided by cloud platforms like Amazon Web Services or Google Cloud will reduce the computing cost and will be able to handle the frequency of incoming messages that may be up to lacs of tourists at a time. A tourist will be able to communicate with the Chatbot using Voice or by sending the Image or requesting information by simply sending the text. For the voice feature, we will be using Transcribe, Polly service while using Lex or Google Assistant for translation purpose; for processing image- we will be relying on Computer Vision technology. Also, we will be taking here the advantage of popular NLP based algorithms that are Google BERT and Google Hummingbird. In this paper, we build a business logic which is going to help the tourism industry as well as the travel enthusiasts to find any tourist place detailed information subject to their interest in a simulated environment.

Keywords:

VR Chatbot, Tourism, AI Chatbots, Amazon Lex, Google Dialogflow.

Introduction

Just think about the direct contribution of travel and tourism industry to both local and global GDP. According to the statista.com, you can access the outlook of the direct and total contribution of travel and tourism to GDP from 2020 to 2029. The forecast depicts that the direct contribution of travel and tourism industry to global GDP is close to 5,563 trillion U.S. dollars[1].

In this new normal, tourism industry has been severely affected due to government-imposed restrictions or nationwide lockdown. Once everything will be normalizing, the zillions of travel enthusiasts will opt for the travel options. So, this is the

time for the famous tourism country to bring reforms in their strategies and provide a user-friendly option for people who wish to travel in their country. From the "new normal" to a "new future", providing the travel enthusiasts personalized message platform based on AI based technology can bring a new dimension to a Tourism Industry of one's country.

Serverless AI Chatbots

AI Chatbots will use the power of machine learning, deep learning and natural language processing behind processing any incoming request. Chatbots can act as the travel guide as well as travel blogger in meeting up the tourist's expectations when visiting or choosing the destination with aspects of culture, events, shopping, heritage etc.

Traditionally, Chatbots have been just text-based, but today they can listen and understand one's language which makes it smart multilingual translators and provide answers vocally. This will offer completely new dimension to both the tourism companies and travelers.

Using Serverless platforms in such cases are of great importance in saving up a huge on cost. Serverless offering by Google Cloud Platform "Dialogflow" or Amazon Web services "Lex" allow you to take the following benefits as mention below:

Automatic Scaling: Serverless infrastructure scales automatically depending upon frequency of incoming messages. For a tourism company – Website integrated with Chatbot can handle any number of incoming requests. If on day 1, you have received 10k messages; on the following day, 50k messages and on day 3 – 1k messages. Depending upon number of messages, on day 2 – Servers will automatically scale up to handle the number of request and on day 3, servers will scale down. Concepts of serverless automated operations and scaling of servers helps the developers to focus more on their business logic without having to worry about the complexities of the entire process.

Cheaper Cost: Cheaper Cost is another benefit of switching to Serverless. Company need to pay only for what is being used. There is no need for the creation of large buffer and end up paying for the underutilized resources.

Easy Integration: Build your Chatbot for one platform and later you have the seamless integration options with the multiple platforms at any point of time as per your requirement. You can integrate the same chatbot with platforms like mobile, web, messaging platforms like Facebook messenger. All sort of third-party integrations is being possible with the large number of authorized partners.

Rapid Response Solution: This AI based Chatbots can process real time queries or requests,day, or night, with the visitors. That is why they are also being called as "Rapid Response Virtual Agents" providing information seekers with accurate, relevant and timely information. Today's Customers demands overwhelming customer support resources and that is the significance of AI Chatbots.

Serverless AI Chatbots with Amazon Lex for Tourism Industry

Using Amazon Lex- one of the AI Service for building conversational interfaces, Creation of AI Chatbot using Lex for Tourism Company would be very effective. Lex guides you through the console to create the Chatbot from scratch using GUI/ Graphical User Interface components.

Designing effective business logic or conversation flow plays a key role. In this flow, Amazon Lex can take the speech, text or image as the input and understand the user input to generate the corresponding response. If the user is sending the input in the form of image to the bot, then digital image and processing is going to take place.

Levels of Digital Image Processing

Low Level – For enhancing the image

Mid-Level- For recognizing the key features

High Level- Understanding the image

Here for processing the image, the high-level processing is important using Computer Vision technology. AI Chatbot will extract the information from the processed input image automatically and generate the output corresponding to the user query. In this way, Travel enthusiast going to obtain the information in a fast, precise, and effective way just by sending the image sample from his computer or mobile device in the real time.

If user input is speech, Lex is going to convert the incoming speech to text and understand the user intent to generate the corresponding response. In such cases, Amazon Transcribe – Automatic Speech Recognition (ASR) service will be used to convert speech input to text quickly and following this, Amazon Polly for converting text to speech to generate output at the user end.

Both the services 'Amazon Transcribe' and 'Amazon Polly' will also allow the tourist to send the input and receive output in their preferred language. Tourism companies can take the advantage of these services to create speech-enabled communication platforms.

Tourism companies are required to keep all the images of the famous tourist spots in the form of library and its corresponding information or description in the labelled format.

Amazon Lex Bot Structure

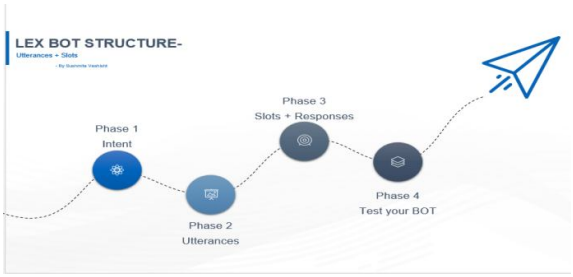


Figure 1: BASIC LEX BOT STRUCTURE

There are 2 main components of LEX: Utterances and Slots also known as 'User Inputs'. In other words, the user input are being mapped to these two main components

1. Utterances: Possible User Interactions are considered as Utterances. For tourism industry in Thailand, pre-defined list of what tourists are likely to say? For an example 'best tourist places in Thailand', 'best tourist destinations in Thailand', 'best family tourist places in Thailand' are the utterances.

   Here, we are going to use the Machine Learning algorithms to train all the phrases.

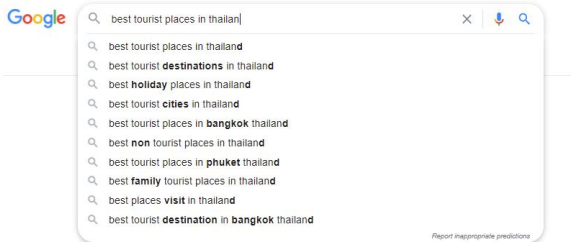


Figure 2: Utterances

2. Slots: Variables populated by the user input are being considered as Slots. Slots are very important to generate the cash-out ready leads. For tourism industry, the often-asked questions such as– Name, Email ID, contact details are considered as built-in Slots and Choose from Hotels Category 3 star, 4star, 5star; location; Check-in and Checkout dates and Number of guests are called Custom Slots.
   We can use the Slots for the lead generation purpose and to keep the registration details with us for future re-marketing campaigns.

Making experience more real and natural to the Travel Lovers can do wonders in the tourism industry. Adding Virtual Character which acts on Natural Language Understanding is another interesting area. Imagine a future where Augmented Reality, Virtual Reality and Chatbots converges. Travel lovers can experience the places of their interest before visiting them in actual using 3D environment and can have conversation with the host (Virtual Character)which can act as a tourist guide. Attaching gestures like blinking eyes, lip synchronization to the host and their ability to take the travelers through the famous tourist spots can make experience more realisticto them with regards to their research from watching YouTube videos, looking out for travel bloggers, Wiki travel Articles, or friends.

We are going to use the Amazon Sumerian- A managed service by AWS or a browser-based editor that let us create and run Augmented Reality (AR), Virtual Reality (VR) and 3D Scenes quickly and easily without requiring any specialized programming skills or 3D graphics expertise. It fulfills the 3 basic features

1) Combination of Real and Virtual Worlds
2) Real time interaction
3) 3D registration of Virtual and Real objects

AR and VR Reality

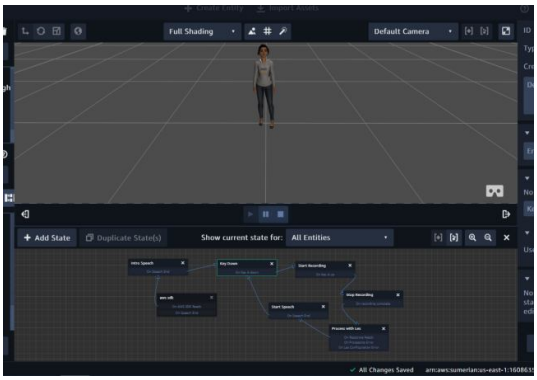


Figure 3: Creating a State Machine that run LEX Bot inside the Sumerian Scene

It helps in replacing the user's real-world experience with a simulated one before reaching the final decision.

Our AI Chatbot will be able to handle all kind of Travel based intents. Traveler passing the image of the place or either asking using speech that he is thinking to visit or confused about,in all such cases our "Image- Moderation and VR based" bot providing him all the information related to that place and making them experience the same in 3D Environment would be the appropriate and unique approach and can bring new innovations to the tourism industry

Other option can be Google Cloud Dialogflow instead of Lex can be taken into account for building your "Image-Moderation and VR based" Smart Multilingual AI Chatbot.

Serverless AI Chatbots with Google Cloud Dialogflow for Tourism Industry

Google Cloud Dialogflow can also be used instead of Amazon Lex to create the conversational experiences across multiple devices and platforms.Dialogflow CX version provides the advanced development suite for creating AI Chatbots.

Chatbots uses "Natural Language Processing (NLP)" and NLP allows the chatbot to understand the user intent which can be in the form of text, Image or Voice from the traveler side and respond accordingly. Because of NLP, Chatbot for the tourism company can understand the intent of the conversation rather than just using the information to communication and respond to queries.

We will be taking the advantage of 2 popular Google Algorithms for NLP [2]

1) **Google Hummingbird:** Algorithm to improve the voice or conversational search

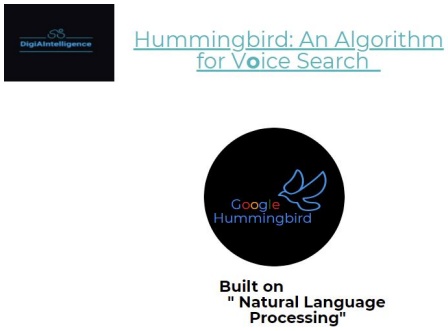


Figure 4: Hummingbird Algorithm

It is going to help the Google in understanding all the intent of the search query even with the spelling mistakes. The Algorithm is built on "Natural Language Processing" and "Semantic Search".

2) **Google BERT:** Algorithm to improve the language understanding for queries

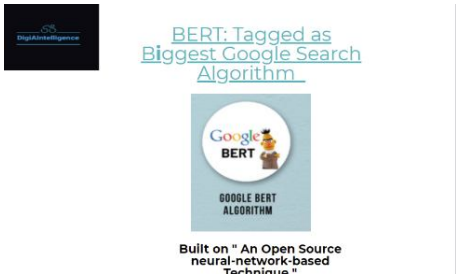


Figure 5: Google BERT

It is going to help the Google in understanding natural language. It performs the tasks like recognizing entities and answering the questions.

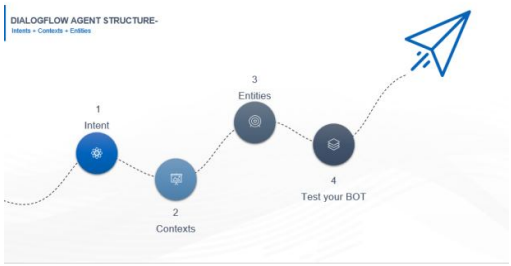


Figure 6: BASIC DIALOGFLOW AGENT STRUCTURE

The Agent structure of Dialogflow is similar to Lex. The three main components of Dialogflow are Intent same as in Lex, Contexts which helps in transferring the "parameter value" from Intent to another. We will be using here the contexts to collect the parameter such as name, email, phone number in one intent and will make the use of its value into other intents. Entities are also like Slot as in Lex.

Conclusion

We culminate that AI chatbot will provide a helping hand between human and machine communication in tourism industry. Tourism company can offer the 24/7 rapid response service in the form of conversational support to the travel enthusiast even if their team is unavailable. Adoption of AI Chatbots can reduce the burden on call centers as well. It is convergence with Augmented Reality and Virtual Reality will make the experience more real and natural for the tourist or any person while making travel plans. According to sources, the size of the global conversational AI market will grow to $15.7 billion by 2024, at a Compound Annual Growth Rate of 30.2% during the forecast period. It is considered as one of the most preferred interfaces for business communications. The use of Conversation AI in Tourism Industry is going to enhance the customer experience and engagement. Human like conversations and assisting customers in real time are the key factors adding value to the Conversational AI offerings. Use of the cloud platforms such as LEX or Dialogflow for deploying Chatbot is going to offer the advantages such as No license cost which means pure consumption-based model (pay only for what is being used), and low installation and maintenance costs.

Both the cloud services Google Dialogflow and Amazon Lex had similar experiences as both the platforms uses a real time conversation box to show bot's training progress. We are going to take the advantage of Multilingual Support offer by these services to overcome language barriers for outbound tourism. Our AI Chatbot is going to ease the language barrier for the outbound tourist.

References

[1] Statista.com. Retrieved from https://www.statista.com/statistics/1093486/travel-tourism-gdp-worldwide-outlook/

[2] SearchEngineJournal.com. Retrieved from https://www.searchenginejournal.com/google-algorithm-history/

[3] Retrieved from https://www.marketsandmarkets.com/Market-Reports/conversational-ai-market-49043506.html

PRATIBHA: INTERNATIONAL JOURNAL OF SCIENCE, SPIRITUALITY, BUSINESS AND TECHNOLOGY (IJSSBT)
Special Issue: International Conference on Global Trends in Engineering & Technology (ICGTET - 2020-21) Vol. 8, No. 1, April 2021,ISSN (Print) 2277-7261

Exploration of Various Machine Learning Algorithms

Dr. Archana Bhavsar[1], Tejashri Patil[2]

[1]*Department of Information Technology,SSBT's College of Engineering and Technology, Jalgaon*
E-mail: asgujar@rediffmail.com

[2]*Department of Information Technology, SSBT's College of Engineering and Technology, Jalgaon*
E-mail: ptejashri2293@gmail.com

ABSTRACT :

Machine learning is predominantly an area of Artificial Intelligence which has been a key component of digitalization solutions that has caught major attention in the digital arena. This paper intends to do a brief review of various machine learning algorithms which are most frequently used and therefore are the most popular ones. From the perspective of their implementation, the author aims to highlight the merits and demerits of machine learning algorithms in order to support educated decision making on the selection of the required. The learning algorithm is designed to comply with the basic requirements of the Requesting.

Keywords: Gradient Descent Algorithm, Linear Regression , Multivariate regression, Logistic Regression, Support vector machine, Baysesion learning, Naive Bayes

1. INTRODUCTION

To start with a good starting point for this paper is to start with the Fundamental Machine Learning definition. Computer in It is assigned to teach a computer programme to perform certain Tasks, and the computer is said to have benefited from its Experience with its observable success in these assignments It strengthens as it acquires more and more expertise in the implementation of These duties.

Take the instance of Computer software learning to identify/predict cancer from cancer Reports of a patient's medical investigation. It will enhance In performance, as it gathers more information by analysing Reports from medical investigations into a larger patient group.

Its efficiency will be calculated by the correct number of Cancer case forecasts and detections as validated by an Seasoned Oncologist. Machine Learning is applied in wide variety of fields namely: robotics, virtual personal assistants (like Google), computer games, pattern recognition, natural language processing, data mining, traffic prediction, online transportation network

In general, machine learning deals with these changes can also result in noisy gradients, which can cause the error rate to hop around instead of steadily decreasing. An example of SGD's application is to test three types of problems: Classification, Regression and Clustering.

2. GRADIENT DESCENT ALGORITH

Gradient Descent is an iterative technique in which the target It is to minimize the cost of a function. It should be possible to be able to Compute the partial derivative of the slope function Oh, or gradient. At any iteration, the coefficients are computed by The negative of the derivative is taken and the derivative is reduced by Coefficients by a learning rate at each phase (step size) Multiplied by derivative in order to be able to minimise the local minimum After a few iterations achieved.

So eventually the iterations are stopped when it converges to minimum value of the cost function after which there is no further reduction in cost function.

There are three different types of this method:

"Stochastic Gradient Descent" (SGD),

"Batch Gradient Descent"(BGD) (BGD),.

"Mini Batch Gradient Descent" (MBGD) (MBGD)

A stable error gradient and a stable convergence are produced. The algorithm, however has the drawback that the stable error gradient can often lead to a convergence state that is not the best the model can accomplish. The algorithm also needs to be in memory and open to the entire training dataset.

The error in BGD is determined for each instance within the BGD Training dataset, but the model will only be revised after the review of all training examples has been completed. Computational estimation is the main value of the BGD algorithm. The error in SGD is measured inside the dataset for each training example and parameters are modified for each training example. This could result in SGD being quicker for the particular problem than BGD.

SGD has the benefit of providing a comprehensive rate of change resulting from periodic updates. However as opposed to the BGD method, periodic updates are more computationally costly.

The MBGD method is obtained by the combination of SGD and BGD principles. The training dataset is split into small batches in this method and an update is performed for each of these batches. A balance is therefore established between the robustness of SGD and the efficacy of BGD. It is possible to train a neural network using this algorithm, so this algorithm is mainly used in deep learning.

In the Back propagation algorithm, the technique of Gradient Descent optimization is used in which the loss function gradient is computed to change the weight of neurons.

The Gradient Descent algorithm has the following drawback: if the gradient descent learning rate is too fast, the true local minimum will be skipped to optimise for time. The gradient descent may never converge if it is too slow, because it is very hard to find a local minimum precisely.

The learning rate will influence which minimum is reached and how fast it is reached. A good idea is to have a changing learning rate, which slows down as the mistake begins to fall.

This produces a stable error gradient and a stable error gradient. Nevertheless the algorithm has the drawback of enquiring Often the stable error gradient can lead to a state of Convergence. This is not the highest convergence that can be accomplished by the model. The algorithm also allows the entire training dataset to be included in the Memory and access to it.

3. LINEAR REGRESSION ALGORITHM

Regression is a supervised learning process. It can be used to model and forecast continuous variables.

Examples of applying the algorithm of linear regression are the As follows: prediction of price of real-estate, forecasting of sales, prediction of students' exam scores, forecasting of movements in the price of stock in stock exchange.

We have the labelled datasets in Regression and the output variable value is calculated by the values of the input variable - so it is the supervised learning method. Linear regression is the simplest type of regression, where an attempt is made to fit a straight line (straight hyperplane) into the dataset, and when the relationship between the dataset variables is linear, it is possible.

Linear regression has the advantage that it is easy to understand and regularisation often makes it easy to prevent over-fitting. We can also use SGD to update linear models with new details. If it is known that the relation between covariates and the response variable is linear, Linear Regression is a good fit.

The downside of Linear Regression is that when one has to deal with non-linear relationships, it is not a good match. It is hard to manage complex patterns. It is also difficult to properly add the correct polynomials to the model.

Over Linear Regression simplifies many real-world issues. There is usually no linear relation between the covariates and response variables.

Therefore, fitting a regression line using OLS will give us a high-train RSS line. There may be no relationship between average dependent and

independent variables predicted by linear regression in real world problems.

4. MULTIVARIATE REGRESSION ANALYSIS

A basic model of linear regression has a dependent variable driven by an independent single variable. Nevertheless, real life concerns are more complicated. Generally, one dependent variable relies on many variables.

For example, The price of a house depends on several variables, such as the neighbourhood. Located in it, area of it, number of rooms, attached facilities, distance from it to the nearest station/airport, distance from it to the nearest shopping area,

In summary, there is a one-to-one relation between the input variable and the output variable in simple linear regression.

But there is a many-to-one relationship between a variety of independent (input/predictor) variables and one linear regression.

Dependent variable (output/response). Adding more input variables does not mean that the regression is better or that better predictions will be made.

There are various use cases for multiple and simple linear regression, and one is not equivalent to the other. Adding more input variables in some instances will make things worse as it results in over-fitting. Again it generates links between them as more input variables are introduced. Therefore, not only are the input variables theoretically related to the output variable, they are also potentially related to each other.

Advantages of Multivariate technique :

It offers a deep insight into the relationship between the independent collection of Variables and variables which are contingent. It also offers insight into the relationship between autonomous variables. Via multiple regression, tabulation techniques and partial correlation, this is done. It models the dynamic problems of the real world in a practical and rational manner.

Disadvantages of Multivariate technique:

This approach is highly technical and involves experience and skills in mathematical and statistical modelling techniques. The sample size for statistical modelling must be high in order to obtain a higher degree of confidence in the outcome of the study. It is also always too difficult to carry out a meaningful study and interpretation of statistical model outputs.

In property valuation, car assessment, energy demand forecasting, quality management, process optimization, quality assurance, process control and medical control, this Regression Analysis method involving many variables can be used.

5. LOGISTIC REGRESSION

To handle a classification query, logistic regression is used. This gives the binomial result as it gives the probability of an occurrence happening or not (in terms of 0 and 1) based on input variable values.

For example, The cases that can be known as binomial effects of logistic regression are predicting whether a tumour is malignant or benign or an e-mail is labelled as spam or not.

Ordinary results can be obtained as well as: 1 to 5 product ranking, etc. So Logistic Regression deals with the estimation of a categorical target variable. Whereas Linear Regression is concerned with the estimation of continuous variable values, e.g. Predicting the price of real estate for a period of 3 years.

Logistic Regression has the following advantages :

Implementation simplicity, computational performance, efficiency from Perspective of preparation, ease of regularisation. For input features, no scaling is needed. This algorithm is often used to solve industry-scale problems.

As the output of Logistic Regression is a probability score so to apply it for solving business problem it is required to specify customized performance metrics so as to obtain a cutoff which can be used to do the classification of the target. Logistic regression is also not impacted by tiny data noise and multicollinearity.

Logistic Regression has the following disadvantages:

Until all independent variables are known, the inability to solve the non-linear problem as its decision surface is linear, prone to overfitting, will not work well. Such examples of Logistic Regression's functional implementation are: Predicting the risk of contracting a given disease, diagnosing cancer, predicting the mortality of injured patients, and predicting the likelihood of failure of a particular method, device or product in engineering.

6. DECISION TREE

Decision Tree is an approach to Supervised Machine Learning to solve problems with classification and regression by constantly separating data based on a certain parameter. The options are in the leaves and the knowledge in the nodes is divided. The decision variable is categorical in the Classification Tree.

Decision Tree has the following advantages :

It is ideal for both regression and classification problems, ease of analysis, ease of managing categorical and quantitative values, ability to fill missing values in the most likely value attributes, high value. Performance due to tree traversal algorithm performance. Decision Tree can face the issue of over-fitting, for which the solution based on the approach of ensemble modelling is Random Forest.

The disadvantage of the decision tree is that it can be unstable, tree size can be difficult to control, it can be susceptible to sampling error, and it provides a locally optimal solution, not an optimal solution globally. In applications such as forecasting potential usage of library books and concerns with tumour prognosis, Decision Trees may be used.

7. SUPPORT VECTOR MACHINE

Support Vector Machines (SVM) can handle both classification and regression problems. In this method
hyper plane needs to be defined which is the decision boundary. If there is a set of objects belonging to different classes, it is important to isolate them from the decision plane. In this case, complex mathematical functions called kernels are necessary to distinguish objects that are members of different groups. The objects may or may not be linearly separable. Based on examples in the training data collection, SVM aims to correctly identify the objects.

Following are the advantages of SVM :

It can handle both semi-structured and structured data, and if the necessary kernel function can be derived, it can handle complex functions. In SVM, as generalisation is implemented, there is less risk of over-fitting. With high dimensional data, it can scale up. It's not trapped in the local Optima.

Following are disadvantages of SVM :

Because of the increase in training time, its efficiency decreases with large data sets. Relevant kernel functions would be hard to find. When the dataset is noisy, the SVM does not work well. SVM does not have estimations of likelihood. It is hard to grasp the final SVM model. Help Vector Machine discovers its practical application in the diagnosis of cancer, identification of fraud in credit cards, and writing recognition, face detection and text
classification etc

8. BAYESIAN LEARNING

A prior probability distribution is selected in Bayesian Learning and then updated to obtain a posterior distribution. Later on the previous posterior distribution can be used as a prior with the availability of new observations. Bayesian networks can handle incomplete datasets. The method can prevent over-fitting of data.

There is no need to remove contradictions from data. Bayesian Learning has the following disadvantages :

Prior selection is challenging. Posterior distribution can be affected to a large degree by before. If the previous selection is not accurate, it can lead to incorrect predictions. It can be programme intensive. Will Bayesian Learning To be used for applications such as medical diagnosis and identification of disaster victims, etc.

9. NAÏVE BAYES

This algorithm is simple and is based on the likelihood of conditionality. There is a probability table in this technique that is the model and it is modified by training data. The probability table is based on its function values, where the class probabilities for predicting a new probability table need to be looked up.

Conditional freedom is the fundamental assumption and that is why it is called "naive". The presumption that all input features are distinct from one another can hardly hold true in the real world sense.

Naïve Bayes (NB) have the following advantages:

It is simple to implement, provides good efficiency, operates with fewer training data, scales linearly with the number of predictors and data points, handles continuous and discrete data, can handle binary and multi-class classification issues, an allows probabilistic predictions. It deals with continuous and discreet

Naïve Bayes has the following disadvantages:

Models which are properly trained and tuned sometimes exceed NB models as they are too basic. If there is a need to provide one of the functions as a "continuous variable" (like time), then it is difficult to apply Naive Bayes directly, although it is not100% right to render "buckets" for "continuous variables."

For Naive Bayes, there is no true online version, so all data must be preserved for the model to be retrained. If the number of classes is too high, such as > 100K, it does not scale. Even for prediction compared to SVM or simple logistic regression, it takes more runtime memory. Particularly for models that involve several variables, it is computer intensive. In applications such as the Recommendation Method and the prediction of cancer relapse or progression after radiotherapy, Naïve Bayes can be used.

10. KNEAREST NEIGHBOUR ALGORITHM

The K Nearest Neighbor (KNN) Algorithm is a classification algorithm that uses a database that groups data points into several classes and the algorithm attempts to classify the sample data point given to it as a classification problem. There is no underlying data distribution assumed by KNN and so It is known to be non-parametric.

Advantages of KNN algorithm are the following:

It is an easy, easily implemented technique. It's cheap to build the model. The classification system is highly versatile and well adapted for multi-modal groups. With multiple class labels, records are. At most the error rate is twice that of the Bayes error rate. It can be the best method sometimes.

Disadvantages of KNN are the following:

Unknown documents are relatively costly to classify. Distance is necessary The k-nearest neighbours' computation. The algorithm becomes computer-intensive with the growth in training set size. Noisy / irrelevant characteristics can result in precision degradation.

In the recommendation method, KNN can be used in medical diagnosis of different diseases with common symptoms, credit assessment using similarity of features, handwriting recognition, examination by financial institutions. Video recognition, estimating votes for various political parties and image recognition, before sanctioning loans.

11. CONCLUSION

An attempt was made in this paper to study the most commonly used machine learning algorithms to solve problems with classification, regression and clustering. The benefits and drawbacks of these algorithms have been addressed and various algorithms have been compared (wherever possible) In terms of productivity, rate of learning, etc. Examples of functional implementations of these algorithms have been addressed along with that. Forms of machine learning methods have been discussed, such as supervised learning, unsupervised learning, and semi-supervised learning. It is intended that it will provide readers with insight to make an informed decision to define the machine learning algorithm options available and then choose the appropriate machine learning

algorithm in the particular sense of problem solving.

REFERENCES

[1] C. Phua, V. Lee, K. Smith, R. Gayler (2010); "Comprehensive Surveyof Data Mining-based Fraud Detection Research", ICICTA '10Proceedings of the 2010 International Conference on IntelligentComputation Technology and Automation Volume 1, pp. 50-53.

[2] S. Cheng, J. Liu, X. Tang (2014); "Using unlabeled Data to Improve Inductive Models by Incorporating Transductive Models"; International Journal of Advanced Research in Artificial Intelligence, Volume 3Number 2, pp. 33-38.

[3] Sonal S. Ambalkar, S. S. Thorat2, "Bone Tumor Detection from MRIImages using Machine Learning: A Review", International Research Journal of Engineering & Technology", Vol. 5, Issue 1, Jan -2018.

[4] Rajat Raina, Alexis Battele, Honglak Lee,Benjamin Packer, Andrew Y.Ng , "Self-taught Learning : Transfer of Learning from UnlabeledData", Computer Science Department, Stanford University, CA, USA,Proceedings of 24th International Conference on Machine LearningCorvallis, OR, 2007.

[5]Patil, Tejashri, Sweta Pandey, and Kajal Visrani. "A review on basic deep learning technologies and applications." In Data Science and Intelligent Applications, pp. 565-573. Springer, Singapore, 2021

[6] Jimmy Lin, Alek Kolcz, "Large-Scale Machine Learning at Twitter",Proceedings of SIGMOD '12, May 20–24, 2012, Scottsdale, Arizona,USA.

[7]Patil, Tejashri A., Latesh S. Mahajan, and Ashish T. Bhole. "Public Auditing Algorithm for Encrypted Data." In 2017 International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC), pp. 831-836. IEEE, 2017.

[8] Dr. Rama Kishore, Taranjit Kaur, "Backpropagation Algorithm: AnArtificial Neural Network Approach for Pattern Recognition",International Journal of Scientific & Engineering Research, Volume 3,Issue 6, June-2012.

[9]Patil, Tejashri A., Sweta Pandey, and Ashish T. Bhole. "A review on contemporary security issues of cloud computing." In 2017 1st International Conference on Intelligent Systems and Information Management (ICISIM), pp. 179-184. IEEE, 2017.

[10] Kedar Potdar, Rishab Kinnerkar, "A Comparative Study of MachineAlgorithms applied to Predictive Breast Cancer Data", InternationalJournal of Science & Research, Vol. 5, Issue 9, pp. 1550-1553,

[11] Patil Tejashri and Archana K. Bhavsar "Data Science Team Roles and Need of Data Science: A Review of Different Cases." In Data Science and Intelligent Applications, pp. 13-22. Springer, Singapore.

[12] Patil, Tushar H., Akash V. Harde, and Ms Tejashri Patil. "Comparative Study of Apriori Algorithm and Frequent Growth algorithm."