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FROM PRINCIPAL'S DESK

Newsletter 'MICROTRONIX' represents the plethora of creativity and talent of the students in the Electronics Engineering Department of SAKEC. Through the newsletter, not only the technical skills and competency of the students brought to the fore, but also their energies are channelized towards the right direction. As a student steps out of the institute, he can develop into a multi-faceted personality by being aware of intricate web of human values, traditions and customs.

The famous quote

"Each person holds so much power within themselves that needs to be let out. Sometimes they just need a little nudge, a little direction, a little support, a little coaching and the greatest things can happen" – PETE CARROLL

has come true with every staff and student's achievement. With this motivation students of Electronics department, SAKEC have achieved many heights in academic year 2019-2020. I congratulate the editorial team for bringing up this newsletter issue Vol.7 in this pandemic COVID-19 situation.

Dr. Bhavesh Patel
Principal, SAKEC.

FROM HOD'S DESK

I am very glad to present the Newsletter 'MICROTRONIX', May 2020, Vol.7 issue, which gives our departmental staff and student achievements, activities in a nutshell. Being the oldest department of SAKEC, our department is strengthened with highly experienced staff members and well equipped laboratories. Various departmental activities are conducted throughout the academic year to enhance the knowledge of staff and students.

Department also provides Internship opportunities to the students at college and in industries and prepare them to face the real industrial world.

Our collective energy and action grounded in data which reinforces our work has created this beautiful issue 'MICROTRONIX', May 2020. I congratulate Staff Editorial team members Prof. B.K. Mathew, Prof. Manisha Mane, Prof. Priyanka Singh, Prof. Santosh Kamble and the student editorial team members Mr. Sunny Mishra, Ms. Ashwini Gangwal, Mr. Ankit Manani, Mr. Jeel Malde and Mr. Varun Nagrecha for their remarkable hard work in bringing out this newsletter in this COVID-19 lockdown period. Looking forward for more achievements in the upcoming years.

"ALONE WE CAN DO LITTLE; TOGETHER WE CAN DO SO MUCH"- HELEN KELLER

Dr. Subha Subramaniam
I/C HOD (ELECTRONICS)

INDEX

STAFF MEMBERS OF THE DEPARTMENT OF ELECTRONICS ENGINEERING

STAFF MEMBERS OF THE DEPARTMENT OF ELECTRONICS ENGINEERING

TEACHING STAFF

| Sr. No.	Name of the Faculty	Sr. No.	Name of the Faculty
1	Dr. Subha Subramaniam Associate Professor, I/C Head	13	Ms. Manisha Mane Assistant Professor
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3	Ms. Shikha Srivastava Associate Professor	15	Ms. Anita Nalawade Assistant Professor
4	Mr. Prashant Khedkar Associate Professor	16	Ms. Jayashri Bhole Assistant Professor
5	Mr. Babychen Mathew Associate Professor	17	Ms. Preethi Warrier Assistant Professor
6	Ms. Vidya Gogate Associate Professor	18	Ms. Nibha Desai Assistant Professor
7	Mr. Nandkishor Narkhede Associate Professor	19	Ms. Aprajita Bera Assistant Professor
8	Ms. Asha Durafe Assistant Professor	20	Mr. Amit Tiwari Assistant Professor
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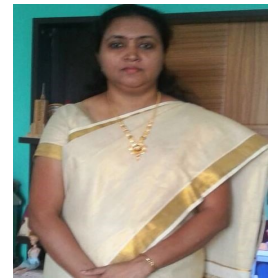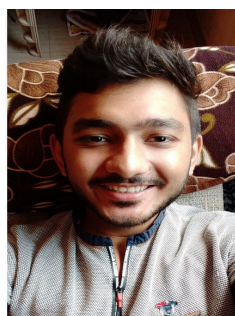
FROM THE EDITORIAL BOARD

Dear all,

It is with great pleasure that we are presenting Microtronix may 2020 ,the newsletter of Electronics Engineering department of our college to you.

It is a great matter of pride that SAKEC has established as a pioneer institution of higher technical education in Mumbai under the dynamic leadership of the Principal **Dr. Bhavesh Patel** , Vice Principal **Dr. V. C. Kotak** and HOD **Dr .Subha Subramaniam**.

The department is providing holistic teaching and training to students in the field of electronics. Apart from the regular class room teaching and laboratory training, the department is conducting various workshops, technical and non technical events and extra curricular activities. The newsletter is trying to catch a glimpse of the activities of the students and staff in the last academic year 2019-20.

I sincerely express my thanks and gratitude to my co-staff editors Prof. Manisha Mane, Prof. Priyanka Singh, Prof. Santosh Kamble and student editors Mr. Sunny Mishra, Ms. Ashwini Gangwal, Mr. Ankit Manani, Mr. Varun Nagrecha and Mr. Jeel Malde, who despite the constraints of lockdown have been consistently working hard to make this venture a success.

For editorial team,

Prof. Babychen Mathew (Chief Editor)

ALUMNI ARTICLES

Akshiv Goel,

BE ELECTRONICS,

Scientific Officer, Bhabha Atomic Research Centre (BARC)

Although it's been almost 8 years since I left the college, still memories of SAKEC are fresh in my mind. After spending 4 years of my life in this college, special bond has developed with friends that I made here and faculties that taught me. So when I recently got invitation to attend annual alumni meet – '**Sampark**' I immediately made my mind to attend it. I was very excited to meet my batch mates, professors and mentors who have a major role to play in shaping my career and making me what I am today. Although I am in contact with many of my batch mates and professors, it's all together a different feeling when you go to college. It brings back all the nostalgic feelings that you have - the classrooms, labs, library, admin office, canteen and playground.

It gave me real happiness to be back and relive all the fond memories of SAKEC. I recalled those days of assignments, lectures, submissions, vivas, exams, games and extra co-curricular activities. I missed one week of events and fun during college fests. I enjoyed a lot participating and volunteering for SAKEC fests. The college has got a complete makeover with new classrooms and labs with modern facilities, instruments and workbenches. Gym and recreation room has been constructed. The brand new auditorium welcomed me and I was glad to meet my batch mates and professors. I was surprised when one of the faculties came and asked – "You are Akshiv Goel? Right?". Many of the faculties still remembered me and we discussed those days of my college. I was proud to know the achievements of students and faculties in various national competitions. Student chapters like IEEE, CSI and ISTE were very active and organizing many workshops and seminars. These workshops and industrial visits plays a vital role in overall development of students. A lot has changed and college has improvised a lot in these 8 years but the student-faculty relationship still remain the same.

It was this SAKEC that gave me my first job in TCS and I'm honored to them. After working in TCS for some time, electronics engineer in my blood craved me to play with wires, instruments and of course electrons!! I started preparing for GATE exam without joining any coaching institute. I'm proud to say that the lectures that I attended during my college time helped me a lot during my preparation. I enjoyed tinkering with devices and circuits during practical/lab sessions and the knowledge gained during these laid foundation for correct approach towards problem solving. Finally I could join Bhabha Atomic Research Centre (BARC) where I'm currently working as a Scientific Officer. I owe my complete success to all the faculty members of SAKEC.

Electronics & semiconductor industry is developing day by day and there is lot of scope in it. I would like to advise my juniors to continue working hard to achieve their goals. Follow **IEEE** - Interact, explore, experiment and execute! College time is the best time of your life and I miss those golden days. College is your second home and later you'll miss each single day spent here. If I can come out with flying colors and join prestigious institute like BARC, so can you achieve your dreams. SAKEC has good infrastructures and facilities; faculties here are very experienced with abundant knowledge waiting to be distributed, you just need to have the desire to grasp it!! Have confidence in you, never get disheartened and bring laurels to SAKEC. I once again thank SAKEC fraternity and wish you **'All The Best'**!!!

Zubin Savla

B.E.Elctronics

+5 Year Experience in Hardware Developer in the field of social Innovation and Researcher with Tata Centre for Technology & Design.

Expertises in prototyping and product development.

Everyone's got their own college stories and experiences however, mine turned out to be significantly interesting and life-changing. The achievements matched the downfalls when I got a year's drop in the 3rd year of engineering (2014-2015). That was when I found out about this UN program intersection on Science, Philosophy, and Culture. It involved an association of 70 artists, scientists, and philosophers from 14 countries. (http://thestoryoflight.org/).

In the wake of dealing with the low blows, I was fortunate enough to have a job even before I graduated and without being a part of the placement program at Tata Centre for Technology and Design. It was an experience of a lifetime to discover how electronics have been making a radical impact in the real world.

I would also like to mention about the time when I was taken by surprise when I discovered that the basis of Core electronics that I'd learnt in college was helping me structure and construct important complex gadgets, such as Cancer care devices.

After dedicating a few months learning and apprehending more hands-on electronics, I started developing a keen interest in health care and medical product development. I spent 3 years in instituting and developing a cancer care device along with an efficient team which is now being launched in the medical devicing markets. Further amplifying my spectrum of curiosity and knowledge, I've been working for domains that encompass Education, Water, Food and agriculture, energy and IoT.

Meanwhile I have been mentoring many innovators and entrepreneurs for the End to End Innovation Program of IIT - Bombay. Along with it, I have also been monitoring, instructing, guiding and training the teams of TechStar StartUp Weekend (SDGs), Gandhian Young Technological Innovation (GYTI) Award, Reviewing for Techpedia and the Big Idea summit.

As of recently I have also been appointed as the Mentor Of Change for Atal Innovation Labs of NITI Ayog, Government of India. I am a part of the production lead of UNESCO's project called the StoryofFoundation which is an Informal Education Program. Simultaneously, I'm also designing the science curiculum and STEAM Education Program for the State Board of Maharashtra.

Co-Founding a non-profit organization called StoryofMakers along with the NGO Tarun Mitra Mandal has been an event of substance for me. Story of Makers is an opportunistic platform for makers, designers and innovators in creating, analyzing, enabling the young talented children to showcase their abilities and capabilities. It is also a 'Library of Everything' since it provides a holistic growth in all aspects of life. The projects alloted create a stimulus of curiosity and learning, encompassing their overall affirmative growth and development.
Also I am the only non-medical student that has been certified by International Eye and Tissue bank for carrying out Corneal extraction.

STAFF ARTICLES

Prof. Babychen Mathew

(Associate Professor, Department of Electronics Engineering)

A Review on the Basics of Wavelet Transforms.

Introduction

Wavelet transforms are one of the major areas of digital signal processing. This article is an attempt to review the basic formulation of forward and inverse wavelet transforms especially the Haar and Daubechies   wavelets. The analysis and synthezis which is done using a simple one dimensional signal can be extended to two dimensions in a similar fashion where image processing applications   can be efficiently dealt with.

The core of wavelet analysis is the multiresolution analysis.It is the decomposition of a signal (such as an image) into subsignals (subimages) of different size resolution levels.

The Haar transform serves as a prototype for all other wavelet transforms.

Let the discrete signal be $\mathbf{y}=(y_1, y_2, ..., y_N)$, where N is a positive even integer which is the length of $\mathbf{y}$. The Haar transform decomposes a discrete signal into two subsignals of half its length. One subsignal is a running average or the trend (u_m) , the other subsignal is a running difference (e_m) or fluctuation.

$u_m = \{y(2m-1)+y(2m) / \sqrt{2}\}$ is the trend signal and $e_m = \{y(2m-1)-y(2m) / \sqrt{2}\}$ is the fluctuation

for   m=1,2,3,...,N/2.
For example, if $\mathbf{y}$ is defined by eight values, say $\mathbf{y} = (4,6,10,12,8,6,5,5)$. Using the above equations we can find $\mathbf{u}^1 = (5\sqrt{2}, 11\sqrt{2}, 7\sqrt{2}, 5\sqrt{2})$ $\mathbf{e}^1=(- \sqrt{2}, -\sqrt{2}, \sqrt{2},0)$

$H_1 (\mathbf{y}) \rightarrow (\mathbf{u^1}|\mathbf{e^1})$ where H_1 is the mapping on **y**
(4, 6, 10, 12, 8, 6, 5, 5) $_{H_1} \rightarrow$ (5√2, 11√2, 7√2, 5√2 | - √2, -√2, √2,0)

The inverse transform is given by

$$\mathbf{y} = \{(u1+e1)/\sqrt{2}, (u1-e1)/\sqrt{2}, \ldots\ldots, (uN/2+eN/2)/\sqrt{2}, (uN/2-eN/2)/\sqrt{2}\} \qquad \textbf{(1)}$$

In other words, $y_1 = (u1+e1)/\sqrt{2}$, $y_2 = (u1-e1)/\sqrt{2}$, $y_3 = (u2+e2)/\sqrt{2}$,

$y_4 = (u2-e2)/\sqrt{2}$ and so on.

Applying the above inverse equations to $(\mathbf{u^1}|\mathbf{e^1})$= (5√2, 11√2, 7√2, 5√2 | - √2, -√2, √2,0)

 produces back **y**= (4, 6, 10, 12, 8, 6, 5, 5).

The magnitudes of the values of the fluctuation subsignal are often significantly smaller than the magnitudes of the values of the original signal. The trend subsignal looks like the original signal, although shrunk by half in length and expanded by a factor of **√2** vertically.

Again applying analyzis equation to $\mathbf{u^1}$

$\mathbf{u^1} = (u^2 \,|\, e^2 \,|\, e^1)$ = (16, 12| - 6, 2| -√2, -√2, 0) $=(u^3 \,|\, e^3 \,|\, e^2 \,|\, e^1)$
   = (14√2 | 2 √2| -6,2| -√2, -√2, √2, 0)

Haar Wavelets
1 level Haar wavelets are defined as
W^1_1 = { (1/√2), (-1/√2), 0, 0, ….., 0) } W^1_2 = { 0, 0, (1/√2), (-1/√2), 0, 0, ….., 0) }
W^1_3 = { 0,0,0, (1/√2), (-1/√2), 0, 0, ….., 0) } .... $W^1_{N/2}$ = { 0,0,….., 0, (1/√2), (-1/√2) }
e_1 = (y1-y2)/√2 = y .W^1_1 Generally, e_m = y . W^1_m **(2)**

1 level Haar scaling signals are defined as
S^1_1 = { (1/√2) , (-1/√2), 0, 0, ….., 0) } ; S^1_2 = { 0, 0, (1/√2), (-1/√2), 0, 0, ….., 0) } ....
$S^1_{N/2}$ = { 0, 0, ….. , (1/√2), (-1/√2) }

u_m = y . S^1_m **(3)**

 2 level Haar Scaling and Wavelet signals are defined as follows.
S^2_1 = { 1/2, 1/2, 1/2, 1/2, 0, 0, ….., 0 }
S^2_2 = { 0, 0, 0, 0, 1/2, 1/2, 1/2, 1/2, 0, 0, ….., 0)
....
$S^2_{N/4}$ = { 0, 0, …… , 1/2, 1/2, 1/2, 1/2 }

W^2_1 = { 1/2, 1/2, (-1/2), (-1/2), 0, 0, ….., 0 } ;
W^2_2 = { 0, 0, 0, 0, 1/2, 1/2, (-1/2), (-1/2), 0, 0, ….., 0 }
....
$W^2_{N/4}$ = { 0, 0, ….. , 0, 1/2, 1/2, (-1/2), (-1/2) }

Multiresolution analysis (MRA).

In MRA signals are sythesized by beginning with a low resolution signal and successively adding on details to create a higher resolution version ending with a complete synthesis of the signal at the finest resolution

Equation (1) can be expressed as $y = U^1 + E^1$,where U are the terms of 'u' and E are the terms of 'e'. Using Haar scaling signals and wavelets we can write

$U^1 = u_1 S_1{}^1 + u_2 S_2{}^1 + \ldots \quad . E^1 = e_1 W_1{}^1 + e_2 W_2{}^1 + \ldots$

Using equations (2) and (3),the above equations can be written as

$U^1 = {}_{(}y.S_1{}^1{}_{)}S_1{}^1 + (y.S_2{}^1)S_2{}^1 + \text{----} \qquad E^1 = {}_{(}y.W_1{}^1{}_{)}W_1{}^1 + (y.W_2{}^1)W_2{}^1 + \text{----}$ **(4)**

These equations show that the averaged signal is a combination of Haar scaling signals with the values of the of the first trend subsignal and that the detail signal is a combination of Haar wavelets with fluctuation subsignal.

Consider the signal **y** again, **y**=(4,6,10,12,8,6,5,5)
$u^1 = (5\sqrt{2}, 11\sqrt{2}, 7\sqrt{2}, 5\sqrt{2}) \quad e^1 = (-\sqrt{2}, -\sqrt{2}, \sqrt{2}, 0)$

Using euations (3) and (4) we can write

$U^1 = {}_{(}5\sqrt{2}{}_{)}S_1{}^1 + (11\sqrt{2})S_2{}^1 + {}_{(}7\sqrt{2}{}_{)}S_3{}^1 + (5\sqrt{2})S_4{}^1$ **(5)**
$E^1 = {}_{(}-\sqrt{2}{}_{)}W_1{}^1 + (-\sqrt{2})W_2{}^1 + {}_{(}\sqrt{2}{}_{)}W_3{}^1 + (0)W_4{}^1$ **(6)**

$U^1 = (5, 5, 11, 11, 7, 7, 5, 5) \quad E^1 = (-1, 1, -1, 1, 1, -1, 0, 0)$

$y = U^1 + E^1$

$y = (5, 5, 11, 11, 7, 7, 5, 5) + (-1, 1, -1, 1, 1, -1, 0, 0)$

Similarly for 2 levels $y = U^2 + E^2 + E^1$ but $U^1 = U^2 + E^2$

The idea can be extended to further levels .We have u^2 for y as (16,2).
So $U^2 = 16(1/2, 1/2, 1/2, 1/2, 0, 0, 0, 0) + 12(1/2, 1/2, 1/2, 1/2, 0, 0, 0, 0) = (8, 8, 8, 8, 6, 6, 6, 6)$

$y = (4,6,10,12,8,6,5,5)$ has the second fluctuation $e^2 = (-6,2)$. Consequently
$E^2 = -6\{ 1/2, 1/2, (-1/2), (-1/2), 0, 0, 0, 0) + 2(0, 0, 0, 0, 1/2, 1/2, (-1/2), (-1/2) \} = (-3,-3,3,3,1,1,-1,-1)$

We found above that $E^1 = (-1, 1, -1, 1, 1 ,-1,0, 0)$

Hence, $y = U^2 + E^2 + E^1 = (8,8,8,8,6,6,6,6) + (-3, -3, 3,3, 1, 1, -1, -1) + (-1, 1, -1, 1, 1 ,-1,0, 0)$

In general, if the number N of signal values is divisible k times by2,then a k-level MRA**:**

$y = U^k + E^k + \cdots + E^2 + E^1$ can be produced.

The Daub4 wavelets:

The difference between the Haar transform and the Daub4 transform lies in the way that the scaling signals and wavelets are defined. Let the scaling numbers c_1, c_2, c_3, c_4 be defined by
$c_1 = \{ (1+\sqrt{3})/4\sqrt{2} \}$, $c_2 = \{ (3+\sqrt{3})/4\sqrt{2}\}$, $c_3 = \{ (3-\sqrt{3})/ 4\sqrt{2} \}$, $c_4 = \{ (1-\sqrt{3})/4\sqrt{2} \}$

The scaling signals are given by

$S^1_1 = (c_1, c_2, c_3, c_4, 0, 0, \ldots\ldots,0)$: $S^1_2 = (0,0,c_1, c_2, c_3, c_4, 0, 0, \ldots\ldots,0)$
......

$S^1_{N/2-1} = (0,0,\ldots\ldots c_1, c_2, c_3, c_4)$ $S^1_{N/2} = (c_3, c_4, 0,0,\ldots\ldots\ldots c_1, c_2)$

Each scaling signal has a support of just 4 time units.

$c_1{}^2 + c_2{}^2 + c_3{}^2 + c^2{}_4 = 1$

The wavelet numbers d_1, d_2, d_3, d_4 are defined as $d_1 = \{ (1+\sqrt{3})/4\sqrt{2} \}$, $d_2 = \{ (3+\sqrt{3})/4\sqrt{2} \}$,
 $d_3 = \{ (3-\sqrt{3})/4\sqrt{2} \}$, $d_4 = \{ (1-1\sqrt{3})/4\sqrt{2} \}$

1 level Daub 4 wavelets are defined as

$W^1_1 = (d_1, d_2, d_3, d_4, 0, 0, \ldots\ldots,0)$ $W^1_2 = (0,0,d_1, d_2, d_3, d_4, 0, 0, \ldots\ldots,0)$ . . . .
.
$W^1_{N/2-1} = (0,0,\ldots\ldots,0, d_1, d_2, d_3, d_4)$ $W^1_{N/2} = (d_3, d_4, 0,0,\ldots\ldots\ldots,0, d_1, d_2)$

$d_1{}^2 + d_2{}^2 + d_3{}^2 + d^2{}_4 = 1$

Method of wavelet Transform Compression

Step 1.   Perform a wavelet transform of the signal.
Step 2. Set equal to 0 all values of the wavelet transform which are insignificant, i.e.,which lie below some threshold value.
Step 3. Transmit only the significant, non-zero values of the transform obtained from Step2. This should be a much smaller data set than the original signal.
Step 4. At the receiving end, perform the inverse wavelet transform of the data transmitted in Step 3, assigning zero values to the insignificant values which were not transmitted. This decompression step produces an approximation of the original signal.

Conclusion

In this article I have tried to analyse the basic formulations of wavelet transforms and tried to apply the procedure to an example signal. The reader may try to verify the equations for higher levels, say 2 or 3 and apply Daub4 analysis and synthesis equations to produce equations similar to **(5)** and **(6)**.

Books Referred
1. Ten lectures on wavelets (Ingrid Daubechies).
2. A wavelet tour of signal processing (Stephen Mallat).
3. Wavelets and filter banks (Gilbert Strangs).
4. A primer on wavelets (J. S. Walker).
5. The world according to wavelets (Barbara Hubbard).

Securing Criminal Records using R-Pi, QR code and Steganography

Asha durafe

Abstract : In today`s digital scenario it has become very essential to maintain secrecy of criminal records otherwise forgery could happen. Using steganography it is possible to provide security for the information which is communicated over the internet from one crime branch to the other. Steganography one of the emerging security fields works to mask the very existence of the message. A wide range of carrier file formats can be utilized, but digital steganography is the extremely beneficial data hiding technique to secure criminal image as well as the crime scene images. Various applications have various prerequisites of the steganography method utilized. In this paper, we proposed CRSS (Criminal Record Security System) an image steganography method with LSB and RSA technique for enhanced security and along with that Raspberry pi and GSM module is used. Thus, for a more secure approach, the proposed method hides the criminal`s confidential records such as criminal`s image, crime scene digital images etc. using LSB steganography and also encrypts the confidential data making use of a private key using RSA algorithm and then sends it to the desired end. The receiver then decrypts the confidential data to get the original criminal information. CRSS is also proposed to send a QR code to the receiver which hides sensitive data and may include criminal`s previous crime history and other written proofs which are scanned at the receiving end reveals the entire criminal record. The entire system is implemented on Raspberry Pi 3 processor and thus a secure transmission of data without traditional desktop dependency in a more economical way could be established.

Keywords: Steganography, Data Hiding, Least Significant Bit (LSB), RSA, Raspberry-Pi, QR code, GSM.

I. INTRODUCTION

Hiding confidential data inside images has become a well accepted method in today`s cyber world. An image with a secret confidential data inside can easily be spread across the cyber world or in digital media. The use of steganography in digital media has been explored by German steganographic expert Niels Provos, who researched a scanning cluster which probes the presence of hidden messages inside images that were posted on the net. However, after checking one million images, no hidden messages were found, so the practical use of steganography still seems to be limited [1]. Image Steganography is the method of concealing the information within the image so as to prevent the unintended user from the detection of the confidential messages or data.

To conceal the confidential data inside an image without losing its visible properties, the cover image can be adjusted in noisy areas with a good amount of color variations, so less attention will be emphasized towards the alterations [1]. The most common technique to make these modifications involves the utilization of the Least Significant Bit or LSB, masking, filtering and transformations on the cover source [2]. The technique may be implemented using diversified acquisition levels on various formats of image files. Image steganography deals with concealing confidential data i.e. text, images, audio or video files in another text, image, audio or video files. The proposed strategy plans to utilize steganography for an image with another image using spatial domain technique. This confidential criminal image can be reconstructed solely through correct decoding system. This hiding and retrieval of the images is done using MATLAB codes on Raspberry Pi 3 where traditional desktop interface is not mandatory and a GSM interface is used to send the secret key. A QR code scanner at the receiver crime branch is used to retrieve the confidential data through a QR code sent from the sender crime branch.

Steganography focuses on concealing the confidential data in a cover image in such a manner that unauthorized users are unable to identify the existence of confidential data by just detecting the information. In contrast to watermarking, steganography does not intend to prevent the hidden information by opponents of removing or changing the hidden message, which is hidden in the cover image but it ensures

that it remains unnoticeable. Steganography is of particular interest in systems wherein encryption cannot be utilized to secure the communication of secret information.

II. STEGANOGRAPHY VS. CRYPTOGRAPHY

Cryptography is the art of encrypting data in such a way that one cannot make sense of the encrypted message, whereas in steganography the mere existence of data is masked in a way that even its occupancy cannot be detected. Using cryptography might raise some suspicion whereas in steganography the existence of the confidential message is imperceptible and thus not detectable. We can think of steganography as an added layer of security in cryptography, and it is generally advisable to use where just encryption is not sufficient.

III. STEGANOGRAPHY WITH LEAST

SIGNIFICANT BIT (LSB) METHOD

Since many years steganography is the technique used for transferring information in a way which conceals the mere presence of the confidential data. Steganography plays a vital role in information security.

It is the art of invisible communication by concealing confidential data inside cover information [3]. The word steganography is originated from Greek which exactly means concealed writing. An Image   Steganography technique involves three major components: cover image (which hides the secret image), the secret image and the stego-image (which is the cover image with secret image embedded inside it). A digital image is always mode led using a 2-D matrix of the color model at each grid point   (i.e. pixel). Generally, gray images use 8 bits and colored   images use 24 bits to outline the color model known as RGB model. The Image Steganography technique which utilizes an image as the cover, there are numerous methods to hide   confidential data inside cover image. The spatial domain methods adjust the cover-image pixel bit values to conceal the secret data. The secret bits are composed legitimately to the spread cover image pixel bytes. That being so the spatial   domain techniques are uncomplicated and simple to put into practice. The Least Significant Bit (LSB) ste-

ganography is amongst the majorly used techniques in spatial domain   techniques. The idea of LSB Embedding is simple. It probes into the fact that the degree of precision in various image formats is far more noteworthy than that noticeable by normal human vision. Accordingly the modified image with slight changes in its hues will indistinct from the original by an individual, just by taking a gander at it [4].

IV. SECURITY OF SECRET DATA

In view of abstaining from the increasing intuitions of   eaves droppers, while escaping from the extensive screening of algorithmic detection, the confidential data must be unnoticeable both intuitively and statistically. A highly imperceptible Stego-image should be resulted by the Steganography techniques.

V. PAYLOAD SIZE

Apart from watermarking technique which is intended to integrate only a small amount of confidential information, steganography focuses at hidden communication and hence it generally demands good amount of embedding capacity [5]. Requirements for large payload and secure communication are often clashing. On the grounds of the various application frameworks, a trade-off between payload and security should be met.

VI. ROBUSTNESS

It is prime important to provide robustness to Stego-image due to the image processing techniques like compression, cropping, resizing etc. It means when any of the mentioned techniques are applied on stego image, hidden data must not be impaired completely. There is no technique of steganography which provides all the three properties at a peak level. There is a trade-off between the payload capacity and the robustness to certain attacks, while keeping the perceptual quality of the stego-image satisfactory level.

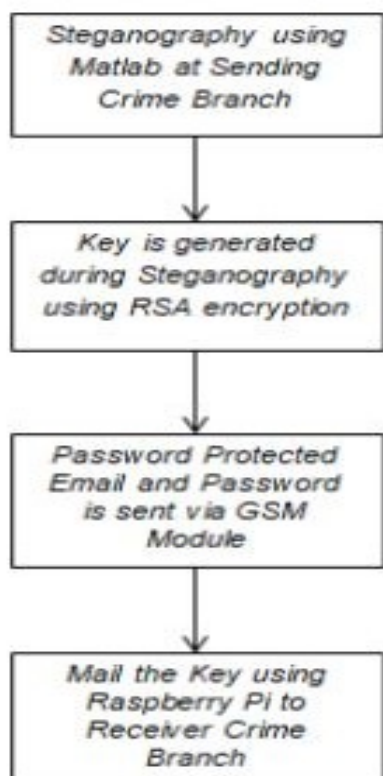## VII. PROCESS FLOW OF PROPOSED ALGORITHM
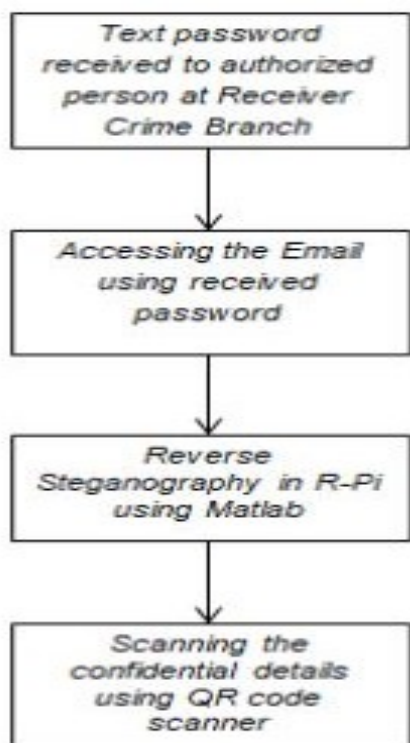
Fig. 1 Transmission process

Fig. 2 Reception process

There are two elements with which information will be transferred by the given process as shown in fig. 1, one is the image and other is the data. The image of a criminal will undergo Steganography process and criminal`s confidential data and other evidence will be transferred using QR code which will be scanned by the receiver upon receiving the data.

Transmission Process:

Step 1: First process is Steganography. A Cover image is selected first, followed by a secret image that is smaller in size compared to the cover image. Then the process of LSB Steganography is performed in MATLAB.

Step 2 : After Steganography is completed, a private key using RSA encryption is generated which is essential in the receiver end without which the inverse Steganography isn't possible.

Step 3: After completion of Steganography and key generation, Email will be sent to the receiver consisting of stego-image and private key as QR barcodes which are protected by passwords.

Step 4: These passwords are sent via text message (SMS) using the GSM module SIM800L.

Extraction Process:

Step 5: On receiving the mail as shown in fig. 2, the user will scan the QR Barcodes to get the secret image and the data related to the secret image.

Step 6: The data is received, but the image received is stego-image which needs to be decrypted using inverse Steganography.

Step 7: The private key generated while Steganography process and transmitted via mail, is used to process the inverse Steganography so as to view the original secret image.

VIII. FUNCTIONAL REQUIREMENTS

Useful necessities are the prerequisites that define specific conduct or capacity of the framework.

- Login: This function will validate the sender if username and password are accurate else it will exit the system.

- Secret Image: This will be the secret criminal image which is to be hidden.

- Cover Image: Cover Image is the image to be selected in which secret criminal image can be hidden.

- Stego Image: Encryption and LSB implementation is performed on cover image to hide secret criminal image by replacing bits of cover image by the bits of criminal image.

- Sender: in this Sender sends this stego image file to the intended receiver to which he does want to establish communication.

- Receiver: The receiver accepts the stego image and with the help of RSA secret key after decryption reconstruction algorithm is applied to retrieve the secret criminal image.

IX. NON-FUNCTIONAL REQUIREMENTS

- Safety Requirements: Sender and Receiver should make sure that only they are having the accurate algorithms to encrypt and decrypt the secret image inside cover image. Sender and Receiver should refrain from eavesdropping.

- Security Requirements: The proposed method scribes an algorithm in which embedding secret image in cover image is discussed. Only sender and receiver should be aware of encrypted files. Users should not unfold the message regarding sent images and also the receiver information.

- Software Quality Attributes: The Quality of the algorithm is supported with crucial security such that only sender and receiver can communicate through image. There is no likelihood of finding a secret image.

A. Hardware requirement

The hardware used in this system is really basic and replaceable. The hardware used in this project is:

1. QR scanner
2. GSM Module- GSM 800L
3. Raspberry Pi 3

B. The Encoding Process
The steganography technique used is LSB coding.

Step 1: The offset of the cover image is recovered from its header.

Step 2: That offset is left as it is to maintain the respectability of the header, and from the following byte, we start our encoding procedure.

Step 3: For embedding, we first take the input cover image which is a RGB image file and then instruct the user towards the selection of the secret Image file for hiding.

Step 4: The secret image file is taken as input and divided in stream of bytes. Now, each bit of these bytes is encoded in the LSB of each cover image pixel.

Step 5: At the end of the encoding process we get the stego-image that contains the encoded secret Image and it is saved, at the specified path given by user, in JPG format using this method. This finishes the embedding process.

C. The Decoding Process

Step 1: The offset of the image is recovered from its header.

Step 2: Allot the user space using the same procedure as in the embedding process.

Step 3: Using LSB method the data of the image is stored into byte array.

Step 4: Using the above byte array, the bit stream of the original output image file is stored into another byte array. And the above byte array is written into the decoded image file, which leads to the original criminal image.

These common weak points of traditional LSB steganography are the sample value changes asymmetrically. The proposed algorithm overcomes this problem as the image is stored as a separated stream of bytes. In this method LSB with pseudo random generator is implemented. The pseudo-random number generator is implemented for this cause and its seed is taken as key of steganography along with RSA key. First of all an array of random numbers, with the length equal to secret bit-stream, is generated using key. By using this array, the number of pixel positions is calculated. Now secret bits are embedded in the LSB of these pixels.

X. RESULTS AND DISCUSSION

A. Open cover image:

This is the image of the Matlab GUI of the developed steganography system. This frame prompts you to upload the

cover image to hide secret criminal image.

B. Open secret image:

This frame prompts you to input the secret image of criminal which is to be hidden inside the cover image and at the same time secret keys using RSA are generated.

Fig. 3 Opening the cover image

C. Steganography:

It is claimed as a one-way function of converting plain image into cipher image or concealing secret image into plain image and it can be reconstructed only with the knowledge of secret keys.
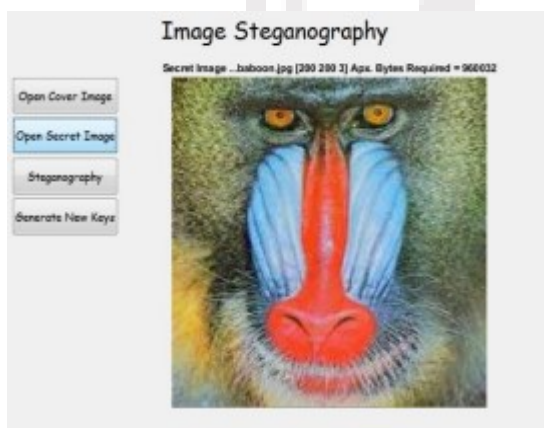

Fig. 4 Opening the secret image

D. Generate new key:

The multifaceted design of finding a private key from a RSA open key closely resembles figuring the modulus n. An aggressor in this manner can't utilize information on a RSA open key to decide a RSA private key except if he can factor n. It is likewise a single direction work going from p q esteems to modulus n is simple yet invert is unimaginable.

On the off chance that both of these two capacities are demonstrated non single direction, at that point RSA will be broken. Indeed, on the off chance that a system for figuring proficiently is grown, at that point RSA will never again be sheltered. The quality of RSA encryption definitely goes down against assaults if the number p and q are not huge primes as well as picked public key e is a modest number. When the key pair has been created, the procedure of encryption and de-coding are generally direct and computationally simple. Strangely, RSA doesn't legitimately work on series of bits as in the event of symmetric key encryption. It works on numbers modulo n. Subsequently, it is important to speak to the plaintext as a progression of numbers not as much as n.

Considering that an eavesdropper intercepts the embedded image and wants to decode it. Obviously he additionally ap-proaches the public key. What he doesn't have is the private key and in different words he should factorize the extremely huge whole number n into the prime components p and q. However, this is troublesome in the current situation with Mathematics: there are no realized calculations to do this in a worthy time.

E. Private Key:

Every recipient has a special unscrambling key, by and large alluded to as his private key. Private and public keys are con-nected numerically; it isn't attainable to figure the private key from the public key. Truth to be told, the savvy some portion of any public key cryptosystem is in structuring a connection between two keys. The Main focal points of this framework are: it gives security to the confidential data without knowing to the unintended receiver, Number of bits been supplanted by client or sender along these lines the unintended receiver can't figure secret key, Normal system client can't figure secret image.
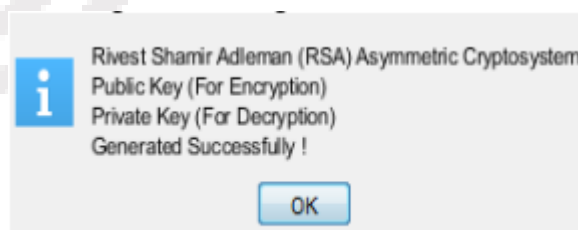

Fig. 5 Generation of secret key

F. The Hardware Platform

Fig. 6 Raspberry Pi 3, GSM Module and QR code scanner

This page is password-protected.
Enter password to continue.

Enter password here

Continue

Fig. 7 Entering the authorized password

Fig. 8 QR Code

Fig. 9 Steganography

Fig. 10 Inverse Steganography

A. MSE: Mean Square Error is one of the measures used to verify the quality of images and measures the difference between the intensities of secret image and extracted image. Mathematically it can be expressed as,

$$MSE = \frac{1}{MN} \sum_{i=1}^{M} \sum_{j=1}^{N} ((f(i,j) - f'(i,j)) * (f(i,j) - f'(i,j)))$$

f(i,j)is the secret image and f'(i,j) is the extracted image. Lower value of MSE is always desired.

B. PSNR: Peak Signal to Noise Ratio is another statistical measure used to evaluate the difference between secret image and extracted image. Mathematically PSNR is,

$$PSNR(dB) = 10\log(\frac{255 * 255}{MSE})$$

Higher value of PSNR is always desired [16].

Table- I: PSNR and MSE values

Cover Image	Secret Image	MSE	PSNR
Lena	Baboon	1.014	50.13
Tom	Jerry	1.106	49.61
Pepper	Cameraman	1.153	47.35
Boy	Moon	1.461	46.03

XII. CONCLUSION

In most of the proposals on Criminal Security Systems it is observed that they offer good amount of security attributes. However, many of them are dependent on costly processors for their execution. A novel data hiding security system is generated named CRSS with the combination of minimal hardware and software to hide the confidential records of criminals which can be used by the Police Department Crime Branch.

The criminal data might be changed for deceiving the police office. The information that can be changed or altered is mostly the kind of wrongdoing performed, which can be changed for lessening the discipline of the guilty party. The proposed framework gives security to criminal information from unapproved access and altering. The same method can be used for different applications like medical imaging security, social media security, protection against internet data tampering and many more. Due to LSB encoding it has high payload capacity with encryption advantages of RSA algorithm which intensify the security attributes.

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AUTHORS PROFILE

Asha Durafe has done her B. E. in Electronics Engineering in 2003. Then she has completed M. Tech. in Electronics Engineering from V.J.T.I. Mumbai in 2011.

Currently she is pursuing Ph.D. in Electronics and Communication Department of Sir Padampat Singhania University, Rajasthan, India. She is also working as Assistant Professor in Electronics Engineering Department of Shah & Anchor Engineering College, Mumbai, India. Her areas of interests are cyber security, Digital Image Processing, Computer Networks, Advanced Networking Technologies and IPR and Patenting.
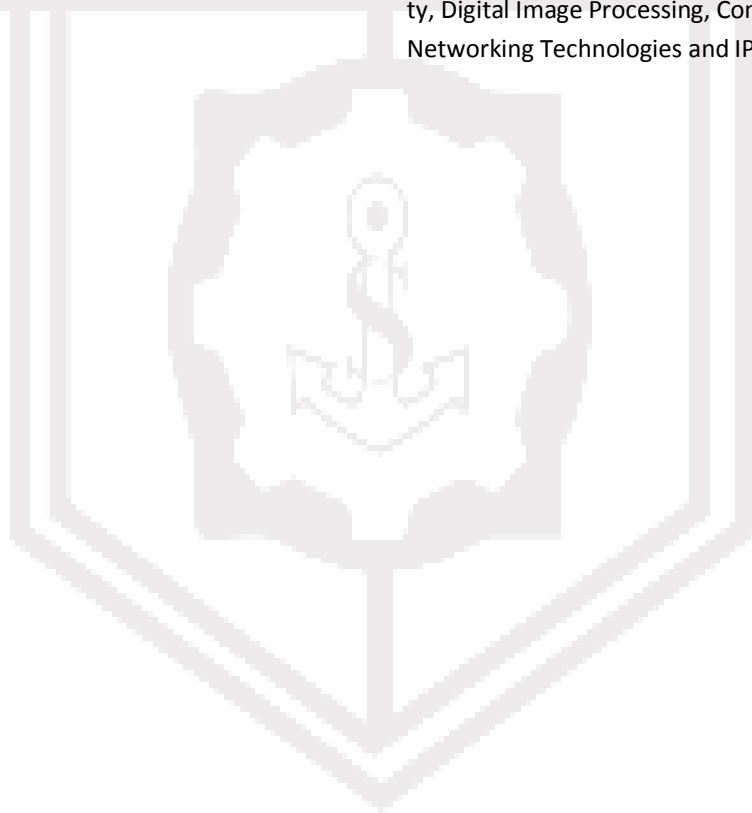
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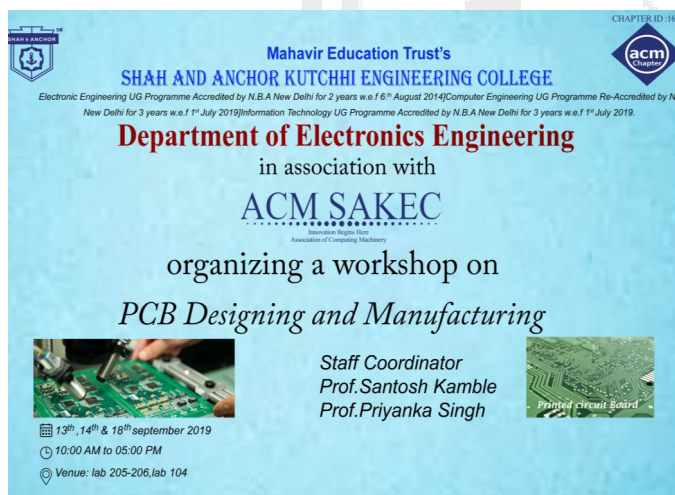
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EVENTS & WORKSHOPS

EVENTS WITH PROFESSIONAL BODIES

1. ACM SAKEC

- Electronics Engineering Department in collaboration with SAKEC ACM Student Chapter, organized "PCB Designing and Manufacturing" workshop that took place on 13th, 14th & 18th September, 2019. It was a three day event and covered various topics related to PCB designing and manufacturing.

- The coordinators of the event were **Prof. Santosh Kamble** and **Prof. Priyanka Singh.**

- This workshop was attended by 59 participants from diploma, second & third year Electronics & Electronics and Telecommunications department of SAKEC. The workshop was also attended by a number of staff members from the Electronics department.

DEPARTMENTAL EVENTS

STTP ON ADVANCED COMMUNICATION TECHNOLOGIES AND SECURITY ASPECTS

- Department of Electronics Engineering has organized an AICTE ISTE approved STTP on **"Advanced Communication Technologies and Security Aspects"** from 1st July to 6th July, 2019. **Mr. Gigi Joseph**, Chief Information Security Officer (CISO), Scientific Officer (H), BARC inaugurated and delivered the keynote address.

- Eminent speakers from the fields of computer networking and security contributed to the event and hands-on training was provided to the participants. The participants actively involved in the lectures and hands-on training.

- **Prof. Babychen Mathew** and **Prof. Rameshwari Mane** were the staff co-ordinators.
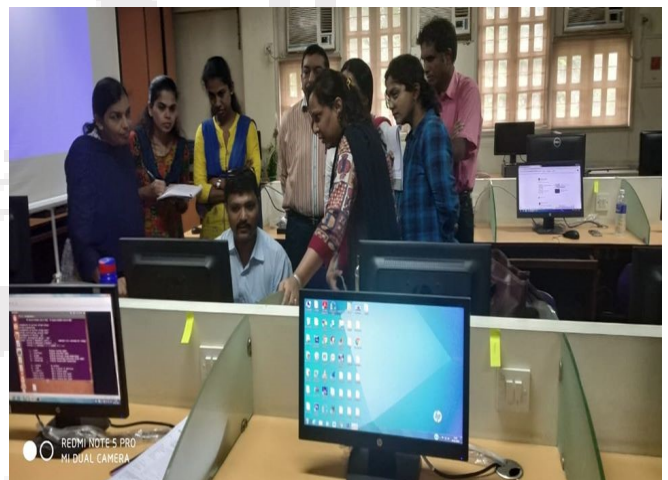
DEPARTMENTAL EVENTS

ORIENTATION PROGRAM FOR INSTRUMENTATION SYSTEM DESIGN

- Department of Electronics Engineering, Shah & Anchor Kutchhi Engineering College conducted an Orientation Program for Instrumentation System Design (ISD)-ELX 701 on behalf of University of Mumbai on Thursday, 11th July, 2019.

- Dr. Deepak V. Bhoir, Member of Board of Studies in Electronics Engineering and Professor, Fr. Conceicao Rodrigues College of Engineering, was the resource person. Orientation program was coordinated by Prof. Prashant G. Khedkar, Dean Academics and Associate Professor SAKEC and Prof. Jayen S. Modi, Assistant Professor, Fr. Conceicao Rodrigues College of Engineering, Mumbai.

- **Prof. Prashant Khedkar** was the staff co-ordinator.

DEPARTMENTAL EVENTS
PLC GUEST LECTURE

- Department of Electronics Engineering conducted a guest lecture on PLC (Programmable logic Controller) and its applications on 27th September, 2019.

- **Prof. Priyanka Singh** was the staff co-ordinator.

- **Prof. Santosh Kamble** was the resource person and 50 students got benifited by this lecture.
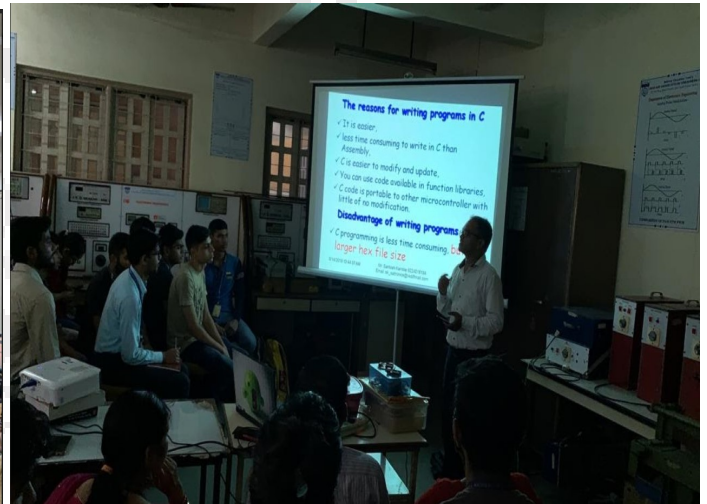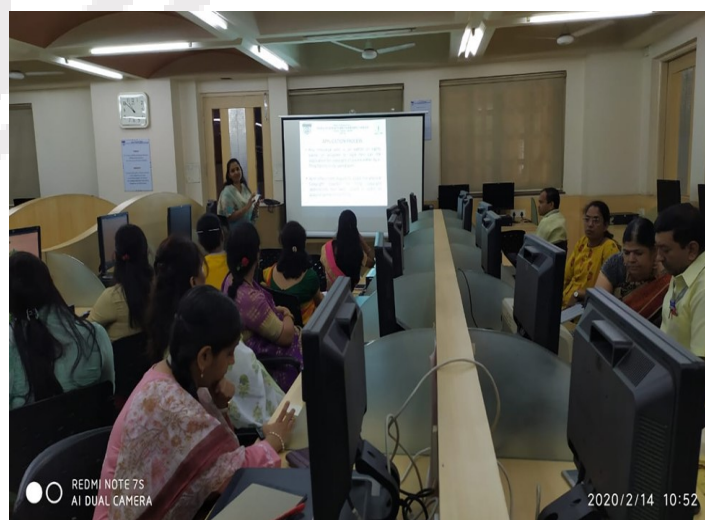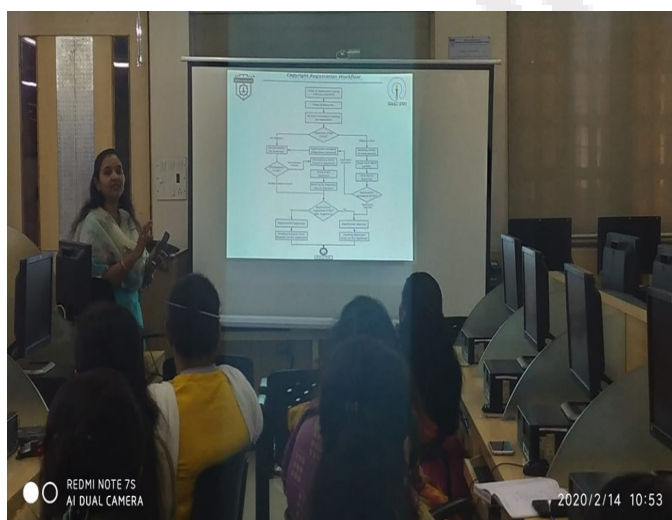
DEPARTMENTAL EVENTS

SEMINAR ON INTELLECTUAL PROPERTY RIGHTS
## (For staff)

- A Seminar on Intellectual Property Right Mentoring Session for Electronics Engineering staff and was conducted by SAKEC IPRC in association with the Electronics Engineering Department on 14th Feb 2020. The session was scheduled at 10:30 am.

- **Prof. Asha Durafe** was the staff co-ordinator and she conducted this session.

- Topics Covered:

1. Workflow of the Copyrights.

2. Discussion of what faculty can copyright? Rules and regulations of copyrighting their work.

3. Creation of username at the Copyright website.

4. Practically assist the faculty to copyright their work.

5. Guide them for the tasks to be performed by them (applicant) after completion of the online copyright application.

6. Discussion on hardcopy submission of copyright and its requirements.

DEPARTMENTAL EVENTS

SEMINAR ON INTELLECTUAL PROPERTY RIGHTS
### (For students)

- A Seminar on Intellectual Property Right Mentoring Session for Electronics Engineering students was conducted by SAKEC IPRC in association with the Electronics Engineering Department on 14th Feb 2020. The session was scheduled at 3:15 pm.

- **Prof. Asha Durafe** was the staff co-ordinator and she conducted this session.

- Topics Covered:

1. Workflow of the Copyrights.

2. Discussion of what faculty can copyright? Rules and regulations of copyrighting their work.

3. Creation of username at the Copyright website.

4. Practically assist the faculty to copyright their work.

5. Guide them for the tasks to be performed by them (applicant) after completion of the online copyright application.

6. Discussion on hardcopy submission of copyright and its requirements.
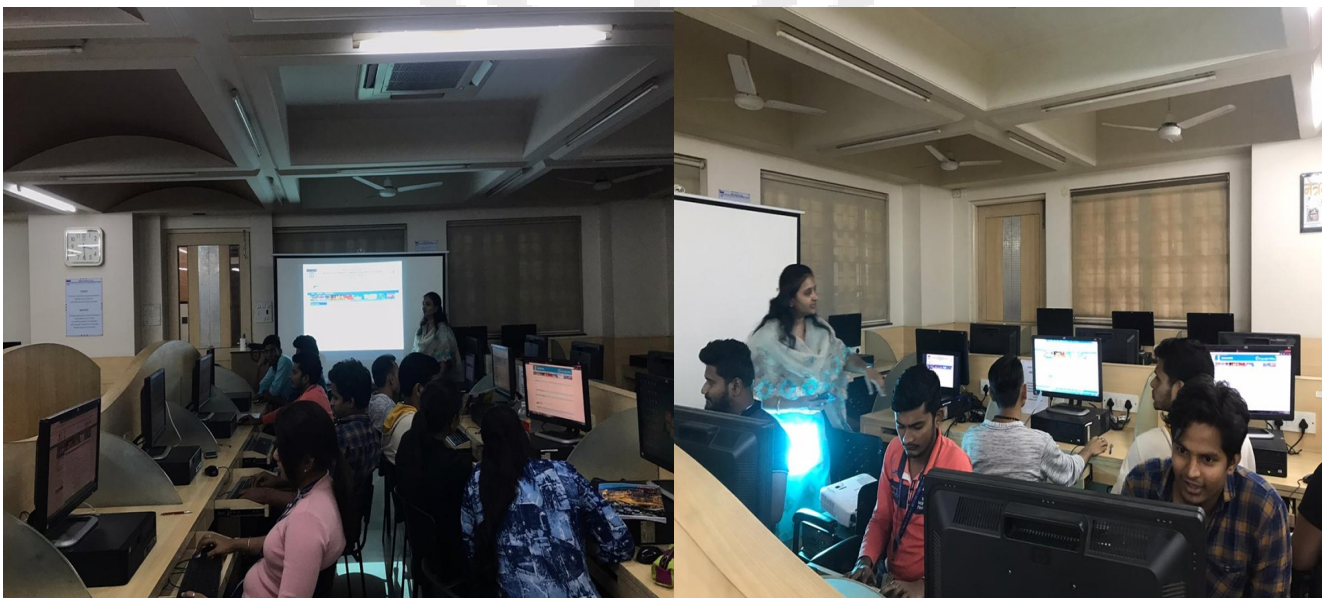
DEPARTMENTAL EVENTS

FDP ON ARDUINO

- Our institute Shah and Anchor Kutchhi Engineering College (SAKEC) Remote Centre of IIT Bombay, hosted A one day Arduino workshop for Teachers, which was conducted by the Teaching Learning Centre (TLC), supported by FOSSEE & Spoken Tutorials on Saturday, 8th February, 2020.

- Total 21 teachers participated in this workshop. Teachers from our institute and other institute participated in large numbers. All participants enjoyed the learning through videos and interaction with the course instructor and project coordinator through videoconference (A-view). There was an overwhelming response from all teachers and feedback received from them is encouraging to SAKEC remote centre team.

- **Prof. Shubhangi Motewar** was the staff co-ordinator.
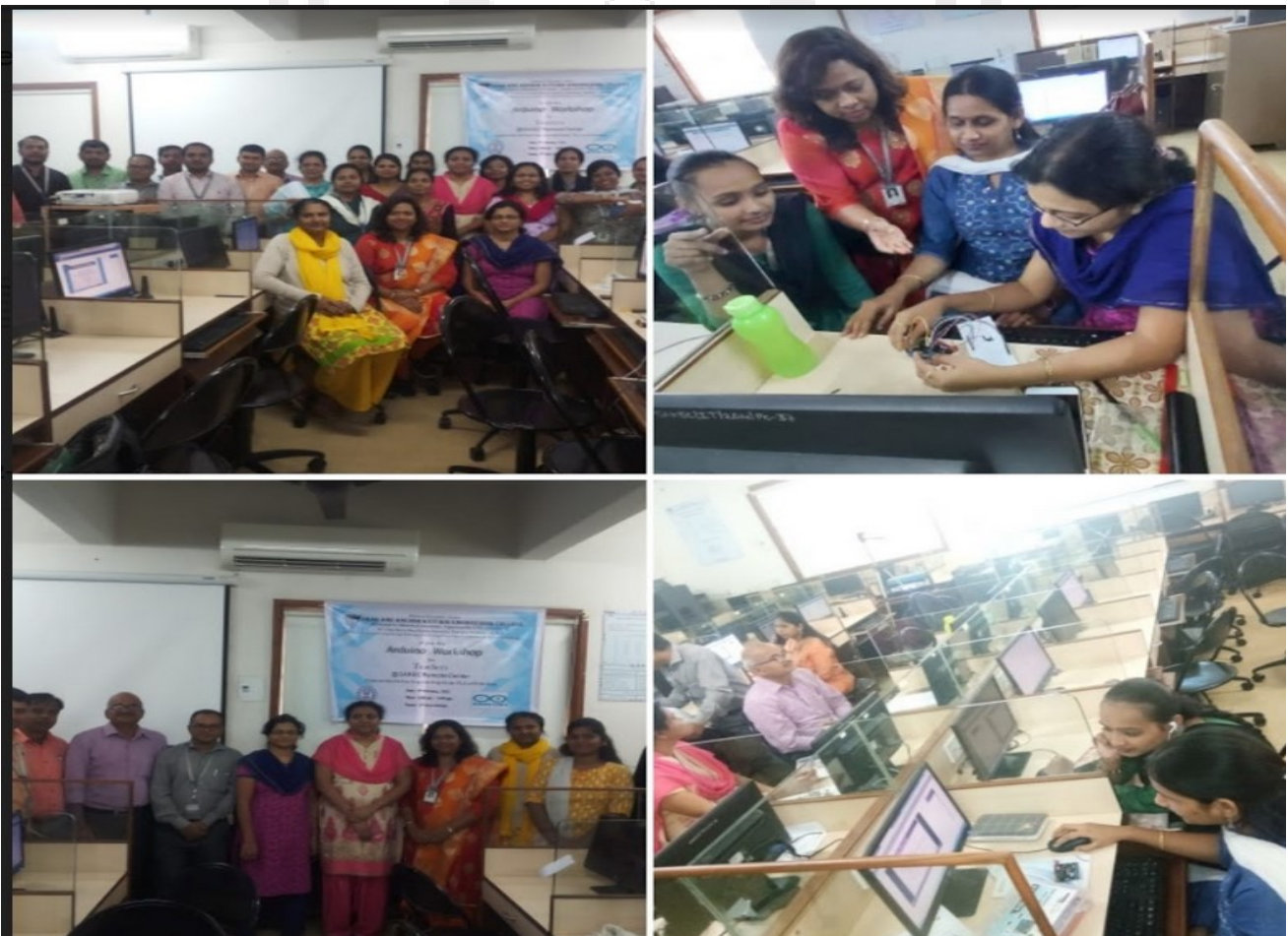
DEPARTMENTAL EVENTS
FDP ON eSIM

- One day eSim workshop for teachers will be conducted on Saturday, 21st September, 2019 at Shah and Anchor Kutchhi Engineering College, Chembur.

- eSim workshop is organized by the Teaching Learning Centre (TLC) at IIT Bombay, funded by Pandit Madan Mohan Malviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD, Govt. of India. This will be a blended training programme that uses A- VIEW for live interactions and Spoken Tutorial to learn eSIM.

- The event staff co-ordinators were **Prof. Sarika Bukkawar** and **Prof. Jayshree Khose**.

DEPARTMENTAL EVENTS
FDP ON GAMIFICATION

- IEEE Bombay section in association with IEEE SAKEC and Department of Electronics Engineering and Electronics & Telecommunication Engineering have organized a faculty development program on "Gamification" by **Dr. Fakhrul Hazman Yusoff**, Faculty of Universiti Teknologi MARA, Malaysia on 16th October, 2019 at 3 PM.

- Around 50 faculties including all departments have participated in the above event. In his session speaker gave information about how we can use gamification for our daily work which will make people more interested and the results of such kind of experiments had been shown through video.

- **Prof. Seema Kawale** was the event co-ordinator.

DEPARTMENTAL EVENTS

INTERNSHIP ON 'DESIGN E-MANIA'

An Exploration in world of Arduino and Raspberry Pi

- Department of Electronics Engineering organized two weeks summer internship from 24th June 2019 to 6th July 2019. **Prof. Shubhangi Motewar** and **Prof. Madhura Pednekar** were co-ordinators and resource persons for this internship.

- 56 students from first year to final year from all branches had registered. In the internship concept of Arduino board, Raspberry Pi board and interfacing of different sensors, Display devices, relays and actuators were taught to all students.

- This internship was completely free to students. All hardware resources were provided by college and complete guidance was given to them. This internship was focused more on hands on practices. So students were divided into different groups and small tasks using sensors, and boards were given.

- All students completed innovative ideas using mini project. To encourage the students and to enlighten their work project exhibition was conducted. Also all participants were gifted with books. In project exhibition first three best project were felicitated with trophies.
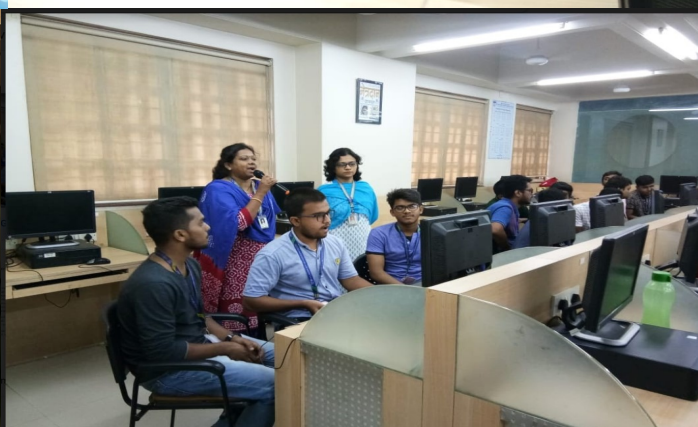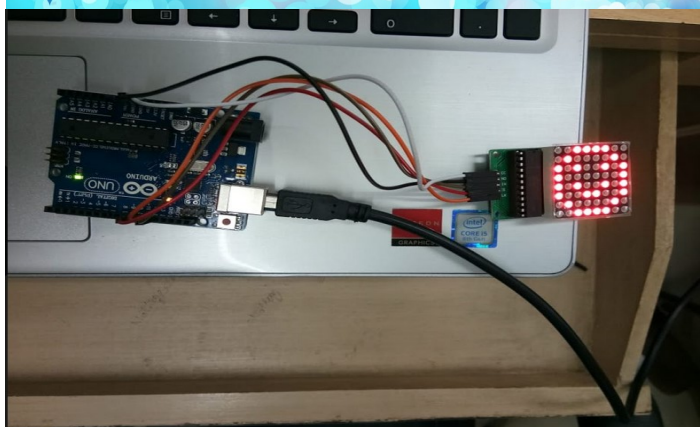
DEPARTMENTAL EVENTS

INTERNSHIP ON

IoT & INTERFACING BOARDS

- In the path of our internship on IoT & Interfacing Boards conducted by Department of Electronics Engineering, SAKEC, we could accord more exposure on Arduino interfacing concept for total 303 students & staff members hands-on practices, training on temperature measurement, ADC, Serial communication, home automation using mobile, PWM with LED, LCD with arduino are demonstrated successfully by **Prof. Santosh Kamble** from Day 1 (20th May, 2020) to Day 7 (27th May, 2020).

- All students made interfacing with Proteus software and attempted quiz daily. Live IoT application of scanning QP code and monitoring temperature humidity at Prof. Santosh Kamble's place was an amazing experience of technology during this COVID-19 lockdown period.

- **Prof. Santosh Kamble** and **Prof. Priyanka singh** were the staff co-ordinators.
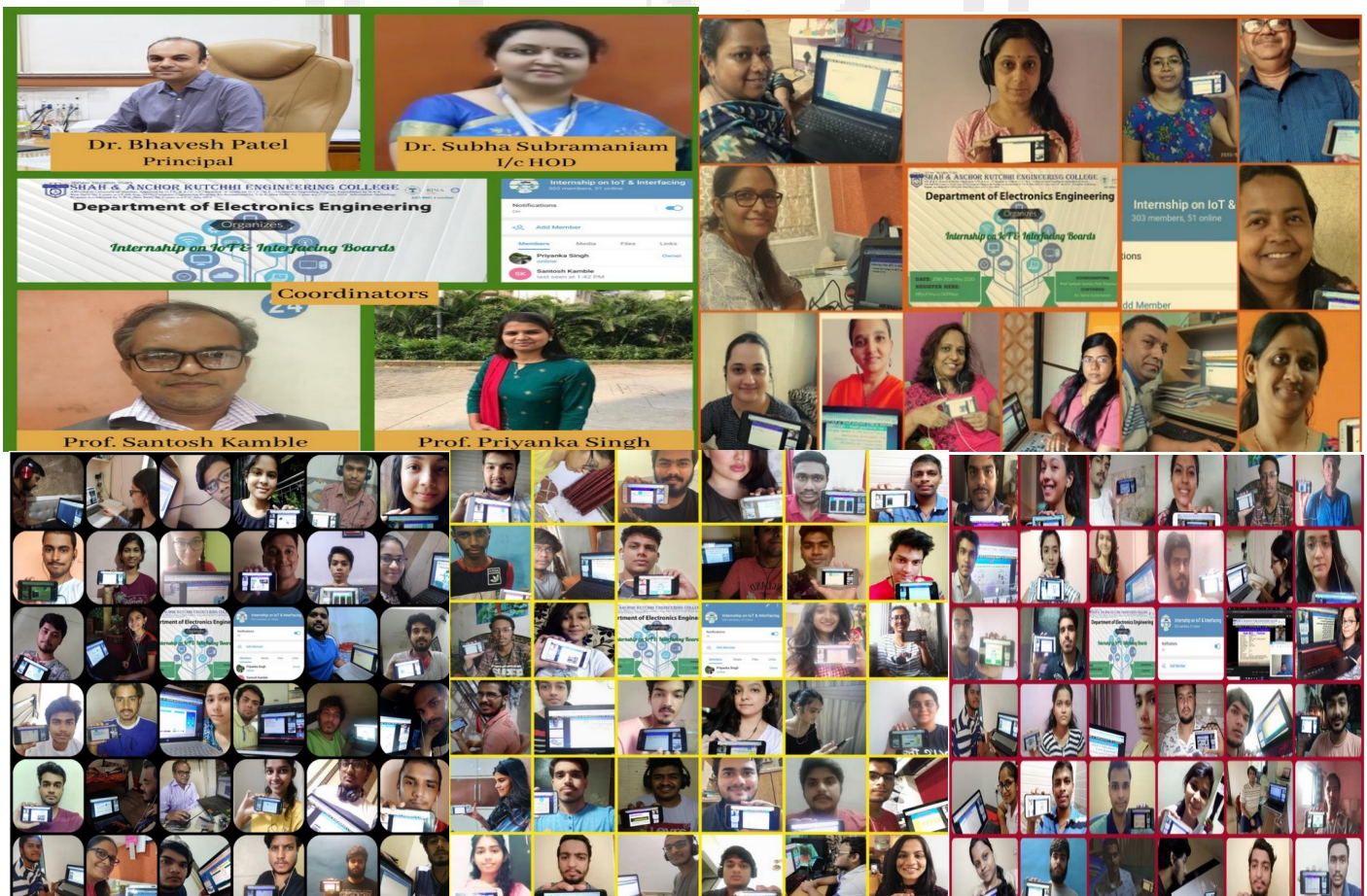
DEPARTMENTAL EVENTS

COUNSELING SESSION FOR SECOND YEAR STUDENTS

- A Counseling Session was held on 5th March 2020, for the Second year students. The session was conducted by the counselor of SAKEC, **Mrs. Hitakshi Joshi**, to help students deal with stress and tensions.

- HOD **Dr. Subha Subramaniam** & Dean Academics **Prof. Prashant Khedkar** were the staff co-ordinators.

DEPARTMENTAL EVENTS

PARENT TEACHER MEETING MARCH 2020

- The Electronics Engineering Department conducted Parent Teacher Meeting on 7th March 2020.

- HOD **Dr. Subha Subramaniam** & Dean Academics **Prof. Prashant Khedkar** were the staff co-ordinators.

- The activities of the department were briefed by Head of the Department, **Dr. Subha Subramaniam**. Coordinators of different bodies within the department also shared details of their activities. Parents were made aware of various activities conducted by different cells such as ISTE,IIC,IEEE. She insisted on importance of attendance of students in order to get good results in examination.

- **Prof. Prashant Khedkar**, Dean academics explained about academic calendar, which helps students and parents in planning activities. He also explained about ISO audit which helps in maintaining highest academic standard.

- **Prof. Vidya Gogate** explained about importance of modern trends in electronics and insisted parents to instruct children for taking active participation in those activities.

- **Prof Nandkishor Narkhede** explained about importance of internal assessment, **Prof. Shubhangi Motewar** explained about projects, **Prof. Asha Durafe** briefed about Patents and IPR cell, **Prof. Nibha Desai** explained about training and placement cell.

- This was followed by distribution of appreciation certificate to all subject and class toppers.

- Parents gave valuable feedback about college and suggested for conducting courses in various software fields which will help students in placement.

DEPARTMENTAL EVENTS

DAB (DEPARTMENT ADVISORY BOARD) MEETING

A meeting of the Department Advisory Board (DAB) of the Department of Electronics Engineering was conducted on 29th February 2020 at 10:00am in the ME (Electronics) classroom at Shah & Anchor Kutchhi Engineering College, Mumbai.

Following members were present for the meeting:

Dr. Bhavesh Patel- Principal
Dr. Vinit Kotak- NBA Coordinator
Dr. Subha Subramaniam- i/c Head of Dept. & Staff Representative
Dr. Ramesh G. Karandikar- Academic Expert
Dr. Bipin Lokhande- Parent Representative
Mr. Mahesh Rao- Industry Representative
Mr. Akshiv Goel- Alumni Member
Prof. Shikha Shrivastava- Staff Representative
Dr. Sushma Srivastava- Staff Representative
Mr. Ankit Manani (TE)- Student Representative
Mr. Jeel Malde (SE)- Student Representative
Prof. Prashant Khedkar- Invitee
Prof. Babychen Mathew- Invitee
Prof. Vidya Gogate- Invitee

The Principal **Dr. Bhavesh Patel** welcomed the gathering and assured the invitees of implementing all the constructive decisions which would be approved in the meeting.

The Head of Department **Dr. Subha Subramaniam** welcomed and introduced the new members.

Prof. Shikha Shrivastava read the minutes of the previous DAB meeting and the same were approved by the members. The progress of implementation of the suggestions of the previous DAB was also discussed.

Dr. Subha Subramaniam gave a brief presentation of the activities and events of the department in the previous academic year. She informed in the meeting that department is trying to achieve maximum efficiency through various technical and non technical activities. She also put light on the actions taken and the progress on previous "To do list" of last DAB. She informed that there is significant increase in student's participation in State/ National level technical events like Hackathon etc. The students have been provided with links to the industries for internships which has benefitted the students. The students are imparted with extra guidance from time to time through remedial lectures as well as individually.

The Department Program Specific outcomes (PSOs) were approved by the members.

The participants started the discussions and came up with the following suggestions:

Dr R.G. Karandikar suggested putting the internship details of each student (linked to the roll list with their email ids) should be there on the website so that the needed information is readily available and can be used when required. He suggested to upload all the permitted data of the department on the college website. All the data tables should be dynamic and necessary permission should be given to the concerned staff for editing. Scholarships based on the CGPA can be given to the students for

motivating the students.

Mr. Mahesh Rao suggested encouraging the participation of students in Hackathon competitions/coding tests etc. He emphasized on conducting more internship to improve the interaction with industry. He advised to upload more photos and videos about the activities held in the department and encourage students to do more practical projects.

Mr. Bipin Lokhande recommended that the students should maintain a strong balance between   projects and academics. He also emphasized on formation of incubators to nurture and motivate the students in taking up projects that can be converted to products. The students should be given training on organic/inorganic scalability of finance/business plans.

Mr.Ankit Manani suggested including sessions on financial planning and business. He proposed free or minimal cost programming sessions for the students and the students to be encouraged for virtual learning.

Mr. Jeel Malde suggested more participation of students in competitions like Hackathon etc.

Prof. Babychen Mathew suggested conducting electronics aptitude test in every semester, to assess the required basic minimum knowledge in the respective semester, until a qualifying score is attained.

The meeting ended with a vote of thanks by Prof. Vidya Gogate.

Report prepared by :- **Prof. Babychen Mathew** and **Dr. Sushma Srivastava**

PROJECTS

IoT BASED PARCEL DROP BOX SYSTEM

IoT Based Parcel Drop Box System

Rohan kadam-Be2-10,kavish jain-Be2-8,kiran lokare-12,

krushankant shinde-Be-2-27

Abstract:

In the modern era, everyone will prefer online shopping followed by delivery of the purchased product. Due to unavailability of the purchaser/customer, collection of the parcel/product becomes difficult. Buying online from any of your favourite websites without the anxiety of missing your deliveries.

In the absence of persons, we propose a solution of IoT based parcel collection unit which will receive the parcel from courier person safely and also provides acknowledgement. This smart system will save time as it avoids rescheduling of the parcel delivery. The automation of system will certainly lead to an easy and safe fulfilment for an online ordering. IoT based parcel box is a feature-rich, scalable and robust hardware platform that provides most dynamic solution i.e. Click and receive parcel.

Process:

- This system is simply connected to your home Wi-Fi.
- In our system we are using camera. The camera provides two view i.e. outer view and inner view.
- Whenever deliver man are come to deliver our parcel he will directly call to customer.

- According to deliver man information customer will verify delivery man through outer view of camera.
- Then customer will open door of drop box.
- Then delivery man put parcel into that drop box. Then again customer will verify our parcel through inner view of camera
- After verifying parcel customer will close door of that drop box.
- The customer also get notification when packages are someone try to dropped off or picked up.
- Our system provides live streaming of all process to customer.
- Our system can give acknowledgement to delivery man through signature after receiving parcel.
- We are design our own app for control this system
- The system is also having a digital lock for manual opening of the box for owner.

App design:

Screen 1
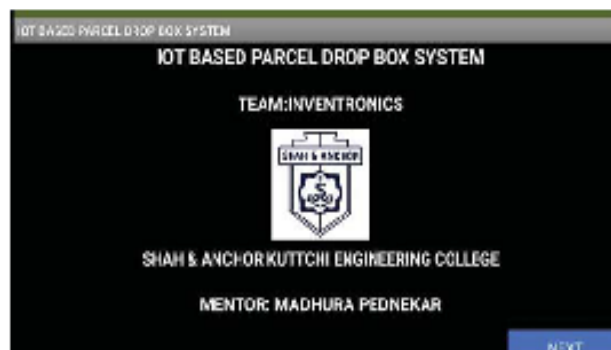
Screen 2
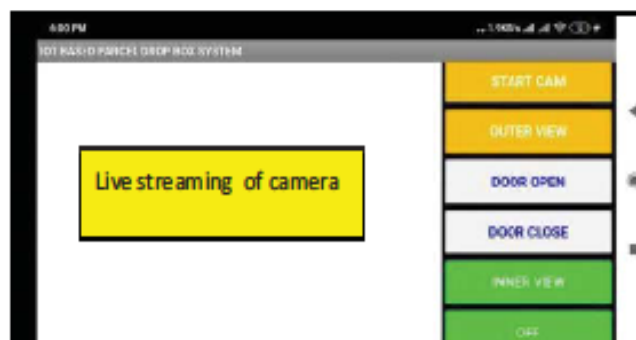
STUDENT ARTICLES

ENERGY GENERATION AND SAVING USING NON-CONVENTIONAL ENERGY SOURCE

Amit Bhosale[1], Aditya Iyer[2], Kunal Jadhav[3], Omkar Karekar[4], Dr. Subha Subramaniam[5], Prof. Santosh Kamble[6]

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Abstract - *Over the past decade, our lives have been more affected and improved by technology than in the entirety of the last century, this is because of vast applications and technologies available today. However the increase in such technologies also means, more energy is required for satisfying this demand. Hence it is essential to generate and use energy in an efficient way. So we have designed a model which will be generating energy using a non-conventional energy source and saving it later. Our model uses solar energy as non-conventional energy source and consists of methods to generate electricity and using it efficiently. With the help of this system, various appliances can be controlled for energy saving.*

*Key Words***: Battery, Microcontroller, Inverter Circuit, Sensors, Solar Energy, Timer.**

1. INTRODUCTION

As new technologies are being developed rapidly, the use both renewable and non-conventional sources of energy such as solar energy is gaining large amount of popularity. The reason being green energy is more efficient and safer than any other usable power sources.

This is the reason which makes solar energy so eco-friendly, and besides that it will save you lots of money. Solar power is a sustainable source of 100 percent renewable energy. As we make continuous progress more and more plant and animal species are expected to be lost in the coming years. Solar energy, by comparison, generates no emissions. The sun provides a large supply of energy that is not at all harmful to the ozone layer and cannot destroy it in any possible way. We have to reduce our reliance on oil, coal, and natural gas for the purpose of producing electricity. As we know emissions from such fossil fuels are very harmful and toxic in nature. This might affect the quality of air, water and soil and become a root cause for global warming.

We aim to implement a system which will produce electricity from solar energy by using a solar panel. This will make the system independent of other energy sources and in turn reduce the electricity bills. Energy saving will be done using timer and sensor. Sensors are used to identify a single person's presence; the lights will glow till the sensor senses human presence. The timer is used to turn on and off the fans for a specified period of time, saving about 50 percent of the energy used as opposed to the actual energy.

2. LITERATURE SURVEY

There are some systems available, wherein people have tried to implement a similar kind of system they are as follows:

ln[1] Keskar Vinaya N. created a system for electricity generation using solar panel. This project consists of energy generation using solar tracking system. A LDR was used as a sensor for detecting intensity of light. Maximum intensity of light was obtained using motor to rotate solar panels. Battery was charged in day time using charging unit. Microcontroller was used to control entire operation. A relay was used for the output circuit of the system.

ln[2] Mohd Rizwan Sirajuddin Shaikh, Santosh B. Waghmare, Suvarna Shankar Labade, Pooja Vittal Fuke, Anil Tekale in a review paper analyzed Sunlight Solar Energy and explored its future developments and aspects. The article also gave a brief about different forms of solar panels. It also discussed the different applications and approaches available so as to promote the use of solar energy. The working of the solar panels was also described.

ln[3] Mr.Deshmukh P.R. and Mr.Kolkure V.S. used PSoC (Programmable System on Chip) microcontroller and

S T U D E N T A R T I C L E S

photovoltaic technology for generating and saving it. Wherein PSoC microcontroller act as Maximum Power Point Tracking controller and also reduces additional circuit requirements by controlling both the analog as well as digital circuits. This system also focuses on matching the impedance of Photovoltaic system by making adjustments in response to the changes in the climatic conditions.

3. OVERVIEW OF PROPOSED SYSTEM

Problem statement

 To develop a system for Energy Generation and saving, that uses non-conventional energy i.e. solar energy. The system will consist of self-developed microcontroller circuit to control entire operation of the system thereby reducing the manufacturing cost. Energy saving will be done using timer and sensor.

Hardware Requirements

- ATMEGA328 microcontroller IC.
- Solar panel.
- Passive Infrared Sensor.
- CD 4047 for Inverter Circuit.
- Relay Module.
- 16*4 LCD.
- MOSFET INR547

Software Requirements

- Arduino IDE for programming.
- Proteus Software for circuit Designing and Express PCB for PCB designing.
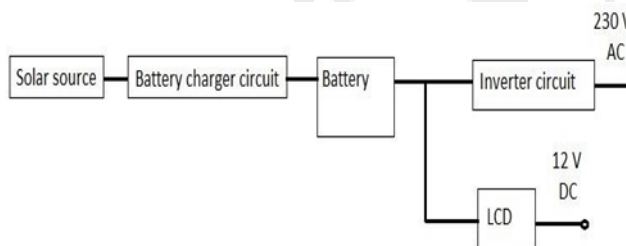
Design Details

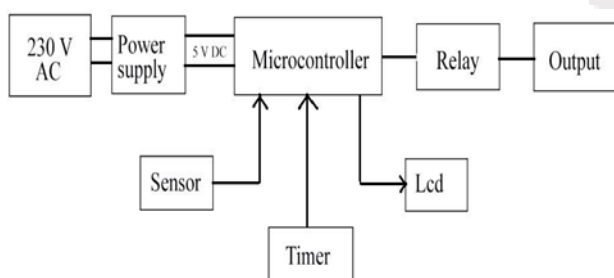**Fig 1.1** *Block Diagram of Generator Circuit*

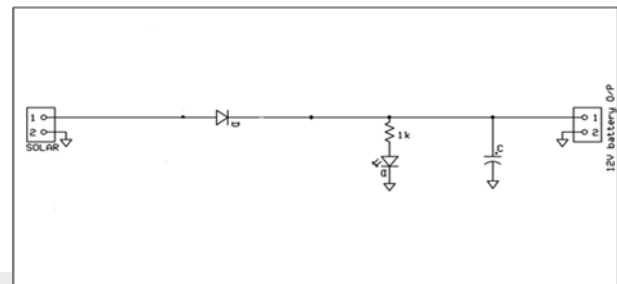**Fig 1.2** *Block Diagram of Saver Circuit*
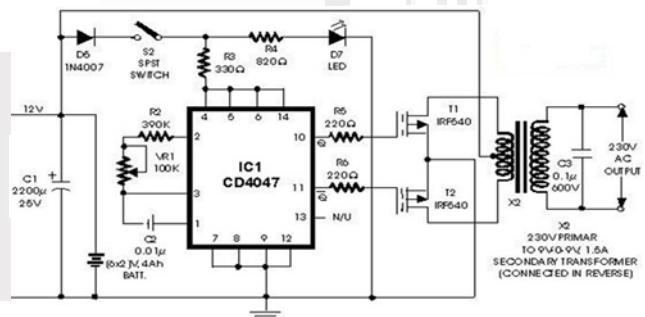

Fig 1.3 *Battery Charging Circuit*


Fig 1.4 *Inverter Circuit*

4. WORKING

 Power generation will be done by using the energy generator unit as shown in Fig 1.1 with solar energy being the source. We are going to save energy by using energy saving unit as shown in Fig 1.2 which consist of timer and sensor. The output of the solar panel is in DC which can be converted into AC by using inverter. The dc output (12v) will be stored in the battery using battery charging circuit as shown in Fig 1.3. While connecting the solar panel to the battery the negative terminals of battery and solar panel will be connected normally, for the positive terminal there will be an additional diode connected between the battery and the solar panel to prevent the reverse flow of current. An indicator is used here to check if the battery is charging. The dc output from the battery can be connected to dc load if required for application. We need to connect AC load for our application, so we use an inerter which will give us 230v AC.

 The inverter circuit as shown in Fig 1.4 consists of a center tapped step-up transformer, IC CD4047. The primary side of the transformer will have 12-0-12 v input from the battery. Output on the secondary side of the transformer will be 230V AC. On the primary side of the transformer there are two switches on either side of the battery forming two loops. When switch S1 in loop1 is closed the current will flow in anticlockwise direction, the voltage formed in the second loop will be due the mutual inductance. We get a negative half cycle of 230V on the secondary side. After some time the S1 is open and the S2 in

S T U D E N T   A R T I C L E S

loop2 is closed, the current in the second loop will flow in clockwise direction. Voltage formed in loop1 will be due to mutual inductance. We will get a positive half cycle of 230V on the secondary side of the transformer. As the polarity is changing it is alternating, so it is an AC output. These switching cannot be done manually, so we use electronic switches. There are two types of switches transistors and FET. Transistors are current operating device whereas FET are voltage operating device. For our application we will use FET, its input impedance is infinite and output impedance is low as it has proper isolation. As we need alternate output we will use flip-flop circuit, this flip-flop will be connected to those switches we discussed earlier. As they are n-channel they will be active high. CD4047 is a normal T flip-flop but it has free running clock, for giving a clock to cd4047 we need to connect a resistor and a capacitor. It has a frequency of 50HZ.

5. FLOWCHART
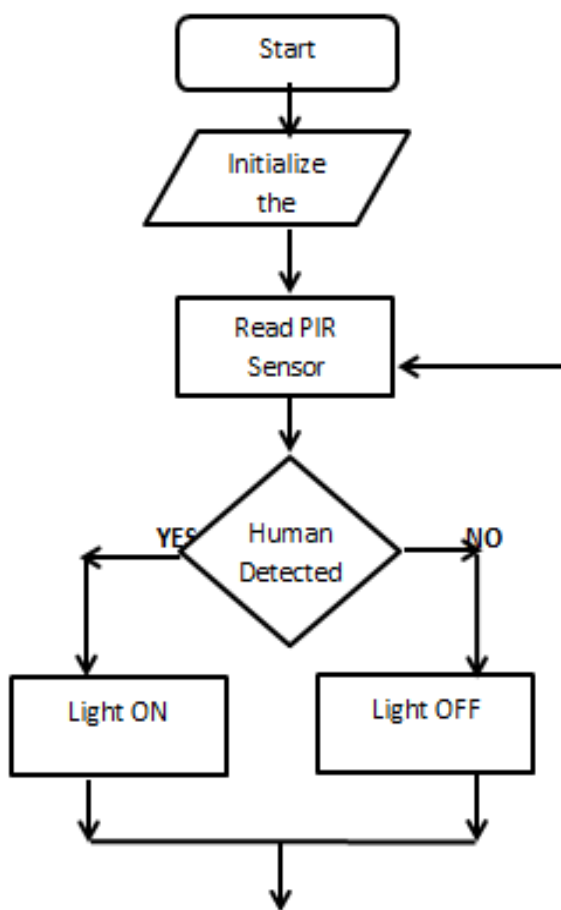
6. ADVANTAGES

- Reduction in manufacturing cost.
- Independent of other energy source other than solar energy.
- Highly useful for energy generation in remote location.
- After implementation maintenance of this system is very low.

- This type of system can be used in various applications such as street light control to save energy.

8. CONCLUSION

In this project work, we were able to develop a control system which is smart and energy efficient. Our system provides an innovative technology that provides a way to utilization of energy in efficient way so as to reduce the energy usage and helps to reduce ones bill. A more intelligent system is required to be embedded for monitoring and controlling the power resources as per the requirement, providing a user friendly environment. It includes a feedback system. Unlike traditional system, wherein there is no feedback to specify when and how much energy is required. In this thesis work, we have designed an Energy Saver using PIR sensor which senses the present situation, as soon as it detects a human being it transmits the information to the Micro controller regarding the current status. It takes an intelligent decision to control the corresponding devices of the room which it is mounted in. If the sensor does not sense a presence of a human it will take a decision to turn OFF. We have also used a timer circuit, which is programed to run for a certain time and then turn off for some time. This will save up to 50% of the energy. We used solar panel in order to generate power which can be used in household appliances.

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3. [3] Mr. Deshmukh P.R. and Mr. Kolkure V.S. "Self-Electricity Generation and Energy Saving By Solar Using Programmable System on Chip (PSOC)", Vol. 4 Issue 2 , 2014, The International Journal of Engineering And Science (IJES), ISSN: 2319 – 1813
4. "Op-Amp & L. I. C." By R. A. Gayakwad.

DIGITAL IMAGE FORGERY DETECTION

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Abstract - Digital images are the foremost important source of information. The availability of powerful image processing software's make it relatively easy to make further as manipulate and make digital image forgery of 1 or multiple images. In today's world it's easy to develop image forgery by adding or removing some element from the image which ends in image tampering. A copy-move is made by copying and pasting content within the identical image, and post operating it. The detection of copy-move forgeries has become one in all the foremost actively researched topics in image forensics .The key objective of the proposed method is to review the effect of various styles of tampering on the digital image, detect image forgery by copy-move method under many varieties of attacks by combining block-based and feature-based method and accurately locating the duplicated region.

1. INTRODUCTION

One of the main purpose of image forgery is to conceal an object in the image. Normally the simplest way is to copy another portion of the image and paste it over the object to be concealed such that it blends with the remaining part of the image and leaves no clue of tampering. To cover up any traces of forgery, retouching may be done at the periphery of the pasted object. An example of this kind is shown in figure 1.1.

Figure 1.1 : A truck in the original (left) is removed by covering with surrounding foliage

The second purpose may be to replicate some object in an image. Then, a copy of the desired object in the image is made and pasted at one or more appropriate locations in the image. Once again, to cover up any traces of forgery, retouching may be done at the periphery of the pasted object. An example of this kind is as shown in the figure1.2.

Figure 1.2: A boat with a yellow-orange hoist in the original (left) is replicated

There can also be a situation when an object from another image is copied and pasted at multiple locations in the forged image. The Copy-Move forgery described above introduces a correlation between the original image object and the pasted one. This correlation can be used as a basis for a successful detection of this type of forgery. Because of the possibility of retouching and saving of the image in a lossy compressed format like JPEG, the two objects may match only approximately and not exactly. In this paper, a strategy that can efficiently detect and localize duplicated regions in an image is developed from the simplest and seemingly obvious techniques.

2. Overview of Proposed Algorithm

2.1 Block Match A good method for detecting copy-move forgery is to verify if a set of blocks of pixels in a region of the image matches with another in a different region of the image. That is, the image is divided into n non-overlapping blocks, and each block is compared with the remaining ones. But, selecting the size of the block is difficult. If the size of the block is larger than the forged area, an exact match of the blocks does not result. If the size of block is smaller, the forged area may cross the boundaries of adjacent blocks and then also exact matches would not result. If the size of the block size is made very small, the matching process becomes computationally intensive, particularly with large images. Also uniform areas in the original image will be shown as duplicates. This kind of block matching can be termed as non-overlapped block matching.

1. Grayscale conversion: If the given image is a colour image, convert it in to grayscale.

2. Forming overlapped blocks: Divide the grayscale image into overlapped blocks of size (bxb).

3. Extracting features: For each of the (M-b+1)*(N-b+1) blocks, extract the features. Here, pixel values are the features. Store the extracted features of each block as rows of a matrix.

4. Lexicographic sorting: Sort the matrix in ascending order.

5. Matching process: Search successive identical rows and get the respective block positions.

Figure 3.2: Original image(left), Forged image(middle), Result of exact match algorithm with a block size of 3 × 3

It is observed that the Exact Match algorithm can detect plain Copy-Move forgeries but produces many false matches in re-touched forgeries.

3. Implementation Details

The Exact Match algorithm was implemented using MATLAB software. Eighty images obtained from various sources were used for testing the algorithm. Color images were converted into grayscale. Images were resized to 128x128 pixels. Blocks of size of 8x8 pixels were considered. Duplicate regions found by matching blocks found in the forged image 1.1. are shown in the figure 1.2.

Figure 3.1: Copied and pasted regions in the forged images image 1.1

Discontinuities in the detected regions may be due to some retouching operation done after the forgery. But, if the forged image had been saved as JPEG, many of identical blocks would have disappeared because the match would become only approximate and not exact. Figure 1.3 shows a forgery that could not be detected with a block size of 8x8 as retouching has been done after forgery. However when the block size was reduced to 3x3, some blocks are shown as forged but many are false matches.

4. Robust Match

The best alternative to detect copy-move forgery is Robust Match where instead of matching the pixel representation of blocks, their robust representations are matched. One of the robust representations is the quantized DCT (Discrete Cosine Transform) coefficients. The advantage of DCT is that the signal energy would be concentrated on the first few coefficients, while most other coefficients are negligibly small. Therefore, the changes in high frequencies, which would occur due to the operations such as noise addition, compression, and retouching, do not affect these first coefficients greatly.

4.1. Discrete Cosine Transform (DCT)

Discrete Cosine Transform expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies and it is a Fourier-related transform similar to the Discrete Fourier Transform (DFT), but using only real numbers. DCT finds numerous applications in signal processing where small high-frequency components can be discarded. Lossy compression techniques like MP3 and JPEG utilize DCTs. The most common variant of Discrete Cosine Transform are the Type-II and Type-III which are popularly called the DCT and the Inverse DCT respectively. In image processing, transform coding relies on the premise hat pixels in an image exhibit a certain level of correlation with their neighboring pixels. Therefore transformation is defined to map this spatial (correlated) data into transformed (uncorrelated) coefficients and DCT attempts to decorrelate the image data. DCT represents an image as a sum of sinusoids of varying magnitudes and frequencies.

DCT is often used in image processing because of its strong energy compaction property and decorrelation property. Decorrelation is the removal of redundancy between neighboring pixels. This leads to uncorrelated transform coefficients, which can be encoded independently. Energy compaction property is the ability to pack input data into as few coefficients as possible. For a typical image, most of the visually significant information about the image is concentrated in just a few coefficients of the DCT.

For an 8x8 matrix, the 64 basis functions are shown in the Figure 1.5. Horizontal frequencies increase from left to right, and vertical frequencies increase from top to bottom. The constant-valued basis function at the upper-left i.e. the first transform coefficient, is the average of the sample sequence. In the literature, this value is referred to as the DC Coefficient. All other transform coefficients are called the AC Coefficients
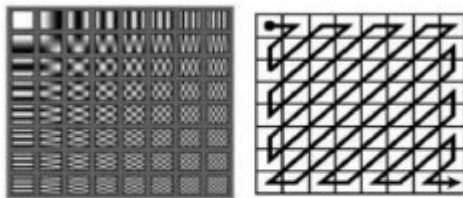

Figure 4.1 : DCT Basis Function

For the detection of forgery, good features of image blocks are needed to compare and match. Most of the visually significant information is concentrated in just a few coefficients of the DCT. Hence DCT coefficients of the blocks are used as features of blocks. To get better quality features, the DCT coefficients are quantized.

4.2. Quantization and Quality Factor (Q)

Human eye is good at seeing small differences in brightness over a relatively large area, but not so good at distinguishing the exact strength of a high frequency brightness variation. This allows one to greatly reduce the amount of information in the high frequency components. This is done by dividing each component in the frequency domain by a constant for that component, and then rounding to the nearest integer. This rounding operation is the Quantization. Quantization

enables the user to decide quality levels (Quality Factor), which determines the quantization steps for DCT transform coefficients. Quality Factor ranges from 1 to 100, where 1 gives the poorest image quality and highest compression, while 100 gives the best quality and lowest compression. For higher quality i.e. quality level greater than 50 (less compres-

sion, higher image quality), the standard quantization matrix is multiplied by ((100-quality level)/50). . For quality level less than 50 (more compression, lower image quality), the standard quantization matrix is multiplied by (50/quality level). The standard quantization matrix is the JPEG quantization matrix with quality level of 50 (Q50) and is shown below:

$$Q_{50} = \begin{bmatrix} 16 & 11 & 10 & 16 & 24 & 40 & 51 & 61 \\ 12 & 12 & 14 & 19 & 26 & 58 & 60 & 55 \\ 14 & 13 & 16 & 24 & 40 & 57 & 69 & 56 \\ 14 & 17 & 22 & 29 & 51 & 87 & 80 & 62 \\ 18 & 22 & 37 & 56 & 68 & 109 & 103 & 77 \\ 24 & 35 & 55 & 64 & 81 & 104 & 113 & 92 \\ 49 & 64 & 78 & 87 & 103 & 121 & 120 & 101 \\ 72 & 92 & 95 & 98 & 112 & 100 & 103 & 99 \end{bmatrix}$$

Forgery detection needs good quality rather than good compression. Hence quality level greater than 50 is used. For example, for quality level 75 (Q75) the standard quantization matrix is multiplied by ((100-quality level)/50) = ((100-75)/50) = 0.5 and then rounding to the nearest integer. Q75 is given below:

$$Q_{75} = \begin{bmatrix} 8 & 6 & 5 & 8 & 13 & 20 & 26 & 31 \\ 6 & 6 & 7 & 10 & 13 & 29 & 30 & 28 \\ 7 & 7 & 8 & 12 & 20 & 29 & 35 & 28 \\ 7 & 9 & 11 & 15 & 26 & 44 & 40 & 31 \\ 9 & 11 & 10 & 28 & 34 & 55 & 52 & 39 \\ 12 & 18 & 28 & 34 & 55 & 52 & 57 & 46 \\ 25 & 32 & 39 & 44 & 52 & 61 & 60 & 51 \\ 36 & 46 & 48 & 49 & 56 & 50 & 52 & 50 \end{bmatrix}$$

For a better match, block size is taken as 8x8. To quantize the DCT coefficients of 8x8 block, standard JPEG quantization matrix was used. During forgery detection, the quantization steps are calculated from a user-specified parameter Q which determines the quantization steps for DCT transform coefficients. Higher the value of the Q-factor finer will be the quantization and blocks matching will be more accurate. Lower the value of the Q coarser will be quantization. This may result in more matching blocks and some of them may be false matches also. Another important point to consider is that when an object in an image is copied to another region, a number of blocks are duplicated and the distance between every original and duplicated block pair would be the same. Therefore decision of forgery can be made only if there are more than a certain number of duplicated image blocks with the same distance and these blocks are connected to each other. Hence, a matching pair is considered if there are many matching pairs in the same mutual positions, that is, if they have the same shift vector. This will avoid many false matches. For this purpose, if two consecutive rows of the sorted matrix A are found matching, the positions of these matching blocks are stored in a separate list and a counter C is incremented.

$$Q_{16} = \begin{pmatrix} Q'_8 & 2.5 q_{18} I \\ 2.5 q_{81} I & 2.5 q_{88} I \end{pmatrix}$$

.............................(3.6)

$$\text{where} \quad Q'_8 = \begin{pmatrix} 2q_{00} & 2.5 q_{12} & \dots & 2.5 q_{18} \\ 2.5 q_{21} & 2.5 q_{22} & \dots & 2.5 q_{28} \\ \vdots & \vdots & \vdots & \vdots \\ 2.5 q_{81} & 2.5 q_{82} & \dots & 2.5 q_{88} \end{pmatrix}$$

(i1, i2) and (j1, j2) are the positions of two matching blocks, the shift vector between the two matching blocks is calculated as s = (s1, s2) = (i1 − j1, i2 − j2) where i1>j1 and i2>j2. At the end, the counter C indicates the frequencies with which different shift vectors occur. Then the shift vectors s1, s2, …, sK, whose occurrence exceeds a userspecified threshold T that is C(sr) > T for r = 1, …, K, are determined. For all such shift vectors, the matching blocks that contributed are identified as segments that might have been copied and moved. The value of threshold T is also important. If it is large, some matching regions may be missed. If it is small, it may lead to many false matches. The steps in the Exact Match algorithm are as follows:

1. Grayscale conversion: If the given image is a colour image, convert it in to grayscale.

2. Forming blocks: Divide the grayscale image is into overlapped blocks of size (bxb).

3. Extracting features: For each of the (M-b+1)*(N-b+1) blocks, compute the DCT coefficients as the features. Quantize the resulting block by dividing the DCT coefficients block element-wise, by the appropriate quantization matrix, with quality factor Q and round each resultant element.

4. Store the quantized coefficients for the blocks as the rows of a matrix. Also store the co-ordinates of the top-left corner pixel (x,y) as the location of the block. Then the matrix will have (M-b+1)*(N-b+1) rows and (bxb)+2 columns. The last two columns are the block location coordinates x and y.

5. Lexicographic sorting: Sort the matrix in ascending order

6. Matching process: Search for consecutive identical rows and if there is a match store the positions of both the blocks in a separate list.

7. Compute the shift vectors: Compute shift vectors for every pair of matching blocks using equation: s = (s1, s2) = |(i1 - j1, i2 - j2)| and set the value of a shift vector counter c(s1,s2) to 1. If the shift vector value is a repetition, increment its counter

value by 1.

8. Mark the Blocks: Find all shift vectors whose counter values exceed a user specified threshold value T. Mark all these blocks with some colour to indicate duplication. If there are no such shift vectors, declare that the image is not tampered.

5. Implementation details

The Robust Match algorithm was implemented using MATLAB software. Twenty images obtained from various sources were used for testing the algorithm. Color images were converted into grayscale. Images were resized to 128x128 pixels. Blocks of size of 8x8 pixels were considered. Results of forgery detection of the image shown in the Figure 1.1 using Exact Match and Robust Match methods are shown in Figure 1.6 for comparison. The results are better in the Robust Match method.

Figure 5.1 : Results of forgery detection of image in the figure 1.1: Exact Match (left) and Robust Match (Right)

Result of forgery detection using the exact match technique on the image in figure 1.2 is shown in the figure 5.2.

Figure 5.2: Forgery detected in the image of figure 1.2 – Copied and pasted regions are coloured in pink

Figure 5.3 shows a forgery that could not be detected by the Exact Match technique.

Figure 5.3: Forgery detected by the Robust Match Method

5.1 Modified Robust Match Technique

This method is same as the method discussed in section 4.2 in which quantized coefficients of DCT of blocks are used as block features. Here the length of the feature of the blocks is reduced which reduces the execution time without affecting the quality of the result. Reduction in the length of the feature ector is possible, because, when the quantization of DCT coefficients of the blocks is done, there are many long run zeros. These are high frequency DCT coefficients, which do not contribute to the quality of the image and hence can be omitted. The quantized DCT coefficients are read in zigzag order, as shown in Figure 4.1 and only quantized low frequency coefficients are taken. The algorithm for this modified Robust Match Technique is the same but for the step 4 in which selected the features are read in zigzag order as shown and first n features are considered. 120 values are considered for a block size of 16x16 and 45 values are considered for a block size of 8x8 which are stored in the matrix for further processing. This algorithm is equally efficient as Robust Match algorithm as for as the detection of forgery is considered but the execution is reduced. The average reduction in execution time is observed to be about 24%.

6. Performance Measures

The performance evaluation of a forgery detection algorithm can be done at two levels: at image level, where the focus is on the ability to detect if there is a forgery and at pixel level, where the accuracy of detecting the tampered regions .In this work only image level evaluation is done. At Image level, the important parameters are: TP-True Positive - the number of correctly detected forged images, FP - False Positive - the number of images that have been falsely detected as forged, and

FN-False Negative - the number of falsely missed forged images. The following metrics are used to analyze the performance of the algorithm:

Precision: Probability that a detected forgery is truly a forgery, computed as:

$$P= T_p/(T_p+F_p). \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(i)$$

Recall: Probability that a forged image is detected, computed as:

$$R= T_p/(T_p+F_n). \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(ii)$$

This is also called True Positive Rate.

Score: This combines both Precision and Recall in a single value. It is computed as:

$$F=2*(P*R/P+R). \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(iii)$$

In this work, a total of 40 images are considered out of which 15 were forged 25 were not forged. The performance parameters are given in the Table 1.1.a

7. Conclusion

Copy-Move forgery is a widely committed forgery. In this paper, the concept of block based forgery detection algorithms which are efficient in detecting Copy-Move forgery was developed. Analysis and implementation details

Method	T_P	F_P	F_N	Precision	Recall	Score
Exact Match	50	0	100	100.00	33.33	49.62
Robust Match	110	20	40	84.61	73.33	78.56
Modified Robust Match	110	20	40	84.61	73.33	78.56

of two methods namely Exact Match and Robust Match were presented. Robust Match method yields a better result than the exact match. An improvement over the Robust Match is made by reducing the number of features which results in the reduction of execution time without compromising its ability to detect forgery.

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Steganography for Public Security

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Abstract - As technology is stepping up the ladder with each day, we need to find ways to transfer crucial data from one point to another in a secure manner. With the evolution of internet, it has become inevitable to store information in an electronic format. Our daily work is highly dependent on transmitting data over a network. Security of this information has become a major concern. To prevent unauthorized access of digital information, numerous data sharing techniques have been introduced. Cryptography and steganography are the most widely used techniques for securing the transmitted data.

Keywords – Steganography, Image, Cryptography, RSA Algorithm

I. INTRODUCTION

Steganography is obtained from the Greek word 'Steganos' meaning concealed or hidden and 'Graphia' meaning writing. Hence Steganography is a technique of hidden communication. In Steganography, the secret/important information such as text, audio, video or image is embedded into another multimedia file with the help of a key.

Steganography disguises the information in the spare or non-essential bits of the cover file. It hides the fact that communication is taking place. Steganography is carried out so cleverly that an intruder cannot detect the existence of a hidden message inside the cover object.

In cryptography, the information is encrypted with the help of an encryption key. Cryptography makes the information illegible for an intruder. However, this encoded message can be meddled with or decoded by the intruder. This is why steganography is preferred over cryptography. A simply encrypted message can draw attention to itself, but steganography conceals the fact that there is a secret message. Our project intends to use Steganography to securely transfer criminal information (photo and information) from one CBI node to another. The image is hidden using Steganography and the information is password protected with a QR code. The two files are zipped with a password and mailed to the receiver using Raspberry Pi. The OTP is sent as a text message using GSM Module

48

II. TYPES OF STEGANOGRAPHY

a. Text Steganography

Commonly used methods in text steganography are number of tabs, white spaces, capital letters & every nth letter of a word to hide the message. Even emoticons can be used to conceal secret information.

b. Audio Steganography

Phase coding, spread spectrum & low-bit encoding to embed secret information in audio steganography.

c. Video Steganography

Videos are generally a combination of images and audio which is advantageous as video signals carry a large amount of data enabling us to hide a lot of data in it.

d. Image Steganography

The cover image is bigger in size than the secret image. The unimportant bits of the cover image are used to embed the secret image.

III. CHARACTERISTICS

- Capacity: This is the size of data that is hidden within the cover object. If the capacity is increased, a smaller cover object can be used. Thus higher capacity decreases the bandwidth required to transmit the image.

- Embedding efficiency: When inverse steganography is performed, the probability of error measured is called the embedding efficiency.

- Perceptual Transparency: When steganography is performed, some amount of noise is added to the cover object. Now, this distortion should not be visible to an intruder. When the original image and the cover image are kept side by side, the distortion should not be visible.

- Robustness: If a steganalysis attack is performed, the stego-object should be able to resist it.

IV. IMAGE STEGANOGRPAHY

In image steganography, the secret image is hidden in a cover image. The cover image is always bigger in size than the secret image so that the unused bits of the cover image can be used to conceal the secret image. The steganography is performed using a public key. The resultant image is called stego-image. Another key, called the private key, is also generated which is used by the receiver to perform inverse steganography to obtain the secret image from the stego-image. Steganalysis attack is a technique to determine the existence of a secret image.
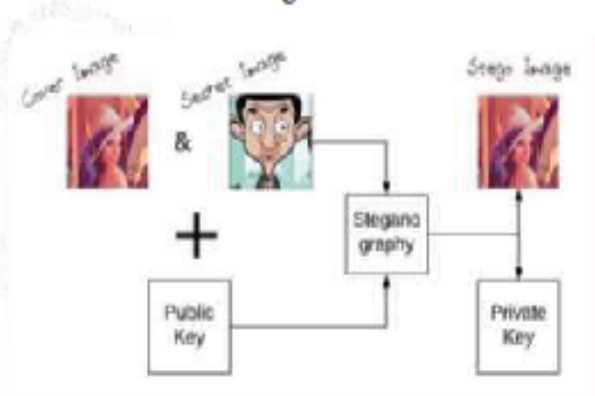
We use a matlab code to perform both, steganography as well as inverse steganography. We use the RSA algorithm.

V. RSA ALGORITHM

Ronald Rivest, Adi Shamir, and Leonard Adleman developed the RSA system. The RSA cryptosystem is a public-key cryptosystem that offers both encryption and digital signatures.

There are three steps in the RSA Algorithm:
1. Key Generation: Key generation RSA involves a public key and a private key.
2. Encryption: The public key can be known by everyone and is used for encrypting messages.
3. Decryption: Messages encrypted with the public key can only be decrypted in a reasonable amount of time using the private key.

VI. TRANSMISSION PROCESS
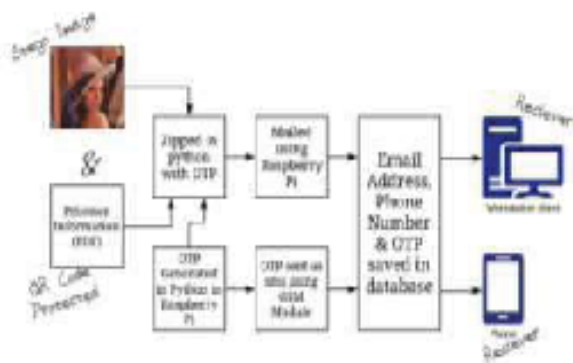
The criminal information is QR code protected. The stego image and the QR code are zipped in the Raspberry Pi using a python code with a One Time Password. Using the Raspberry Pi mailing function and a python code, the zipped file is mailed to the recipient. The OTP generated is sent as a sms using the GSM Module integrate with the Raspberry Pi. The Email, Address, Phone Number & OTP is saved in the database of the system.

VII. INVERSE STEGANOGRAPHY

We now use the private key to obtain the secret image from the stego-image.
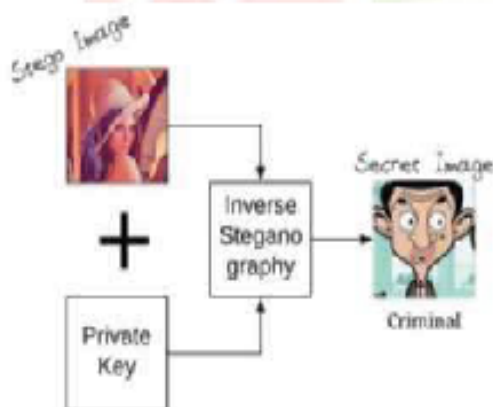
VIII. MERITS

- Draws no attention to the message
- High capacity
- Confidentiality
- Accurateness
- Imperceptibility

IX. DEMERITS

The three biggest areas of illegitimate steganography evolve around terrorism, pornography and data theft. During the research for this website the illegitimate uses of steganography were also found to be on a global scale, involved national security or were done on an academic basis in order to better understand the potential danger of steganography if created by individuals with ill-intentions.

X. APPLICATIONS

- Secret data storing and sharing
- E-Commerce
- Media
- Database Systems
- Digital Watermarking
- Protection of data alteration
- Confidential Communication
- ID cards where the details are embedded in their photograph

XI. OUTPUTS

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XII. CONCLUSION

In a nutshell, secure transmission of data is the rising concern with the advancements in technology. Steganography has its own pros and cons but is a better choice for sending secret information from one point to another without getting detected.

AUTOMATED FOOD SERVING ROBOT

WITH TABLE ORDERING SYSTEM

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Abstract— Our lives have been affected, changed and improved by development more in the earlier decade than in the entire past century. Computerization has entered our lives in strange habits and it will stay here for a long time. We have propelled cell phones, splendid homes, sharp vehicles, wise leaving and soon we will have smart bistros that take and pass on customer orders. Here we propose to design, make and complete an Intelligent Food Serving structure using a Robot. Not in the slightest degree like other theoretical thoughts this structure truly works. It uses an amazingly strange space not in the least like the ground-based robot vehicles which will when all is said in done possibility upon a specific something or the other. The proposed unit will be a 3 DOF Cartesian robot with the end effector as a food passing on holder. The customer enters a menu from the Table module which lands at the kitchen module. At the point when the food is prepared, the kitchen staff places it on the conveyor and presses the objective table. At the point when the customer takes the food off the carrier, the Home catch is pressed and the transporter returns to the kitchen staff and the entire cycle is reiterated for the accompanying solicitation.

I. INTRODUCTION

Our principal objective to take a shot at this undertaking is to supplant pen-paper that server uses to take a request with an Automated Food Serving Robot that assists with explaining this tedious cycle where clients make requests and sit tight for the dinners requested. Café is where individuals pay to sit and eat suppers that are cooked and served on the establishment. In conventional café framework orders are taken by a server and they bring the food when it is prepared. In the wake of eating the food clients will take care of the tab. This framework depends on enormous quantities of labor to deal with client reservation, requests about them, requesting food, putting requests on table, helping dishes to remember clients. Along these lines, how to viably improve the administration quality for clients by utilizing trend setting innovations has gotten a lot of consideration as of late. —Intelligent Restaurant‖—it's everything about getting the entirety of your distinctive touch-focuses cooperating—associated, sharing data, customizing encounters and speeding forms. This paper supplanting pen-paper which is utilized by the server to take a request.

This assessment names the structure as Automated Food Serving Robot With Table Ordering System. The new proposed system structure involves concealing lines that are drawn on the diner ground and they associate all tables to the kitchen filling in as an overseeing track; a robot that is in a condition of congruity with the mentioning system will serve. Right when customers present their solicitation through the mentioning system, the structure will send the solicitation to the kitchen. At the point when the dish is prepared, a sign will be sent to the robot then the robot will by then pass on it to the specific table and return to the kitchen and confer an analysis sign to the mentioning structure as an insistence of transport. This system is yet to be notable in the food and refreshment industry and there are a couple of specific difficulties to be endured. In any case, when the specific difficulties can be endured and upgrades are made, the robotized food movement system using a robot is a potential response for the issues looked by an enormous number of bistro owners.

II. COMPONENT OF THE SYSTEM

The various components involved in our innovation are   as follows:

1. ATMEGA328 microcontroller (Arduino): The Atmel ATmega48/88/328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single

clock cycle, the ATmega48/88/328 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.
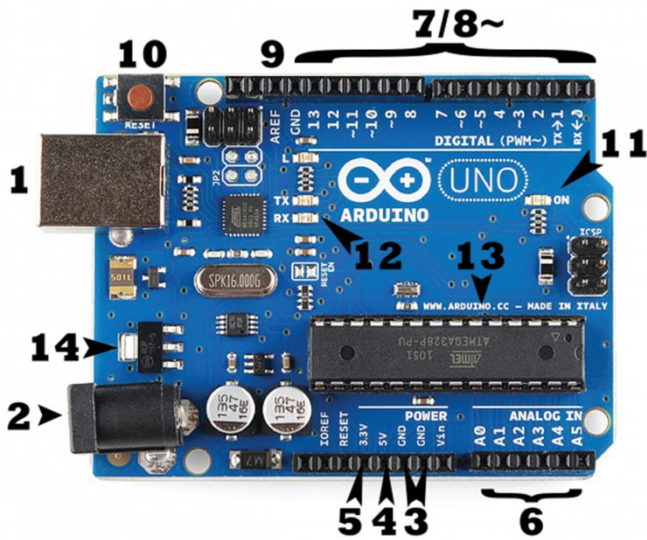
3. AT89C2051 microcontroller : The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful micro-computer which provides a highly-flexible and cost-effective solution to many embedded control applications.

Fig 1. Arduino.

Fig 3. AT89C2051 microcontroller

4. LCD DISPLAY : LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical.

16*2 LCD is named so because; it has 16 Columns and 2 Rows and **16*4** is named so because it has 16 Columns and 4 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16*2 LCD.

2. AT89S52 microcontroller : The **AT89S52** comes from the popular 8051 family of Atmel Microcontrollers. It is an 8-bit CMOS microcontroller with 8K as Flash memory and 256 bytes of RAM. Since it is similar to the trust worthy 8051 architecture these microcontrollers are as per industry standard. It has 32 I/O pins comprising of three 16-bit timers, external interrupts, full-duplex serial port, on-chip oscillator and clock circuitry.

Fig 4. LCD display.

Fig 2. AT89S52 microcontroller.

5. RF module (TX & RX) : RF modules transmit and receive the data because it has high volume of applications than IR. RF signals travel in the transmitter and receiver even when there is an obstruction. It operates at a specific frequency of 433MHz. RF transmitter receives serial data and transmits to the receiver through an antenna which is connected to the 4th pin of the transmitter.
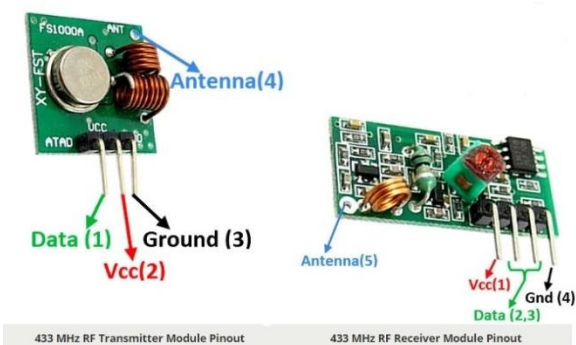

Fig. RF module (TX & RX).

6. L293D DC Motor Driver : L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*). The l293d can drive small and quiet big motors as well.
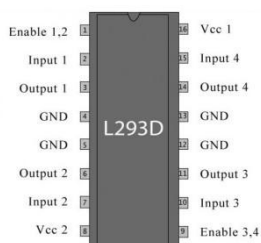
Fig. L293D DC Motor Driver.

7. SG90 DC Servo Motor : Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just
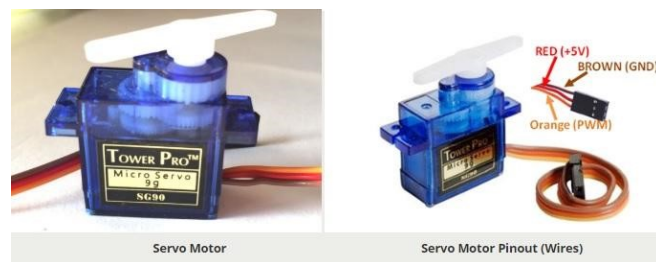
stick with normal plastic gear.

Fig. SG90 DC Servo Motor.

8. DC MOTOR : 100 RPM Side Shaft Heavy Duty DC Gear Motor is suitable for large robots / automation systems. It has sturdy construction with gear box built to handle stall torque produced by the motor. Drive shaft is supported from both sides with metal bushes. Motor runs smoothly from 4V to 12V and gives 100 RPM at 12V. Motor has 8mm diameter, 17.5mm length drive shaft with D shape for excellent coupling.
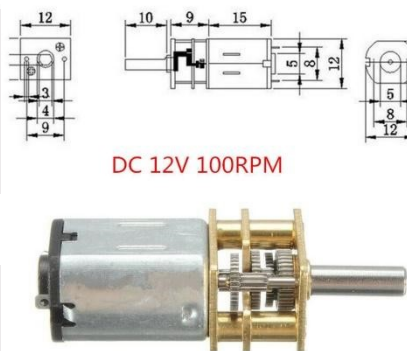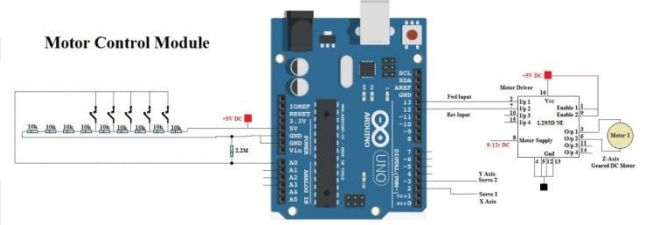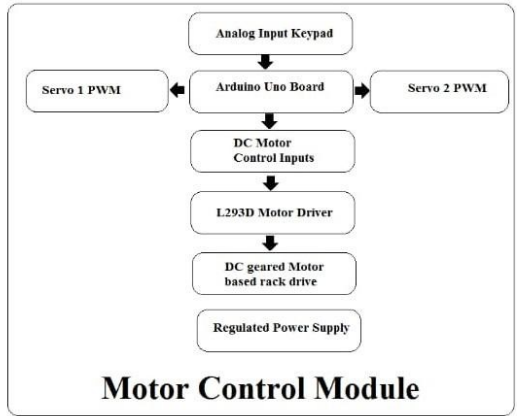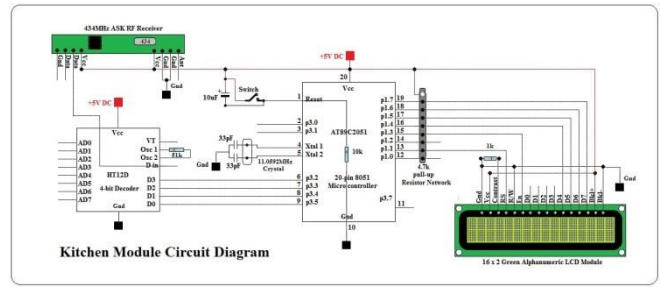

Fig. DC Motor.

III. BLOCK DIAGRAM

Table Module

Kitchen Module

Kitchen Module Circuit Diagram

Motor Control Module

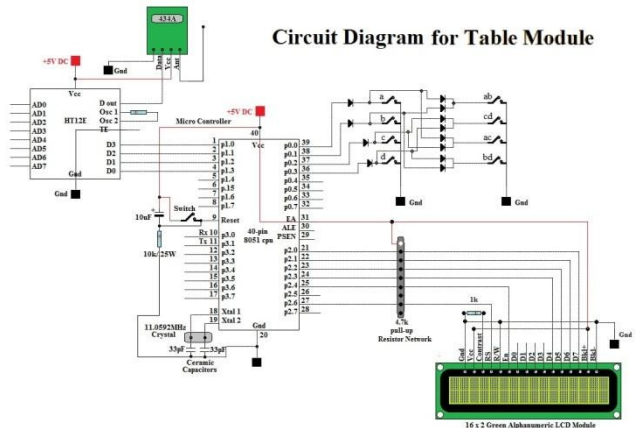**Motor Control Module**
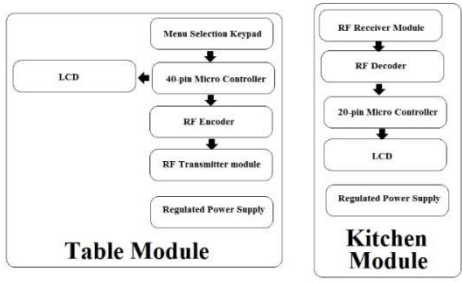
IV. SOFTWARE REQUIREMENT

Operating System: Windows.
MC programming : Embedded C in Keil µVision IDE.
Arduino IDE for Programming.
Proteus Software for circuit Designing.

V. CIRCUIT DIAGRAM

Circuit Diagram for Table Module

VI. ADVANTAGES

A. Spare Time - This sort of course of action spares time since it permits programmed catch of information. It diminishes pivot and the time taken to serve the clients.

B. Limit Manual Task - It decreases the manual main jobs and subsequently the work costs are brought down too. What's more it chops down the issue of wrong conveyance, since it contains the token number, which is available on the bill.

C. Ongoing Monitoring - It can have a full oversight over business through continuous observing, if having outlets at different areas

D. Limits Revenue Leakage - Since it can have regular deals and stock subtleties on your fingertips, it helps in limiting income spillage.

. Low Investment - The charging applications coordinated with the element doesn't expect you to contribute a lot. These are normally reasonable and rather welcome on general improvement of the business and along these lines the income earned.

. Sanitation - Food security is a logical control which portrays taking care of, readiness and capacity of food in manners that forestall food-borne ailments. Sanitation is a worldwide worry that covers an assortment of distinctions of regular daily existence.

VII. DISADVANTAGES

A. Potential Job Losses - One of the greatest concerns encompassing the presentation of mechanical mechanization is the effect of occupations for laborers.

B. Beginning Investment Cost - This is commonly the greatest deterrent that will choose whether or not an organization will put resources into mechanical mechanization, or hold up until a later stage.

C. Increment in the utilization of intensity flexibly and power. - The measure of intensity gracefully to run this framework increments ten times and furthermore utilizes a great deal of power.

D. Upkeep and Repairs - This framework cost a lot of cash in support and fix, The projects should be refreshed to suit the evolving prerequisites, the machines should be made more astute.

VIII. FUTURE SCOPE

In future, the accompanying could be actualized:

• Add progressively number of client hubs and actualize a star connected with the getting segment as the focal center.

• Adding contact screen at the client interface side rather than keypad/LCD module. The touch screen can give a simpler UI.

• Adding an increasing number of interfaces includes programming both on the client and kitchen terminals. This is conceivable as the highlights can be effortlessly consolidated in programming which can be upheld by the current equipment without numerous changes.

IX. CONCLUSION

Robots are not new now, and this is a perfect chance to recognize new advancement that will serve open in social domains in addition. We pick a diner, since this is the place open not simply come to join with buddies or family yet furthermore to go to authentic social events as well. The clever mentioning system will give wonderful association with bistros. The rule focus of the keen mentioning system is to make the complete bistro robotized. This system licenses customers to mastermind food by LCD module surface which is

tweaked by embedded c, which is remotely connected with the kitchen and the cash counter through RF module. A line following robot is used to pass on meals from kitchen to customer. The mechanical arm makes serving the food successful just as decreases work and time which was required in the ordinary systems for food serving.

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Image Processing Based Driving Assistant System

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Abstract- Rapid industrialization and the consequent urbanization has brought about an unprecedented revolution in the growth of motor vehicles all over the world and India is no exception. Such growing urbanization, combined with rising number of vehicle ownership, has led in recent years to an increased traffic related stress and overnight driving exhaustion which lead to accidents in long term and short term period of time. To avoid such ambiguity we are developing a system which will detect autonomously and continuously track drivers' faces and determine its emotion. With the help of which we can pinpoint if the driver falls to sleep. If the driver is falling asleep an alarming sound will play to wake up the driver and we can make speed adjustments in the car. Based on the emotion we can play music to make the driver journey more joyful.

Indexed Terms- Arduino, Image processing, Machine Learning, YOLO

I. INTRODUCTION

In the beginning of the 21st century advanced features such as collision warning and avoidance systems were introduced into motor vehicles. However, there are many issues that need to be addressed before the driving assistance system can be widely introduced in the future vehicles. The theoretical and experimental research on control of such issues is in a developing stage. The main challenge in the driver assistance system is the sensory issues. Today's technology has addressed many of the sensory issues with many still to be solved. The impact of automation on the driver necessitates an understanding of human factors in relation with the automated driving controls or assists. Research on the human factor is very important and demands a lot more work. Legal and institutional aspects of automated vehicles are very important concerns.

In the late 1980s and beginning of 1990s, state and private funded programs started more focused research in the United States, Europe and Japan, to bring the idea of automated vehicles closer to reality. The main initiative was to improve safety with automation. The very well organized and futuristic thorough research in this era, along with the rapid advancements in electronics and sensor technology, contributed to a more vivid understanding of the difficulties and potentials of such systems. Although the research in this period was focused more on advanced highways, it later switched to intelligent vehicle initiative (IVI). While a lot has been said about improved safety and higher comfort level with automation in different papers, sometimes inconsistencies exist between different points of views on these matters.

II. LITERATURE REVIEW

In dynamic scenes, tracking is used to follow a face through the sequence. In order to incorporate the face changes over time, in terms of changes in scale, position and to localize the search for the face, it is essential to exploit the temporal correspondence between frames. Tracking exploits the temporal content of image sequences. Face tracking can be divided into two categories.

1. Head tracking.
2. Facial feature tracking.

Feature tracking methods track contours and points or follow eyes and mouth, and require independent trackers for each feature. Head tracking methods use the information from the entire head and can be region-based color-based or shape-based. Color-based approaches are not robust to lighting changes and approaches that use information from the entire head are, in general, unable to handle occlusion. Tracking involves prediction and update for which filters like Kalman filter and Condensation filter have been used.

Tracking approaches can also be model-based, for example, using statistical models, or exemplar-based. A combination of feature and head tracking methods, together with filtering, have tried to eliminate the problems of the individual approaches. [1]

III. APPROACHES

The task of emotion recognition often involves the analysis of human expressions in multimodal forms such as texts, audio, or video. Different emotion types are detected through the integration of information from facial expressions, body movement and gestures, and speech. The technology is said to contribute in the emergence of the so-called emotional or emotive Internet.

The existing approaches in emotion recognition to classify certain emotion types can be generally classified into three main categories: knowledge-based techniques, statistical methods, and hybrid approaches.

A. Knowledge-based techniques

Knowledge-based techniques, utilize domain knowledge and the semantic and syntactic characteristics of language in order to detect certain emotion types.[2] In this approach, it is common to use knowledge-based resources during the emotion classification process such as WordNet, SenticNet, ConceptNet, and EmotiNet, to name a few. One of the advantages of this approach is the accessibility and economy brought about by the large availability of such knowledge-based resources. A limitation of this technique on the other hand, is its inability to handle concept nuances and complex linguistic rules.

Knowledge-based techniques can be mainly classified into two categories: dictionary-based and corpus-based approaches Dictionary-based approaches find opinion or emotion seed words in a dictionary and search for their synonyms and antonyms to expand the initial list of opinions or emotions. Corpus-based approaches on the other hand, start with a seed list of opinion or emotion words, and expand the database by finding other words with context-specific characteristics in a large corpus. While corpus-based approaches take into account context, their

performance still vary in different domains since a word in one domain can have a different orientation in another domain.

B. Statistical methods

Statistical methods commonly involve the use of different supervised machine learning algorithms in which a large set of annotated data is fed into the algorithms for the system to learn and predict the appropriate emotion types. This approach normally involves two sets of data: the training set and the testing set, where the former is used to learn the attributes of the data, while the latter is used to validate the performance of the machine learning algorithm. Machine learning algorithms generally provide more reasonable classification accuracy compared to other approaches, but one of the challenges in achieving good results in the classification process, is the need to have a sufficiently large training set.[5]

Some of the most commonly used machine learning algorithms include Support Vector Machines Naive Bayes, and Maximum Entropy. Deep learning, which is under the unsupervised family of machine learning, is also widely employed in emotion recognition Well-known deep learning algorithms include different architectures of Artificial Neural Network (ANN) such as Convolutional Neural Network (CNN), Long Short-term Memory (LSTM), and Extreme Learning Machine (ELM). The popularity of deep learning approaches in the domain of emotion recognition may be mainly attributed to its success in related applications such as in computer vision, speech recognition, and Natural Language Processing (NLP).[4]

C. Hybrid approaches

Hybrid approaches in emotion recognition are essentially a combination of knowledge-based techniques and statistical methods, which exploit complementary characteristics from both techniques. Some of the works that have applied an ensemble of knowledge-driven linguistic elements and statistical methods include sentic computing and iFeel, both of which have adopted the concept-level knowledge-based resource SenticNet. The role of such knowledge-based resources in the implementation of

hybrid approaches is highly important in the emotion classification process. Since hybrid techniques gain from the benefits offered by both knowledge-based and statistical approaches, they tend to have better classification performance as opposed to employing knowledge based or statistical methods independently. A downside of using hybrid techniques however, is the computational complexity during the classification process.

IV. IMPLEMENTATION

As shown in the figure 1 there are four main modules in our project. The first one is camera module from which we take input. The input is in the form of live video feed from the camera. The second module is face tracking module where using YOLO training module we continually track face and face emotions.
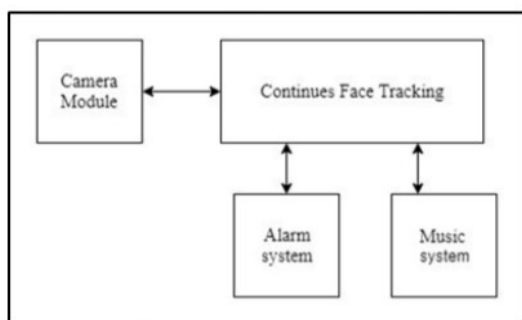
Figure 1. Block Diagram

In coincide with face tracking module there are music system alarm system connected to it which work based on the values detection by modules. If the eye where closed for more than 5-10 seconds the alarm system get activated and based on the detected emotions music system tries to maintain optimal emotion level for driving.

V. RESULT

Based on the different selection of approaches to detect track faces we are able to successfully detect and track faces in a video stream using a mobile application result of which are shown in figure 2. Using this application driver moment can be continuously monitor and if sleep is detected an alarm get triggered vai hardware module connected via bluetooth.
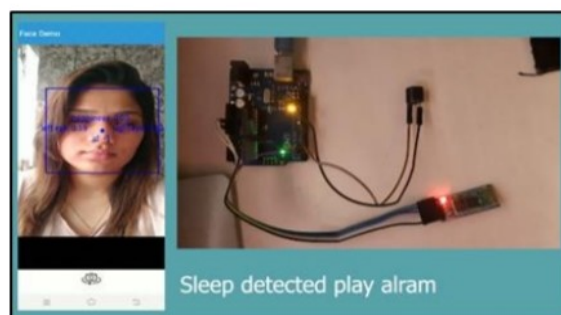

Figure 2. Result Screen

The hardware module consists of an arduino uno, connected with HC-05 bluetooth module which is connected to the mobile application and continuously fetches the data stream coming from the application.

Table 1. Facial feature contours

Facial feature contours probability can be illustrated in the table below which show probalisty for one face out of three face detected in the test stream.

CONCLUSION

The field of image processing technology is growing very fast, there are lots of recent trends in object and face detection systems. In our project we focus on using image processing to be used as a digital assistant for drivers. This system with slight modification can be utilized in different industries for various applications. Also with help OpenAI projects we are able to train our model to detect emotions in faces. We successfully created a web based platform on which we can track multiple human face with their face trailing lines with this we have created an mobile application which will provide a safer journey experience for drivers.

REFERENCES

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[2] Face Detection and Tracking in a Video by Propagating Detection Probabilities. IEEE Transactions On Pattern Analysis And Machine Intelligence, VOL. 25, NO. 10, OCTOBER 2003.

[3] Georgios Georgakis, Md Alimoor Reza, Arsalan Mousavian, Phi-Hung Le, "Multiview RGB-D Dataset for Object Instance Detection", 3D Vision (3DV) 2016 Fourth International Conference on, pp. 426-434, 2016.

[4] Tian Wang, Yang Chen, Mengyi Zhang, Jie Chen, Hichem Snoussi, "Internal Transfer Learning for Improving Performance in Human Action Recognition for Small Datasets", Access IEEE, vol. 5, pp. 17627-17633, 2017.

[5] *Ijaiem, Traffic Surveying And Analysis*, International Journal of Application or Innovation in Engineering & Management.

[6] Smita Desai et al, International Journal of Computer Science and Mobile Computing, Vol.6 Issue.9, September- 2017, pg. 46-50, © 2017, IJCSMC All Rights Reserved 47.

ACHIEVEMENTS

STAFF ACHIEVEMENTS

Dr. Subha Subramaniam

I/C Head of Department

Ph.D. (Electronics)

22 Years of Experience

Specialization : **Nano Electronics**

1. "BEST HOD OF THE YEAR 2019" Award From CSI TECHNEXT INDIA

2) **Dr. Subha Subramaniam** published paper titled 'Novel Three Stage CMOS Ring Oscillator Circuit Design with Co-Integration of N-InGaAs and P-SiGe Vertical Nanowire Transistor Devices' in 'Journal of Active & Passive Electronic Devices' Dec 2019, Vol. 14 Issue 1, p17-28. 12p.

3) **Dr. Subha Subramaniam** published paper titled 'Low Cost Smart Automation System with Energy Meter' in 'International Journal of Sciences: Basic and Applied Research (IJSBAR)'. Dated 13/5/2019 Volume 46 Issue No 1. Pages 73-88.

1) **Prof. Babychen Mathew** successfully completed one week online FDP on **'Moodle : Learning Management System'** conducted by MGM university, Aurangabad from 7th May to 12th May,2019.

2) Worked as a staff coordinator of the STTP 'Advanced Communication Technologies and Security Aspects' conducted by the department of Electronics Engineering, SAKEC from 1st July to 6th July, 2019.

3) **Prof. Babychen Mathew** successfully completed online STTP on "Sensors, IoT & Machine Learning" from 1st June to 5th June, 2020 conducted by K.J. Somaiya college of Engineering,, Vidyavihar, Mumbai.

1) Congratulations **Prof Sarika Bukkwar** for getting minor research grant of INR **25,000** from the **Mumbai University** for the project on Fish farming**.**

2) Secured Top 2% rank with Elite in NPTEL course on **Database Management System**.

3) Coordinated remote center workshop on 'eSim' on 21st September, 2019 conducted by IIT, Bombay.

1) Congratulating **Prof. Rameswari Mane** for her selection as a **NPTEL translator.**

2) **Prof. Rameshwari Mane** has successfully completed the **NPTEL** online certification course '**Introduction to Machine learning**' with a consolidate marks of 79% hence achieved **Elite** certificate.

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1) **Prof Asha Durafe** has Successfully Completed the NPTEL Online Certification Course Introduction to Research having a Final Score of 81.

2) **Prof Asha Durafe** has Successfully Completed the NPTEL Online Certification Course Digital Image Processing having a Final Score of 75.

3) **Prof Asha Durafe** has Successfully Completed the Spoken Tutorial Test on Linux having a Final Score of 72.

4) **Prof Asha Durafe** has Successfully Completed the Spoken Tutorial Test on Moodle for Teachers having a Final Score of 62.5

5) **Prof Asha Durafe** has received **"Best Research Project"** award by CSI Tech-next for 2019-20.

6) **Prof Asha Durafe** has Successfully Received ISA Maharashtra section Award for giving expert talk on Digital Steganography and its applications in cyber security in One Day Seminar on Cyber Security in Industrial Automation & Control on 24th February, 2018.

7) Congratulations **Prof. Asha Durafe** for receiving University Minor Research Grant of 35000/- for year 2018-19.

8) Mentoring for Product development of Roti Bank India Project 'Test Before Taste' from January 2019 to June 2019 with a grant worth Rs. 60,000/-

9) **Prof. Asha Durafe** secured 100/100 on Star Cyber Secure User Certification Exam held on 04th June, 2020.

Prof. Asha Durafe has been selected as SCSU training instructor by Star Certification.

10) Copyright Registration:
The following BE project group members under the guidance of **Prof. Asha Durafe** have successfully registered their project report under Indian Copyright Act. The copyright registration is approved for the project titled 'Steganography for public security' with diary number L-91772/2020.
Project group members are:
     1. Ritika Desai
     2. Suraj Gupta
     3. Anushka Kashyap
     4. Pushkar Bagul

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सत्यमेव जयते

Extracts from the Register of Copyrights

Dated : 04/06/2020

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1) **Prof. Salabha Jacob** Successfully completed the NPTEL online certification course in **Fuzzy Logic and Neural Networks** with a consolidate marks of 80% with Elite + Silver certificate in April 2019.

2) **Prof. Salabha Jacob** Successfully completed the Spoken Tutorial project ,IIT Bombay online certification course in **LateX** with a score of 81.7% in May 2020 organised at A.P Shah Institute of Technology.

3) **Prof. Salabha Jacob** Successfully completed Certification Programme in **Python for Machine Learning** conducted by IIT Roorkee in May 2020.

4) **Prof. Salabha Jacob** Successfully completed the online workshop on **Universal Human Values** on the theme Inculcating Universal Human Values in Technical Education organized by AICTE in May 2020.

1) **Prof. Shubhangi Motewar** worked as coordinator for FDP of Remote centre of IITB on "Arduino Workshop" on 8th February, 2020.

2) **Prof. Shubhangi Motewar** organized two weeks internship for students of all departments in Shah and Anchor Kutchii Engineering college on "Design E-Mania : An exploration into the world of Arduino and Raspberry-Pi" from 24th June to 8th July, 2019.

1) Congratulation **Prof. Madhura Pednekar** and her **Team Inventronics** has selected for final Hackathon in **Terna College.**

2) Participated One Week Online Faculty Development Program on "R" organized by S. B. Jain Institute of Technology, Management, and Research (SBJITMR), Nagpur. Department of Mechanical Engineering, in association with IIT, Bombay, Spoken Tutorial.

3) **Prof. Madhura Pednekar** completed the "Faculty Awareness Programme on Outcome Based Education (OBE) and NBA Accreditation" organized by Sinhgad Institute of Technology and Science, Narhe, Pune on 5th May, 2020.

1) **Prof. Preethi Warrier** has successfully completed the **NPTEL** online certification course '**Principles of Communication Systems – Part II**' with a consolidate marks of 61% hence achieved **Elite** certificate.

1) **Prof.Aparajita Bera** got Elite certificate from **NPTEL** with a consolidated score of 67% in '**Computational Electromagnetics**' in October 2019.

2) **Prof.Aparajita Bera** sucessfully completed **LaTeX** test organized at RMD Sinhgad School of Engineering with course material provided by the Spoken Tutorial Project ,IIT Bombay in May 2020.

STUDENT ACHIEVEMENTS

Mr. Surabh Patil (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 77% and achieved **Elite + Silver** certificate.
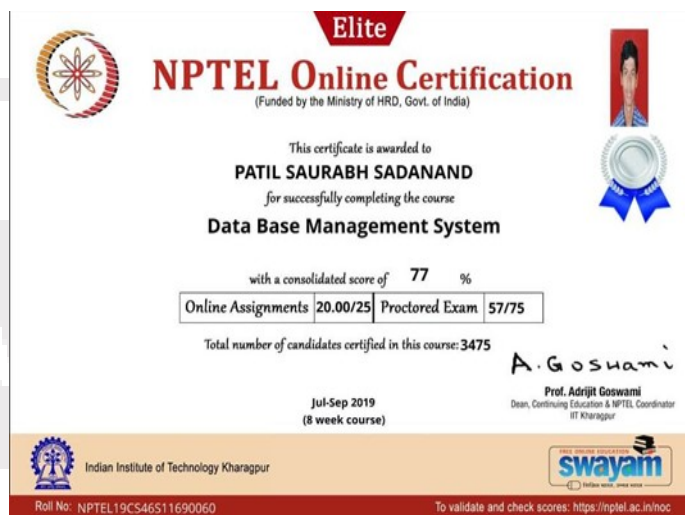
Ms. Sara Shaikh (TE 1) has successfully completed the NPTEL online certification course '**Marketing Management - I**' with a consolidate score of 75% and achieved **Elite + Silver** certificate.
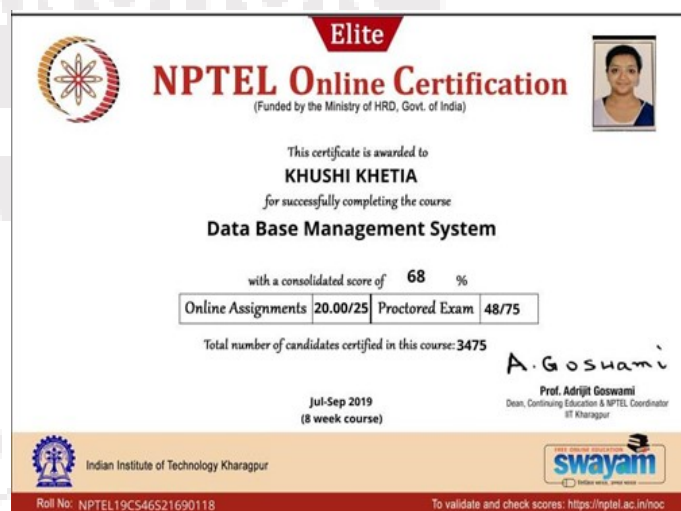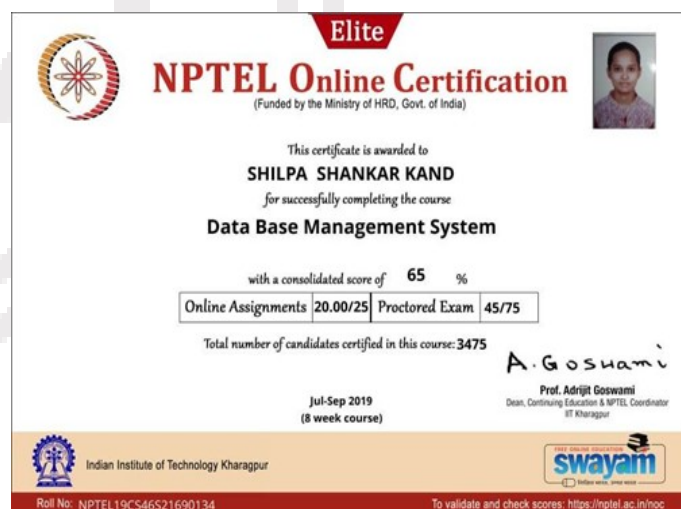
Mr. Rishab Shetty (TE 1) has successfully completed the NPTEL online certification course '**Programming Data Structure & Algorithm**' with a consolidate score of 72% and achieved **Elite** certificate.

Mr. Ankit Goswami (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 70% and achieved **Elite** certificate.
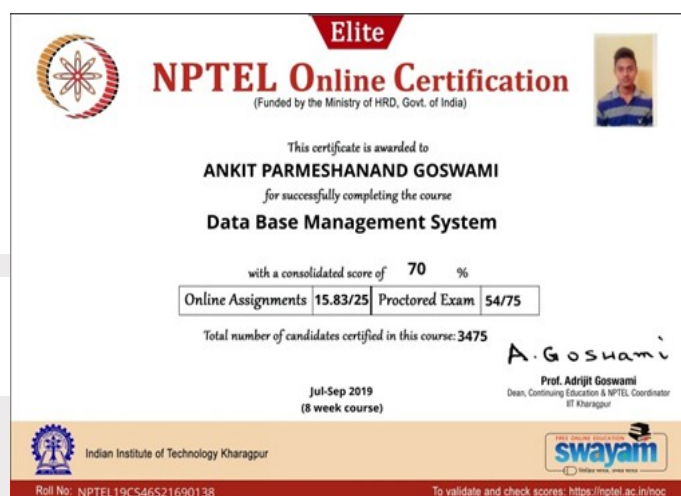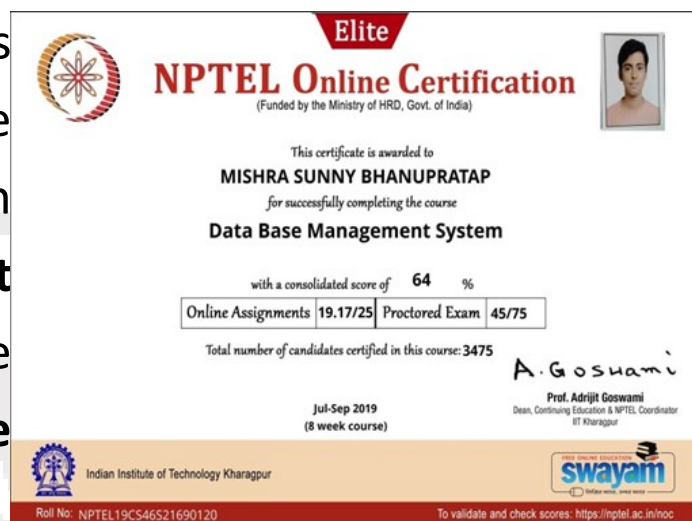
Ms. Khushi Khetia (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 68% and achieved **Elite** certificate.

Ms. Shilpa Kand (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 65% and achieved **Elite** certificate.

Mr. Sunny Mishra (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 64% and achieved **Elite** certificate.

Mr. Arpan Kumath (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 63% and achieved **Elite** certificate.

Mr. Akshta Kalekar (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 63% and achieved **Elite** certificate.

Mr. Dhrumil Buch (TE 1) has successfully completed the NPTEL online certification course '**Data Base Management System**' with a consolidate score of 63% and achieved **Elite** certificate.
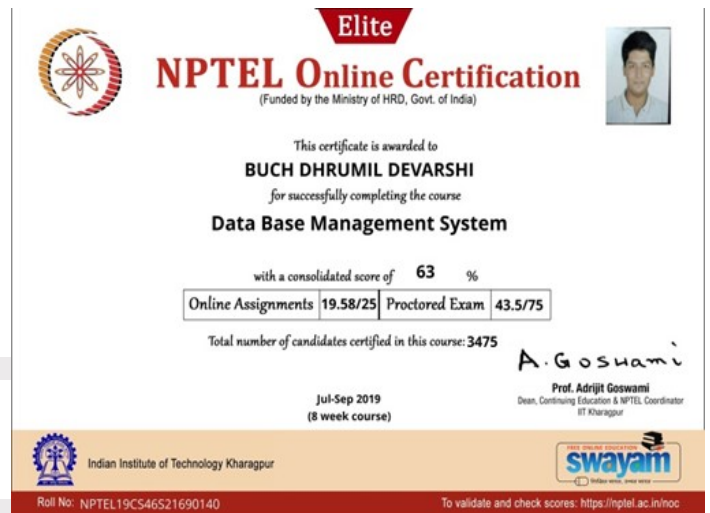
ACHIVEMENT BEYOND ACADEMICS

SMART INDIA HACKATHON

Team Technoroots participated in Grand finale of Smart India Hackathon 2019 held on 8th to 12th July, 2019. This competition was held at VEL Tech University Chennai.

Members :

Mr. Rakesh Algarswamy (Leader)

Mr. Vinay Bhalekar

Mr. Jay Ramane

Mr. Abhihek Patil

Mr. Sushilkumar Mourya

Ms. Himani Thakkar

Mentors :

Prof.Manisha Mane

Prof. Madhura Pednekar

They worked on the problem statement of category Smart Textile and Developed Smart LED T-shirt.

Team Resilient6 got selected for hardware edition in Grand finale of Smart India Hackathon 2020.

Members:

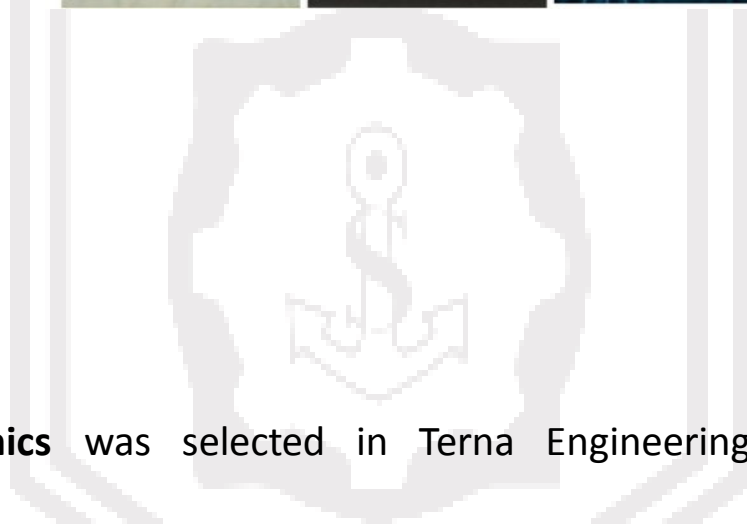Ashwini Gangwal

Ankit Goswami

Drumil Buch

Hiren Bhanushali

Niranjan Chotaliya

Alisha Jiwani

Team inventronics was selected in Terna Engineering college for final Hackathon.

The Internal Hackathon on behalf of Smart India Hackathon was conducted at SAKEC on 18th January, 2020.

It was continuous 12hrs completion where students worked on different categories of software and hardware problem statements.

For Hardware categories 4 teams from department of Electronics participated. That was a huge success.

AVISHKAR

Team '**Inventronics**' participated in the competition called Avishkar Research Convention 2019-2020, on behalf of University of Mumbai.

Team Members :

Mr. Rohan Kadam

Mr. Kavish Jain

Mr. Kiran Lokare

Mr. Krushanant Shinde

SAKEC STUDENT COUNCIL

Purva Desai - Ladies Representative

Shivam Chaube - Technical Head

Aditya Iyer - Technical Coodinator

Amit Bhosale -Technical Coordinator

Mohit Bhanushali - On Stage Coordinator

Ishan Lokhande - P.R.H

Usham Singh - Sports Coordinator

Rushikesh Palande - Paparazzi Head

Shikhar Jain - Sports Representative

Jaimin Desai - Paparazzi Coordinator
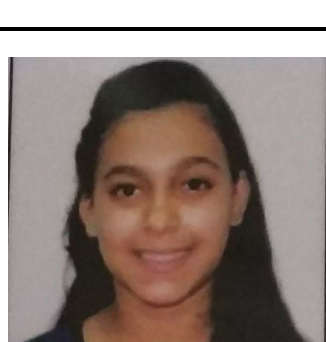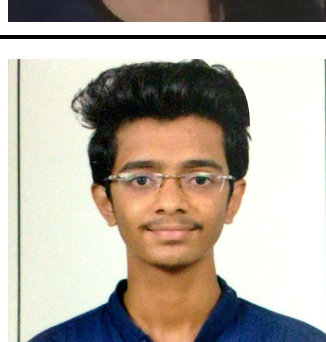
SPOKEN TUTORIAL

RESULT ANALYSIS

CLASS	TOPIC	DATE OF EXAM	APPEARED	PASS	FAIL	% PASS
FE	C	23/4/2020	21	16	5	64
SE	ARDUINO	23/4/2020	30	30	NIL	100
TE	PHP - mySQL	7/8/2019	25	17	8	68
BE	LINUX	7/8/2019	18	4	14	22

TOPPERS

NAME	CLASS	COURSE	PERCENTAGE	PHOTO
Jagdale Satyam	FE 1	C	80	
Kamble Ansh	FE 1	C	77.5	
Ambodkar Rutvij	FE 1	C	75	
Sawant Prathamesh	SE 1	C	72.5	
Divakaran Ajit	FE 1	C	57.5	
Malvankar Gururaj	FE 1	C	57.5	

ACHIEVEMENTS

NAME	CLASS	COURSE	PERCENTAGE	PHOTO
Shete Aditya	SE 1	Arduino	85	
More Ishan	SE 1	Arduino	85	
Gupta Archana	SE 1	Arduino	82.5	
Vartak Sanjana	SE 1	Arduino	82.5	
Chauhan Nikesh	SE 1	Arduino	82.5	

NAME	CLASS	COURSE	PERCENTAGE	PHOTO
Kand Shilpa	TE 1	PHP-mySQL	87	
Raut Siddhi	TE 1	PHP-mySQL	83.3	
Shah Vrushank	BE 2	LINUX	70	
Ravariya Hasmukh	BE 1	LINUX	63.3	

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RESULT ANALYSIS

EVEN SEMESTER RESULTS

SE SEM IV

SUBJECT	TOTAL APPEARED	TOTAL PASSED	% PASSED
Linear control systems	62	55	88.7
Digital System Design	62	56	90.32
Principles of Communication Engineering	62	56	90.32
Electronics Devices and Circuits	62	51	82.25
Microprocessor and Applications	62	55	88.7
Applied Mathematics IV	62	57	93.44

TE SEM VI

SUBJECT	TOTAL APPEREAD	TOTAL PASSED	% PASSED
Electronic Product Design	17	17	100
Signals and Systems	90	69	76.66
Computer Organization and Architecture	30	28	93.33
Embedded System Design	93	84	90.3
Wireless Communication	44	38	86.36
VLSI Design	90	84	94.33
Computer Communication and Network	87	82	94.25

BE SEM VIII

SUBJECT	TOTAL APPEARED	TOTAL PASSED	% PASSED
MEMS Technology	150	144	96
CMOS VLSI Technology	150	140	93.33
Advanced Networking Technologies	150	147	98
Mobile Communication	126	124	98.4
Robotics	25	25	100

SUBJECT TOPPERS

R E S U L T A N A L Y S I S

SE SEM IV

SUBJECT	NAME	MARKS OBTAINED OUT OF 100
Electronic Devices and Circuits II	Juilee kotnis	94
Microprocessor and Application	Kanchan Jha	81
Digital System Design	Rahul Jagtap	98
Principles of Communication Engineering	Sara Shaikh	83
Linear Control System	Rahul Jagtap	92
Applied Mathematics IV	Ankit Goswami	86

TE SEM VI

SUBJECT	NAME	MARKS OBTAINED OUT OF 100
Electronic Product Design	Arushi Shetty	72
Signals And Systems	Mohammad Ayoob	85
Computer Organization and Architecture	Shweta Sawant	74
Embedded System Design	Kanchan Jha	82
Wireless Communication	Shivam Rai	79
VLSI Design	Aditya G.	81
Computer Communication and Networks	Sara Patil	89

BE SEM VIII

SUBJECT	NAME	MARKS OBTAINED OUT OF 100
MEMS Technology	Aditya Monghe Arushi Yadav	80
CMOS VLSI Technology	Shushant Awale	75
Advanced Networking Technologies	Arushi Yadav	85
Mobile Communication	Samar Mayank	79
Robotics	Tanvi Joglekar	84

ODD SEMESTER RESULTS

SE SEM III

SUBJECT	TOTAL APPEARED	TOTAL PASSED	% PASSED
Applied Mathematics III	62	39	62.9
Electronic Devices and circuits I	62	46	74.2
Digital Circuit Design	62	51	82.55
Electrical Network Analysis and Synthesis	59	47	79.66
Electronic Instrumentation and Measurement	59	52	88.13

TE SEM V

SUBJECT	TOTAL APPEARED	TOTAL PASSED	% PASSED
Microcontroller and Application	77	67	87
Design with Linear Integrated Circuits	79	72	91.13
Engineering Electromagnetics	77	67	87
Database Management System	57	45	78.94
Digital Communication	80	77	96.25
ASIC Verification	19	19	100

BE SEM VII

SUBJECT	TOTAL APPEARED	TOTAL PASSED	% PASSED
Instrumentation System Design	86	83	89.93
Power Electronic	86	72	84
Management Information Systems	59	59	100
Digital Signal Processing	87	73	84
Robotics	5	4	80
Advanced Networking Technologies	81	76	93.82
Cyber & Security Laws	29	24	82.75

SE SEM III

SUBJECT	NAME	MARKS OBTAINED OUT OF 100
Electronic Devices And Circuits I	Archana Gupta	91
Digital Circuit Design	Jeel Malde	92
Electronics Instruments & Measurements	Jeel Malde	89
Electrical Network Analysis & Synthesis	Simranjeet Kaur Nikesh Chauhan	87
Applied Mathematics-III	Pooja Gauda	94

TE SEM V

| SUBJECT	NAME	MARKS OBTAINED OUT OF 100
Digital Communication	Rahul Jagtap	97
Engineering Electromagnetics	Ashwini Gangwal	85
Design with Linear Integrated Circuits	Ankit Goswami	91
Database Management System	Rahul Jagtap	90
ASIC Verification	Ankit Goswami	96
Microcontrollers and Application	Ashwini Gangwal	89

BE SEM VII

SUBJECT	NAME	MARKS OBTAINED OUT OF 100
Instrumentation System Design	Aditya Verma	78
Power Electronics	Tejaswi Narvekar	76
Management Information System	Shweta Sawant	92
Digital Signal Processing	Kanchan Jha	69
Robotics	Mohammad Ayoob	65
Advance Networking Technologies	Sara Patil	77
Cyber Security & Laws	Sara Patil Sonali Pawar Isha Kothari	67

BRANCH TOPPERS

Sarita Varma

BE - Sem VIII

CGPI– 8.905
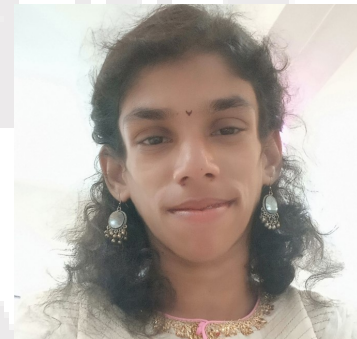
Tanvi.H.Jogalekar

TE- Sem VIII

CGPI - 8.76

Kanchan R. Jha

TE- Sem VI

CGPI - 8.455

Mohammad Ayoob

TE - Sem VI

CGPI - 8.18

Sara Shaikh
SE - Sem IV
CGPI - 9.795

Juilee Kotnis
SE - Sem IV
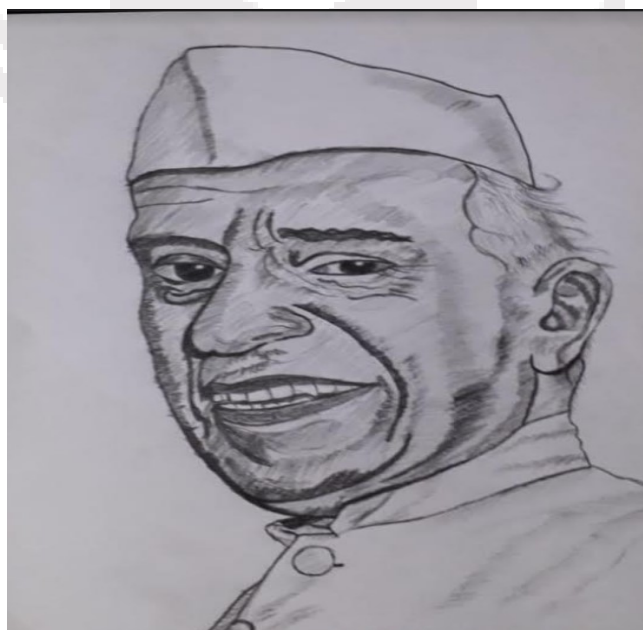CGPI - 9.775

Rahul Jagtap
SE - Sem IV
CGPI - 9.72

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CREATIVITY CORNER

C R E A T I V I T Y

1. PAINTINGS & SKETCHES

By Sakshi Raorane, FE ETRX

By Jeel Malde, SE ETRX

2. LITERARY ARTICLES

C
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An Inspirational short story

This is a story of a poor farmer who was hard working, brave and honest. One day while coming from his farm after working hard for the whole day he noticed that one small boy was crying for desperate help. The boy was fallen in the well. Immediately farmer jumped in the well and by putting his own life in danger, saved the boy from sinking.

Farmer took the boy to his own home. Next day after receiving information about son his rich father who was businessman came at the farmer's house with gold coins and gifts. Farmer refused to accept all gifts offered to him. Businessman while taking his son back to home observed one boy playing nearby. He was son of farmer who was not going to the school .Businessman decided to provide financial help for study of poor boy.

Many years passed away ,farmer's son became microbiologist and discovered vaccine. One day Son of businessman was very serious and at this crucial time vaccine of farmer's son saved his life. In this way once farmer saved life and next time his son who became researcher due to financial help of businessman saved the life.

The name of farmer's son is Alexander fleming, the vaccine he discovered is Penicillium for which he got Nobel prize in 1928.The man whose life was saved twice is the famous prime minister of England Winston Churchill.

The moral of the story is, help others even by putting your life in danger, god will definitely help you.

Universe is surviving due such type of selfless people only.

Prof. Prashant Khedkar

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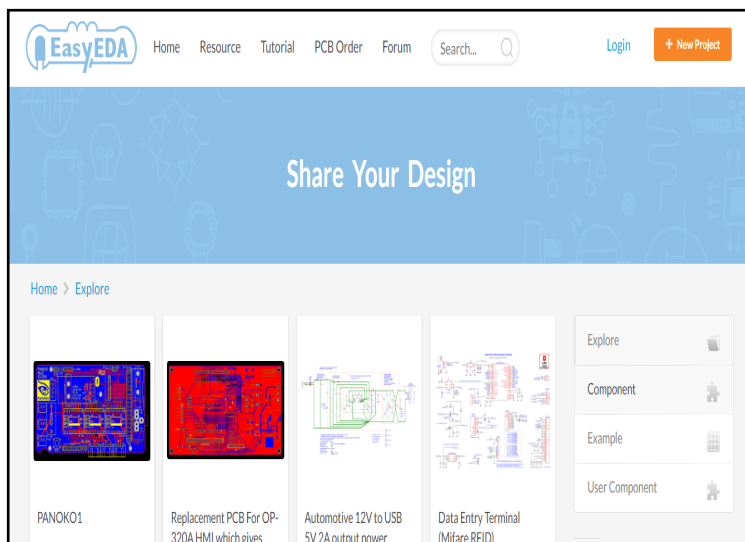
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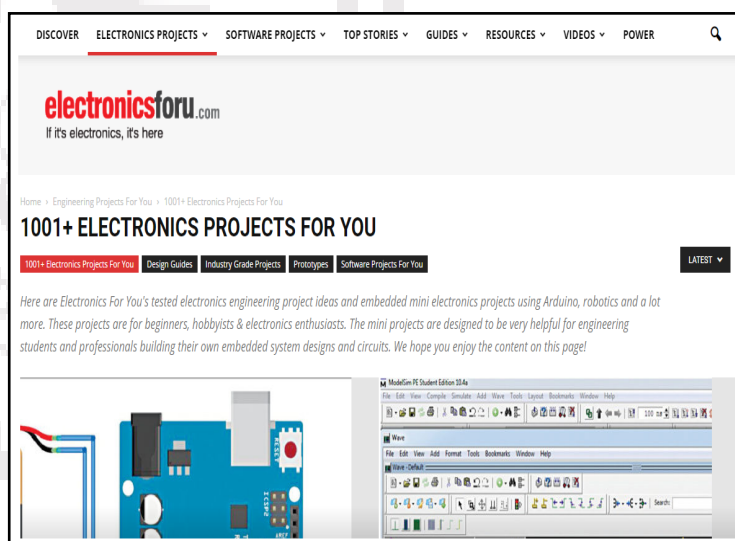
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