Geethanjali

College of Engineering and Technology

TECHNOCHRONICLE

An ECE magazine

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FOREWORD

-From the desk of the Chairman

I heartily congratulate the department of ELECTRONICS & COMMUNICATION ENGINEERING for releasing 'Techno-chronicle', a Technical Magazine of ECE Department.

I strongly believe that these magazines should serve a purpose. If a student or teacher is looking forward for the release of the next issue, then the litmus test is through. For that, the magazine should contain publications, which are of generic interest too, in addition to the technical content of course. It could be latest Development / Innovation in the field of Electronics & Communication which when presented in a simple and lucid manner will interest the students. The practical applications and implication of latest research outcomes must be communicated in an interesting way, which will attract their attention. The write-ups should not be too technical with jargon that is not understood and appreciated by the students.

Achievements of the students of the college will give them a moral boosting and give them a confidence that they too are capable of doing them. Additionally, some entertaining articles will also amuse the readers.

I wish this magazine the best of luck in this Endeavour.

CHAIRMAN
Shri. G.R. Ravinder Reddy

PRINCIPAL'S MESSAGE

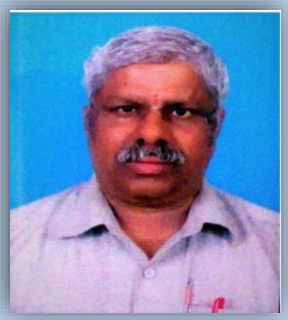
I am greatly delighted to write this message for our ECE department's Techno Chronicle magazine, which is the SECOND issue of technical magazine from the department. It is indeed heartening to note that students and faculty of the department have taken tremendous interest in writing various articles for the magazine and I am sure the readers would find them interesting. I appreciate the tenacity of the department, which has obviously resulted in the successful release of the magazine.

I am confident that this untiring effort of the department would motivate other departments too, to publish their respective technical magazines. I further, wish the department of ECE would sustain this momentum and continue with many other technical activities.

PRINCIPAL

Dr. Udaya Kumar Susarla

MESSAGE FROM THE HoD



I am happy to announce the release of the SECOND issue of ECE technical magazine, **Techno Chronicle**. The motto of this magazine is to encourage students, staff and faculty members to collect the latest information about research and developments in the areas of engineering, technology, administration, economy, quality assessment and quality assurance, pedagogical requirements etc., in the present scenario of rapidly changing world. This would improve the awareness among the stakeholders about the latest trends in the socio-economic scenario and pave a path for fulfilling the dreams of budding engineers.

I congratulate the editorial board and other team members for making this issue successful and valuable.

Dr. S. Suryanarayana, ME, Ph.D.

HoD- ECE Dept

MESSAGE FROM THE DEAN

It gives me immense pleasure to pen down my thoughts on the eve of releasing the second issue of the technical magazine “Techno chronicle” brought out by the students and staff of our department. I am fortunate to have been associated with the department which is progressing dynamically in all academic matters of interest. The introduction of “Project Based Learning” in various courses, the innovative projects carried out by students, the innovations in teaching brought in by the teachers, the growing research culture in the department, and the improvements witnessed in the students’ placements and the increased number of students seeking higher education, reflect its effort to align and work towards realizing the motto of the institution “Striving towards Perfection”

“There are two types of education, One that teaches you how to make a living and the other how to live." –Anthony de Mello

We do not simply teach our students how to make a living instead; we prepare them how to live. In other words, we mould the students as job providers and not as just job seekers. We wish to provide our students a holistic learning experience for life. Our aim is to teach students to LEARN, not just STUDY. Hence, we strive to travel beyond the boundaries of mere books. We have realized that the future is abstract and unknown but the youth in our hands are real and can be molded.

I believe this magazine will provide us the benchmark for continued improvement in overall development of the department. This magazine should be a good source of guidance for faculty and coming batched of students in choosing activities of their choice in their future building their careers.

May all our students soar high in uncharted skies and bring glory to the world and their profession with the wings of education!

"YOU DON'T HAVE TO BE GREAT TO START, BUT YOU HAVE TO START TO BE GREAT."

Prof. B. Hari Kumar

Dean – SE & CE

FOR THE STUDENTS

Hello Geethanjalites!

Thank you for taking time out of your schedules to read this magazine. It means a lot to us.

Writing is one of the most powerful tools known to humankind and we wish that this magazine would help students learn, practice and develop the art of discussion through the means of writing.

It gives us immense pleasure to announce the publishing of the second issue of this magazine. We hope it will offer an effective learning experience and deem itself a dear resource to all the students and teachers who read it.

Firstly, we thank the Chairman, Principal and HOD for giving this magazine and us a chance. We also thank our advisory board, for their guidance and valuable inputs that helped us improve our content.

Lastly, we would like to thank our committee members wholeheartedly for their steadfast dedication and belief that led to the successful publishing of this magazine. This would have been impossible without you.

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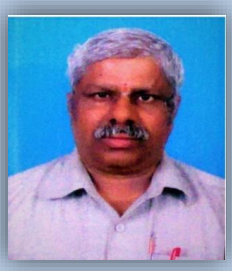

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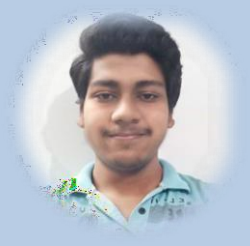

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EDITORIAL

The second edition of in-house technical magazine, **TECHNO CHRONICLE**, of our ECE department has become a reality in July 2021, despite disturbances caused by COVID-19. Surely, it is a moment of joy. I congratulate all the students who worked extra hours, in spite of their busy academic schedule and those who contributed articles that enriched the magazine.

We all have an onerous responsibility to promote and enrich our ECE Magazine. There are about 22 articles received for publication in this second edition of TECHNO CHRONICLE. After editing, 15 articles are printed. A large variety of topics related to ECE technologies- Electronics and Communications, and job applications are covered. Thus, these articles are expected to elicit good response from readers.

Electronics and Communications Engineering technologies have been growing into almost every facet of human life - education, health, automation, entertainment, security, defense, forecasting, and so on.

I trust the magazine, with these informative articles, will provide useful and interesting information to the readers and also promote advanced learning and motivation to publish articles in successive editions of Techno chronicle and reputed journals.

In conclusion, I quote a saying of Dr. A.P.J Abdul Kalam, "If four things are followed- having a great aim, acquiring knowledge, hard work and perseverance, then anything can be achieved."

I wish this magazine will serve its purpose fruitfully and reach the status of "much awaited periodical" in near future.

Dr S Suryanarayana
Professor-ECE Dept

CONTENTS

TECHNICAL ARTICLES/PAPERS

PERFORMANCE ANALYSIS OF LINEAR FREQUENCY MODULATION & NON-LINEAR FREQUENCY MODULATION

Dr B. L. Prakash, Professor, prakshvignan4368@gmail.com

***ABSTRACT*:**

The target and radar with high velocity, when compared with the velocity of transmitted signals, the received signal undergoes Doppler distortion. In order to overcome received signal distortion, LFM and HFM performance is analyzed. In high-speed radars, Doppler effects are one of the significant factors that cannot be ignored. Because of this problem, the linear frequency modulation waveform gets a degraded signal at its output. To overcome this effect, hyperbolic frequency modulation is adopted. In this paper, the hyperbolic frequency modulation waveform is Doppler-invariant compared with linear frequency modulation. Hyperbolic frequency modulation requires the Doppler-invariant property, which is employed for radar pulse compression techniques. Ambiguity diagrams are obtained for linear frequency modulation and hyperbolic frequency modulation waveforms. PSLR and ISLR also PLSR3 AND ISLR3 are computed for these both signals to demonstrate the Doppler invariant property.

Keywords: *Hyperbolic Frequency Modulation (HFM), Linear Frequency Modulation (LFM), Doppler-invariant, Ambiguity Function (AF), PLSR3, ISLR3.*

I. INTRODUCTION:

Good range resolution and long-range detection achieved by using Pulse compression. A very narrow pulse of considerable bandwidth and high peak power required to achieve better detection and Range Resolution transmission. Peak power has more number limitations; pulse compression technique is proposed in which it combines high resolution of short pulse width and energy of long pulse width. Many pulse compression waveforms are available, which are termed phase coding and frequency modulation waveforms. To determine where and whether the target located, a Matched Filter is adopted, which correlates the transmitted signal with the received signal. As a result, the output from the matched filter increases the Output Signal-to-Noise Ratio (SNR) in the presence of additive white Gaussian Noise while projecting a Stationary target. A mismatch will happen if the target is not stationary. The ambiguity functions of Doppler tolerant waveforms have gradually decaying thin ridges and hence reduce range rate, which causes detection degradation.

Target state and system parameters strictly depend on the idea of Doppler insensitivity. The narrowband transmission does not get affected by linear frequency modulation (LFM), Doppler insensitive. In this paper, the HFM is measured in which it opposes to consistent range rate, and thus it's been adopted in radar and sonar for non-stationary targets. The proposed paper aims to bring waveforms where it does not encounter any conflict between long-rate detection and high-range resolution. To avert conflicts, high BT waveforms that are increased bandwidth and time are considered. Examples of waveforms with high time bandwidth are LFM and HFM waveforms. An analysis and assessment are made to illustrate that the HFM is more Doppler tolerant than LFM.

By utilizing the ambiguity functions, the signals are illustrated. The Ambiguity function is a two-dimensional function that correlates the output power versus range and Doppler shift. It is analogous to the output of the matched filter. The Doppler distortion cannot be ignored if the target has high velocity. Due to the variation between the reflected signal from the target and the matched signal affected by Doppler distortion, experience the particular signal loss. By using HFM, which is insensitive to Doppler invariant property, this disadvantage gets mitigated. To avert the excess loss in signal, it is compulsory to use a Doppler invariant frequency-modulated waveform. For proving good range resolution capabilities with high bandwidth energy over an extensive range of frequencies, opted this waveform without losing its detection performance.

II.MATHEMATICAL MODELLING:

The transmitted LFM waveform is represented as in Eq.1

$$x(t) = \cos(\pi \frac{\beta}{\tau} t^2)\ 0 \le t \le \tau \qquad (1)$$

Where β is bandwidth= 1/τ hertz. The real value of the Eq.1 can be considered as the complex envelope of the waveform and given is by Eq.2

$$x(t) = e^{j\pi\beta t^2/\tau} = e^{j\theta(t)}\ \ 0 \le t \le \tau \qquad (2)$$

The derivative of the phase function with respect to time gives instantaneous frequency( ). For LFM waveform sweeps linearly across the total bandwidth of β (Hz) during the pulse duration of τ seconds is by Eq.3

$$F(t) = \frac{1}{2\pi}\frac{d(\theta)}{dt} \qquad (3)$$

The transmitted HFM waveform can be represented as Eq.4

$$x(t) = \exp\left[-j2\pi \frac{f_1 f_h}{\beta} T\left(\ln(1 - \frac{\beta t}{f_h T})\right)\right] \qquad (4)$$

Where$f_1 = f_0 - \beta/2, f_h = f_0 + \beta/2, f_0$ is mid-frequency, β is bandwidth and T is the duration of the pulse. The HFM waveform instantaneous frequency F(t)sweeps logarithmic across the total Bandwidth of β Hz during the pulse duration of T seconds.

III. FREQUENCY ANALYSIS OF LFM AND HFM WAVEFORMS:

Analyzing the waveforms and processing their features done by applying Fourier transforms. It is effortless to analyze a waveform in the frequency domain when compared with the time domain. Fourier transform of signal x(t)is represented as by Eq.5

$$X(\omega) = \frac{1}{2\pi}\int_{-\infty}^{\infty} x(t)e^{-j\omega t}dt \qquad (5)$$

X(t) is time-domain representation, X(ω) is frequency-domain representation.

The LFM waveform range has appeared in Fig. 1, and mostly it is seen to be in a rectangular shape.

Range resolution is a function of the bandwidth and duration of the transmitted signal. The more BT product wave-forms are utilized in the radars, as they permit to reach wider bandwidths without changing a pulse duration.

The power/unit bandwidth of HFM is not consistent so, for the HFM waveform, as shown in Fig.2, the spectrum is not flat. While simulating the operation of radar, the transmitted signal with a time delay can be considered as a received signal. By using the time-shifting property of Fourier transform, the delayed signal is obtained. For a signal $x(t)$, the time-shifted version is taken as $x(t - t_o)$ and is the required delayed signal.

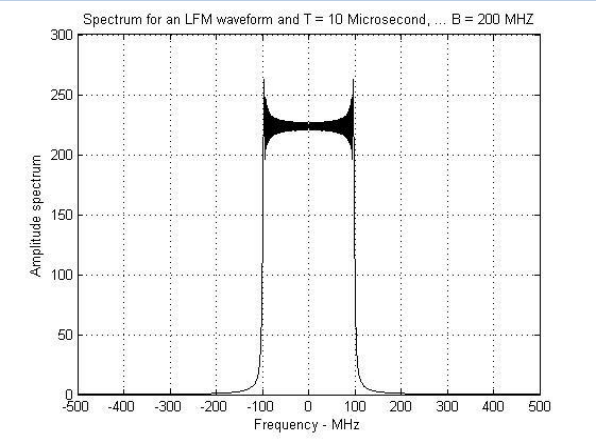

Fig 1.Spectrum of LFM waveform

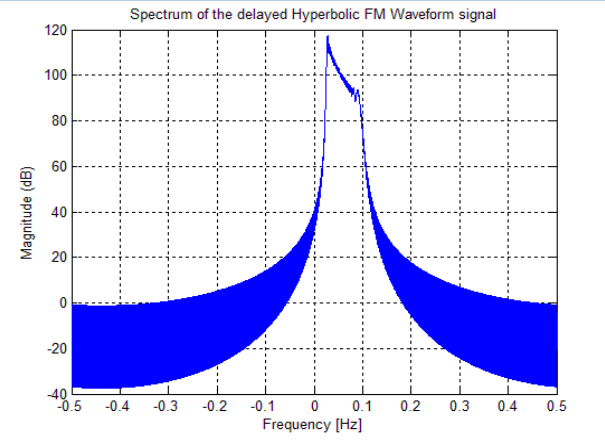

Fig 2.Spectrum of HFM waveform

$$F(x(t - t_o)) = \int_{-\infty}^{\infty} x(t - t_0)e^{-jwt}dt \quad (6)$$

$$= \int_{-\infty}^{\infty} x(\tau)e^{j\omega(\tau+t_0)}d\tau \quad (7)$$

$$= X(\omega)e^{-j\omega t_0} \quad (8)$$

In the frequency domain, a delay in the signal can be achieved by just multiplying with an exponential term $X(\omega)$.

$$X[n - n_0] \overset{F}{\leftrightarrow} e^{-j\omega_0 n}X(e^{j\omega}) \quad (9)$$

$X(e^{j\omega})$ is the Fourier transform of X[n]. The output from the Matched filter output is impulse response and matched to an input signal.

$$y(t) = x(t) * h(t) \quad (10)$$

$x(t)$ is the transmitted signal, and $h(t)$ is the filter response. The matched-filter response can be taken as the auto-correlation function of the signal. Hence matched filter reception and correlation reception are nearly similar.

The attributes parameters of the LFM and HFM wave-forms are uncompressed pulse width T(seconds) and signal bandwidths β(Hz). When the LFM and HFM wave forms are transmitted through the matched filter, a-Si(x) is acquired because of the correlation result. The matched filter yield for LFM and HFM are shown in Fig. 3-4. The height and width of the main lobe of the matched filter output rely on the bandwidth and the pulse width of the uncompressed pulse.

Ambiguity functions of LFM and HFM wave forms. The AF of an LFM waveform is represented as by Eq.11

$$\chi(t,f) = \left|\frac{\sin(\pi(f+\beta t/\tau)(\tau-|t|))}{\tau\pi(f+\beta t/\tau)}\right| \qquad (11)$$

$$\chi(t,f) = \left|\int_{-\infty}^{\infty} \text{rect}\left(\frac{t}{T}\right)\text{rect}\left(\frac{ft+\tau}{T}\right) * \exp\left\{-j2\pi\frac{f_0^2}{k}\left[\log\left(1-\frac{kt}{f_0}\right)-\log\left(1-\frac{k(ft+\tau}{f_0}\right)\right]\right\}\right| \qquad (12)$$

The Ambiguity Function of the LFM waveform shows a linear ridge in the delay Doppler plane. This linear ridge has appeared in Fig. 5. In case that the target moves at a consistent velocity, then LFM can be used. On the off chance that the target moves at a higher velocity, then HFM is utilized. The HFM exhibits a hyperbolic ridge. The performance of these waves can be given by describing the signal measures such as peak Side Lobe Ratio, Integrated Side Lobe Ratio, Merit Factor and Discrimination.

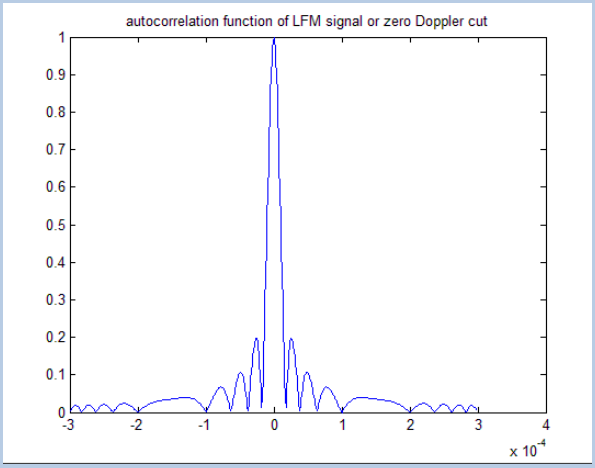

Fig. 3. Zero doppler cut of LFM

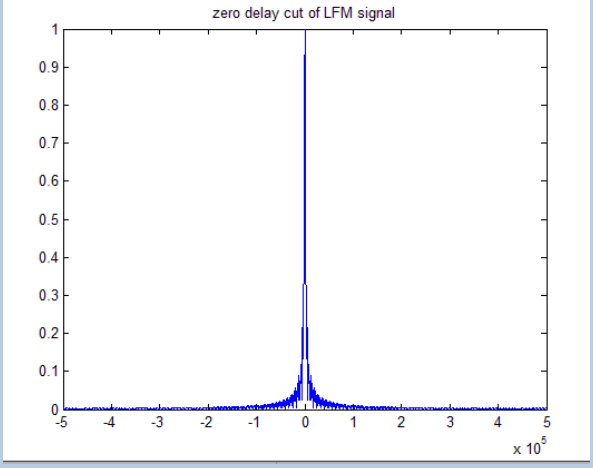

Fig. 4. Zero delay cut of LFM

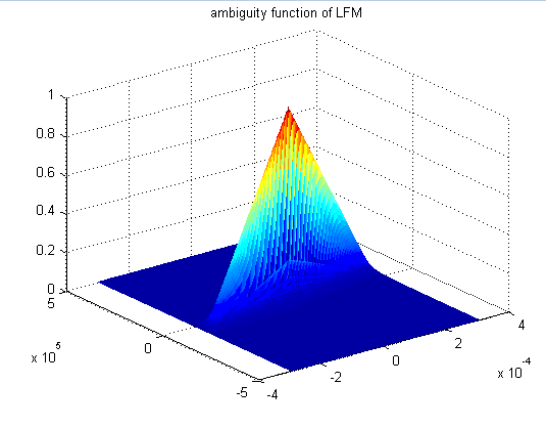

Fig. 5. Ambiguity Function of LFM

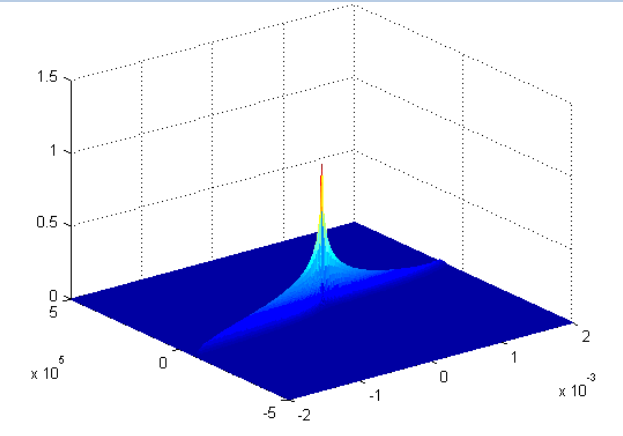

Figure 6. Ambiguity Function of HFM

Discrimination (D): Discrimination (D) is the ratio of the prominent Peak in the Autocorrelation function to the absolute maximum amplitude among the side lobes.

$$D = \frac{x(0)}{\max|x(k)|}, \qquad k \neq 0 \tag{13}$$

Merit Factor (F): Merit factor F is the ratio of energy in the main lobe of the Autocorrelation function to the total signal energy in side lobes.

$$MF = \frac{x^2(0)}{2\sum_{k=1}^{N-1} x^2(k)} \tag{14}$$

PSLR: The Peak side lobe ratio is the most significant sidelobe in the correlation of a code and its filter. This ratio is usually expressed as a ratio of the peak sidelobe amplitude to the primary lobe peak amplitude and is expressed in decibels.

$$PSLR = 20\log_{10}\left(\frac{\text{Max. sidelobe peak}}{\text{Main lobe peak}}\right) \tag{15}$$

ISLR: The Integrated side lobe ratio refers to the total energy in all the side lobes and is expressed as a ratio of the total side lobe energy to primary peak energy.

$$ISLR = 10\log_{10}\left(\frac{\text{Total side lobe energy}}{\text{primary peak energy}}\right) \tag{16}$$

IV.DOPPLER INVARIANT PROPERTY OF HFM COMPARED WITH LFM:

For an LFM, if the target and radar relative velocity is very high when compared with the velocity of waveform transmitted signal, then the reflected signal is Doppler degraded, which undergoes Doppler distortion the resultant output does not match with matched filter. Due to this, the output of the matched filter will be degraded significantly, causing a loss in the signal. The Doppler distorted waveform can be expressed as a function of τ by the range and a Doppler shift (f) caused by the relative velocity between the target and radar. If the Doppler shift is included, the performance will degrade slowly in LFM waveform when matched to HFM waveform. There is a substantial loss in the signal and an increase in pulse width. Whereas in HFM waveform, the Doppler distortion effect is more when compared to LFM. It is observed that the amplitude is marginally reduced in HFM waveforms. The HFM waveform undergoes less signal loss when compared with LFM waveforms.

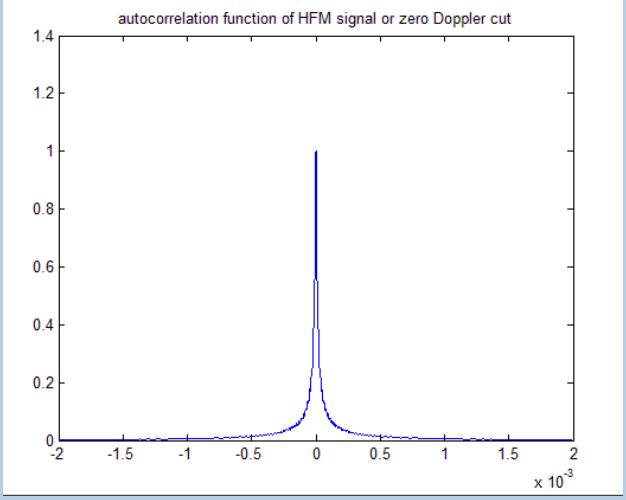

Fig. 6 Zero Doppler cut of HFM

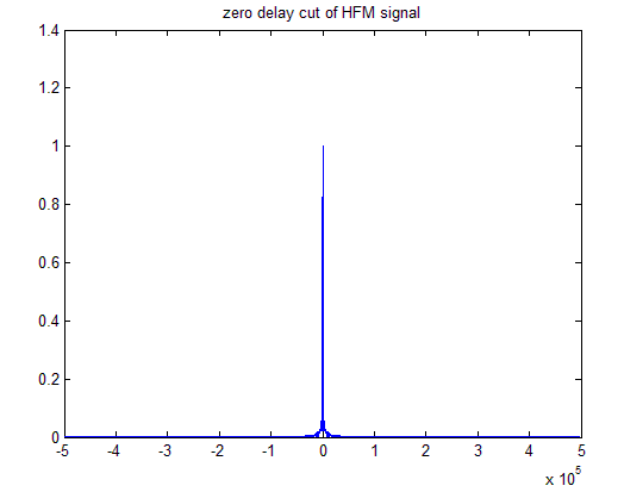

Fig. 7 Zero Delay cut of HFM

V. RESULTS:

The zero-delay cut and zero Doppler cut of LFM and HFM waveforms are observed. The PLSR and ISLR are calculated. In this paper, the Merit, Factor and Discrimination Factor of LFM and HFM waveforms are calculated. By these performance measures, HFM waveform said to behave higher performance than that of LFM.

I. TABLEULAR FORM:

WAVEFORMS	LFM	HFM
DISCRIMINATION FACTOR (D)	5.0408	36.10
MERIT FACTOR (F)	15.527	21.815
PSLR (in dB)	-14.0498	-51.1491
ISLR (in dB)	-11.9098	-13.3868
PSLR 3 (in dB)	-13.311	-51.149
ISLR3 (in dB)	-26.889	-33.058

II. PERFORMANCE CRITERIA OF LFM & HFM:

It is also required to assess the signal characteristics in the Doppler domain. The HFM waveform is a Doppler invariant and displays the range-Doppler ambiguity. Thus HFM provides the chance of escaping the degradation of matched filter output in range resolution, and it can accompany the use of LFM waveform in radar, sonar &laser radar applications.

III. CONCLUSIONS:

The Ambiguity Function of the LFM waveform displays a linear range in the delay Doppler plane; however, HFM signal displays a parabolic range in its delay Doppler plane. The output of matched filter proposes that HFM waveform is Doppler and acceleration tolerant. If the target is of constant velocity LFM waveform can be used, and if the target moves with high velocity, HFM is used as it is Doppler tolerant. With the performance methods of the LFM and HFM waveform, we conclude that HFM waveform can be used for fast-moving targets as they exhibit good results. Due to Better Calculations of Performance Metrics, HFM, which is a Mode of NLFM, is Quite Efficient in RADAR Applications Compared to LFM.

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DynMAC BASED SPECTRUM HANDOFF ALGORITHM FOR DETERMINISTIC MULTIHOP INDUSTRIAL NETWORKS

Appala Raju Uppala, Associate Professor, raju.mdl@gmail.com

ABSTRACT

Cognitive Radio (CR) networks are being used in industrial wireless applications due to their inherent capabilities. The effectiveness of cognitive radio depends on the type of Medium Access Control (MAC) and handoff algorithms used and can be measured by its deterministic reinstating of transmission channels. However, the applicability of CR algorithms for multi-hop networks is less explored. Hence, in this paper a deterministic handoff algorithm for multi-hop networks is proposed with the help of CR based MAC. A Common Control Channel (CCC) free MAC based on GINMAC termed as DynMAC (Dynamic MAC) is chosen for experimentation. Unlike conventional DynMAC, new functionality that makes Child Nodes (CN) aware of the Global Channel (GC) list generated by Sink Node (SN) is added in DynMAC of the proposed approach. This along with the spectrum handoff algorithm facilitates the switching of transmission channels on receiving three consecutive errors. DynMAC is evaluated employing network calculus to theoretically model its arrival and service curves. Simulations have been carried out in the Integrated Development Environment (IDE) using DynMAC with and without the proposed spectrum handoff algorithm for both single and multi-hop networks. Lognormal shadowing, Rayleigh fading, Rice fading, and interference is considered for finding Cumulative Distribution Function (CDF) of delays and Packet Error Rate (PER). Results indicate that DynMAC when used with the proposed spectrum handoff algorithm performs better compared to when it is used without the spectrum handoff algorithm.

1. INTRODUCTION

Sensors are generally tiny, battery-powered devices that monitor and record conditions of environments. Conditions include temperature, pressure, humidity, , power line voltage, chemical concentrations, pollutant levels, and vital body functions. The sensors are usually placed in self-governing devices and are collectively referred to as sensor nodes. Sensor nodes are spatially distributed with the number ranging from few to several thousand. Connecting sensor nodes through wired networks is time-consuming and labor-intensive especially when the distance is large. In industrial applications, using cables leads to high maintenance costs and aggregation of a large number of wired equipment which is dangerous in case of situations like fire outbreaks. Hence, Wireless Sensor Networks (WSN), which connects sensors wirelessly, is used in industries. International Society of Automation (ISA) specifies six types of industrial systems: safety systems, closed-loop regulatory and supervising systems, open-loop control systems, alerting systems, and information gathering systems. In industrial scenarios, WSNs perform three basic

tasks; collection, processing, and transmission of data [1]. While collection and processing depend on the inherent attributes of sensor nodes, transmission works through co-operative action between sensor nodes. Transmission is enabled by various wireless standards like Wireless HART, ISA 100.11a, Zigbee Pro, 6LoWPAN, and IEEE 802.15.4e. However, unlike normal WSNs, Industrial WSN's has additional requirements such as interoperability, link reliability, service differentiation, a facility for data aggregation, noise resistance, deterministic latency, predictive behaviour, coexistence, support for multiple sources and sinks and application-specific protocols which are not fully addressed by above standards [2]. Further, industrial machinery produces interference, in the presence of which deterministic behaviour is not guaranteed by mentioned standards. For example, in case of fire, an alarming signal is produced by the corresponding section which should reach the safety section in deterministic time. If not, it will result in human injuries and machine losses. In the presence of interference, even extensions of IEEE 802.15.4e and Zigbee Pro is inappropriate in tackling this problem. This is a matter of concern in industrial applications which demand real-time capabilities.

Cognitive Radio (CR) proposed by J.Mitola [3], is a handy solution for IWSN's. CR initially finds available channels (spectrum holes) and transmission is initiated in the best free channel. When interference happens, CR stops current transmission and switches to another available channel. However, it is not significant than other wireless standards, as the handoff process (a process of stopping transmission in one channel and reinstating in another channel) is not deterministic. Hence, the deterministic handoff process is required for using CRs in Industrial WSN's (IWSN's).

However, studies in CR have been much concentrated on single-hop networks whereas multi-hop CR networks are gaining interest recently. Hence, in this paper a deterministic spectrum handoff algorithm for CR in multi-hop networks is proposed.

2. PROPOSED SPECTRUM HANDOFF ALGORITHM

DynMAC sensor nodes work based on offline dimensioning mechanisms. Hence, each node is aware of its parent or child nodes. Once channel switching messages are sent by the sink node, child nodes send joining frames back to sink nodes. In case of interference, these frames are not received by sink nodes, since such frames are not generated, as channel switching messages are not received by child nodes. Hence, if the sink node does not receive a joining frame after sending a channel switching message it is considered an error. Similarly, if the parent node does not receive a joining frame from the child node it is also considered an error. Further, as DynMAC is a traditional MAC, slots are reserved for nodes irrespective of whether there are packets to transmit or not. This makes parent nodes unaware of packet loss due to interference as they consider it as lack of packets instead of loss of packets. This is a matter of

serious concern in deterministic real-time industrial applications where every packet is vital. Hence, in the proposed approach two functionalities are appended. One is a new flag functionality added to child nodes of DynMAC which informs parent nodes that packets are there to transmit. This flag frame is sent repeatedly until parent nodes are aware about the presence of packets in upcoming slots. Therefore, when the flag is active and parent nodes do not receive a packet from child nodes it is considered an error. Once an error is found flag frame is sent back to the child node. Another feature of our proposed approach is that every child node is updated with the final channel list used by the sink node for selecting best channels. Hence, when communication is lost child node itself can hop to best channel without rescanning sink node.

Therefore, errors are detected in the MAC layer. When DynMAC is used for cognitive radio, waiting for specific time duration to scan sink node and hop to another channel is not feasible. In our proposed approach, a consecutive number of errors received is taken as a metric to hop to another channel. The schematic representation of the proposed handoff algorithm is shown in Fig.2.It represents three instances of communication loss. In the first instance, due to interference, no Joining Frame (JF) is generated, and hence there is a loss in communication. After three instances, the Child Node (CN) detects interference; Best Channel (BC) selects BC and hops to another Channel Hoping (CH). The proposed handoff algorithm thus ensures time-bound in delay traffic, and since DynMAC which is used to evaluate it is not based on CCC, problems due to external interference are avoided.

3. RESULTS AND DISCUSSION

The simulations were carried out in C++ based Integrated Development Environment (IDE). The nodes were randomly placed in 100m x 100m square to imitate real-time industrial multi-hop topology. All nodes are simulated based on the IEEE 802.15.4 physical layer. The proposed DynMAC based spectrum handoff algorithm is evaluated in terms of PER and delay. In industrial wireless scenarios fading is one of the major factors which influence the transmission and reception of packets. For simulation purposes they are often modelled as a random process. Fading can be slow or fast. Slow ones are termed shadowing and occur when the path between transmitter and receiver is obstructed. They are modelled as shown in Equation (9).

$$PL(d) = PL(d_0) + 10nlog_{10}\left(\frac{d}{d_0}\right) + X_\sigma \qquad (9)$$

Where $PL(d_0)$ is path loss in dB at distance d_0, $PL(d)$ is path loss in dB at an arbitrary distance d and X_σ is zero-mean random variables with standard deviation σ. Fast fading occurs as a result of small changes in results between transmitter and receiver. In our approach, we used Rayleigh fading and Rician fading to model fast fading as shown in Equation (10).

$$PL(d) = \sigma - \sqrt{(-2logU)} \quad (10)$$

Where U is uniform distributed numbers in the interval [0 1]. Rician fading is similar to that of Rayleigh fading except for the fact that the Line of Sight (LOS) component is present. The arrival rate is modelled according to stationary traffic as mentioned in network calculus. Further, other networks may co-exist in a networking environment leading to interference. Hence, WiFi interference was also considered for simulations. Table 1 shows PER of DynMAC with and without spectrum handoff algorithm for both single hop and multi-hop networks under lognormal shadowing, Rician fading, and Rayleigh Fading.

In multi-hop networks, packet error probability increases with the number of hops as is evident from PER values. DynMAC when used in single-hop networks with spectrum handoff shows low PERs compared to normal DynMAC. But its effect is more profound in multi-hop networks which prove that the proposed handoff algorithm is suitable for multi-hop networks under fading environments. Fig.7 shows the performance of DynMAC in the presence of interference for single-hop and multi-hop networks.

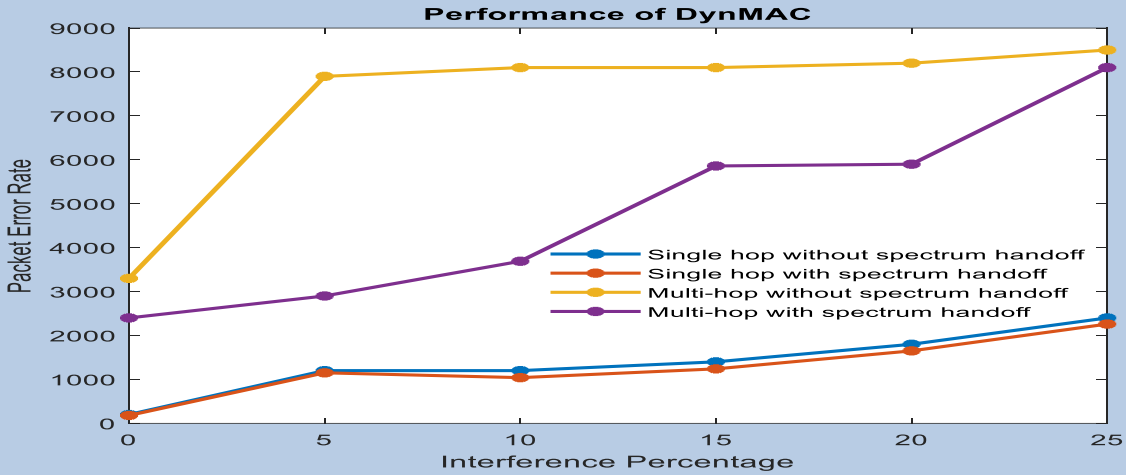

Fig.7. PERFORMANCE OF DYNMAC WITH AND WITHOUT PROPOSED SPECTRUM HANDOFF ALGORITHM FOR SINGLE AND MULTI-HOP NETWORKS

From Fig.7, it is obvious that single-hop networks with handoff produces least PER in environments affected by interference whereas multi-hop networks without spectrum handoff produces the highest PER. In the case of both single-hop and multi-hop networks, the proposed algorithm is found to decrease PER. However, the approach should be validated in terms of delay which is of significance in industrial deterministic applications. Fig.8 and Fig.9 shows the delay of DynMAC with and without the proposed handoff algorithm in lognormal fading environments.

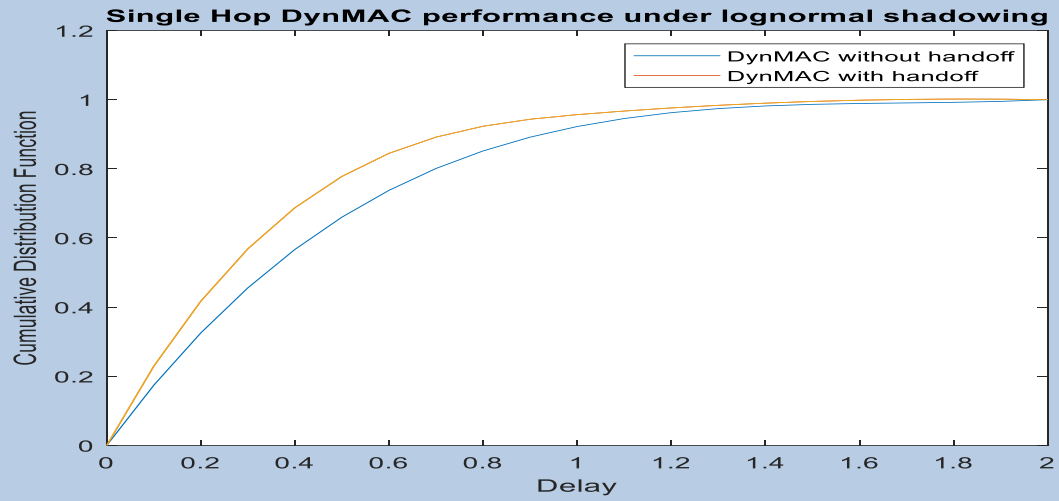

Fig.8. DELAY FOR LOGNORMAL SHADOWING IN SINGLE HOP NETWORKS

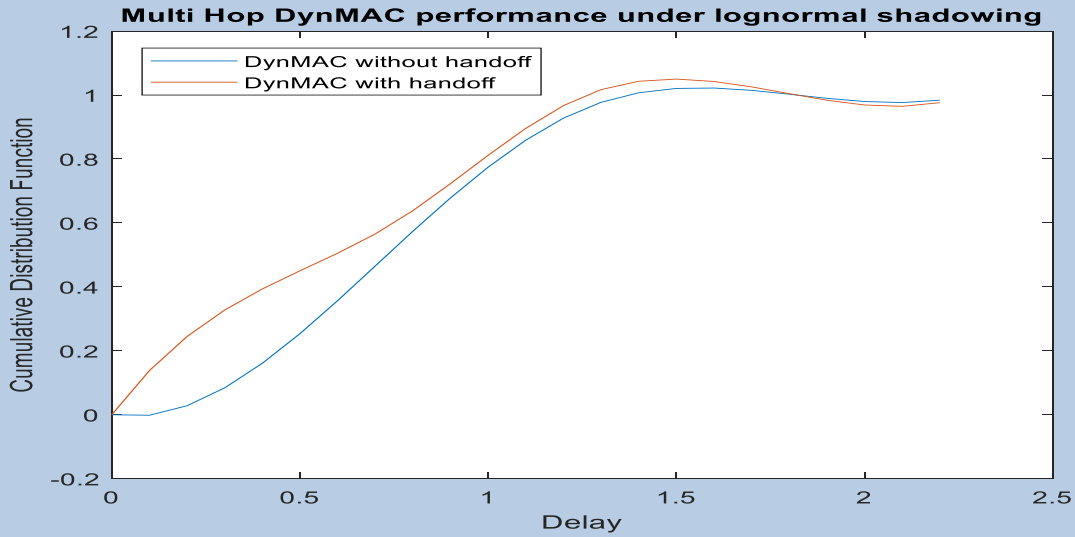

Fig.9. Delay For Lognormal Shadowing In Multi-Hop Networks

In single-hop networks, the proposed spectrum handoff algorithm shows better delay performance compared to a network that used normal DynMAC. Further, the algorithm maintains its performance in multi-hop networks too. However, the delay is increased in multi-hop networks as the number of hops is more. The decrease in delay in the proposed approach can be attributed to flag functionality as well as provision provided to CNs for selecting the best channel, unlike conventional DynMAC where SN is solely responsible for selecting the best channel. Fig.10and Fig.11shows delays in frames for Rayleigh fading environments.

It should be noted that delays are higher in Rayleigh fading channel compared to lognormal shadowed channels. This is due to the fact that in Rayleigh fading many objects are present in the environment that scatters signals before getting to the receiver. However, the proposed algorithm shows better performance in Rayleigh environments too owing to additional functionalities added in DynMAC along with usage of

three consecutive errors for hopping to the next channel by CN's. Rice fading is not discussed as it provides results similar to that of lognormal shadowing.

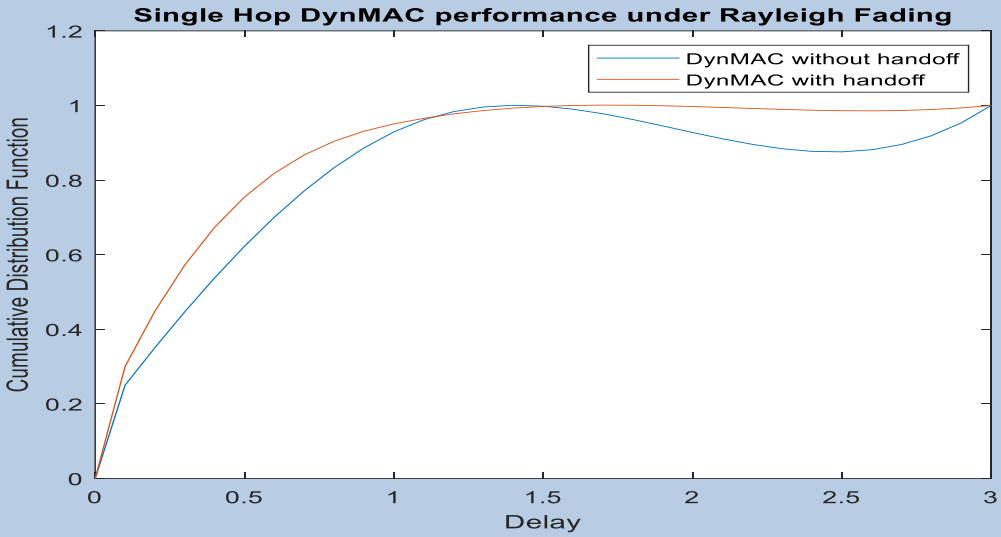

Fig.10. Delay For Rayleigh Fading In Single Hop Networks

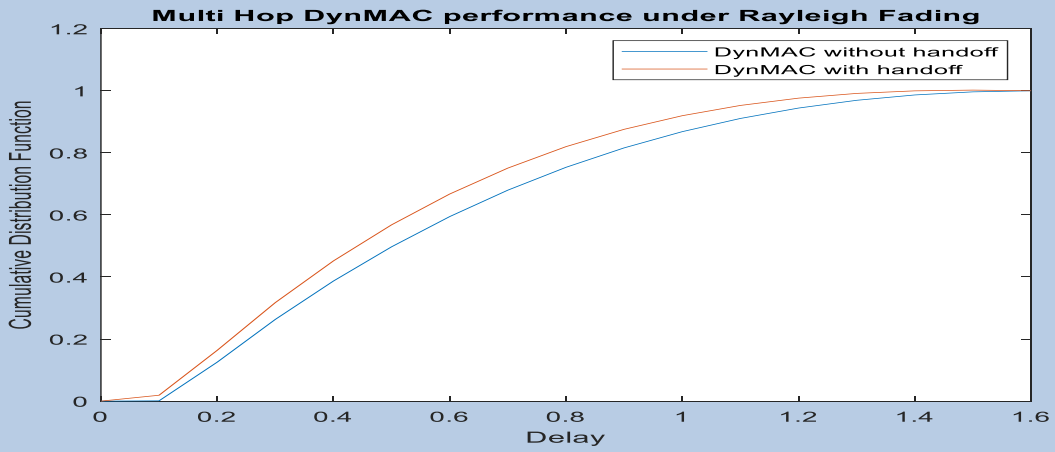

Fig.11. Delay For Rayleigh Fading In Multi-Hop Networks

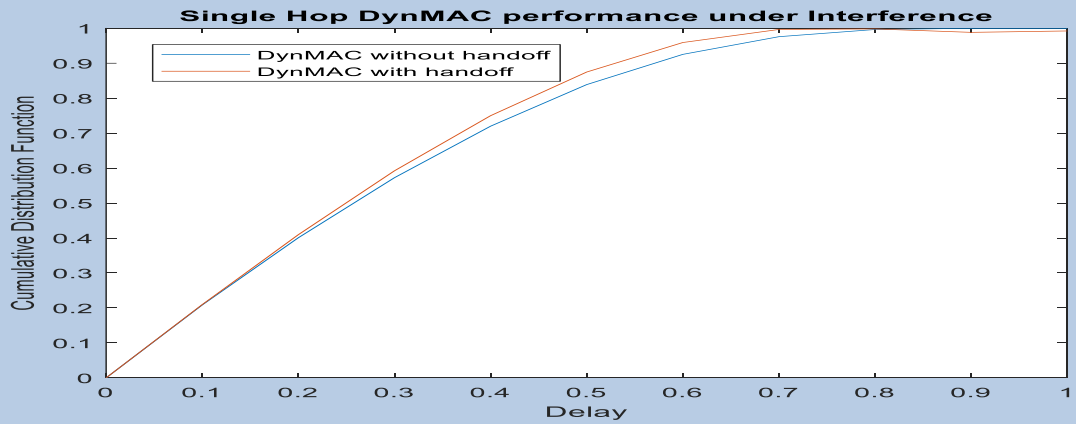

Fig.12. Delay For Single Hop Networks In The Presence Of Interference

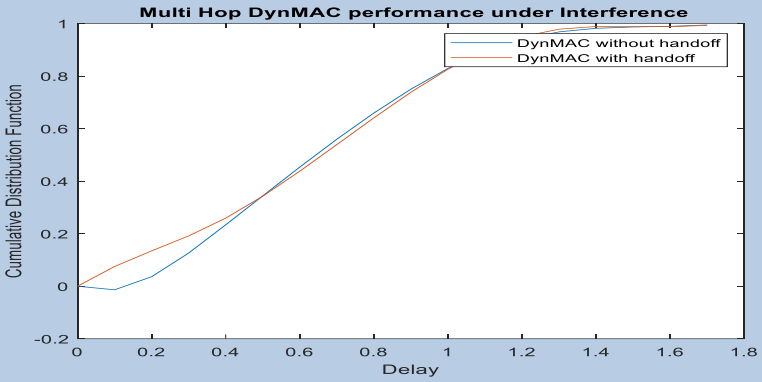

Fig.13. Delay For Multi- Hop Networks In The Presence Of Interference

Fig.12 and Fig.13 shows the cumulative distribution function of the proposed algorithm at 25% interference. When MAC is used without a spectrum handoff algorithm it increases delay. On the other hand, when it is used a CR system capable of detecting interference and hopping to another channel in a deterministic time is created. Additionally, resultant delays of the proposed algorithm are similar to that of interference free environments. From the overall analysis of delay and PER it can be deduced that the proposed spectrum handoff algorithm ensures determinism and robustness against interference.

4. CONCLUSION

In this paper a spectrum handoff algorithm based on one of the advanced MACs known as DynMAC for multi-hop networks is presented. The approach is able to detect interference in the middle of transmission and hops to another channel in deterministic time. The suitability of DynMAC is analyzed with the help of network calculus. Simulations were carried out for the proposed algorithm considering both single-hop and multi-hop networks under different fading and interference environments to determine packet error rate and delay. The results indicate better performance of the proposed. As an extension, the response of the system for non-stationary traffic considering both single and multi-hop networks will be studied in future.

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SMART FLOWER – FUTURE OF SOLAR ENERGY

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I. INTRODUCTION:

What is a "smart flower"?

The sensible flower is that the world's star answer to use associate all-in-one, sculptural style and intelligent answer to supply clean, property energy for industrial and residential functions.

Smart flowers are modeled sort of a helianthus, and that they have all the individual parts, as well as star panels, inverters, wiring, batteries, etc all to come up with electricity and store it.

Besides generating solar energy, another objective of putting in smart flower is to make public awareness and increase the adoption of renewable energy. The system will generate four-hundredth a lot of solar energy than a traditional electrical phenomenon panel. The integrated instrument panel compiles relevant information, like energy usage. Afterwards, the system is created accessible to users through the smart flower mobile application. Every flower petal of the smart flower is rear-ventilated, and that they have brushes that may self-clean the panels whenever they unfold and refold. The smart flower is put in for best operate and potency and may be resettled if the patron moves to a different place.

II. WORKING:

After the sunrise, the integrated trailing system within the smart flower rotates and follows the sun on a dual axis because the sun moves throughout the day. It ensures a relentless best angle for max energy production and potency throughout the day. Typical star panels square measure typically fastened and therefore solely get marginal best positioning if put in correctly. Throughout sunset, the smart flower folds up the petals and cleans its star petals within the method. Sort of a flower, the system rises with the sun by evolving the petals pretty wide to catch the rays and keeps trailing it across the sky throughout the day.

Depending on the placement, a smart flower will generate between three,800 and 6,200 kWh of star electricity p.a., which is, as explicit earlier, nearly four-hundredth quite typical star panels manufacture.

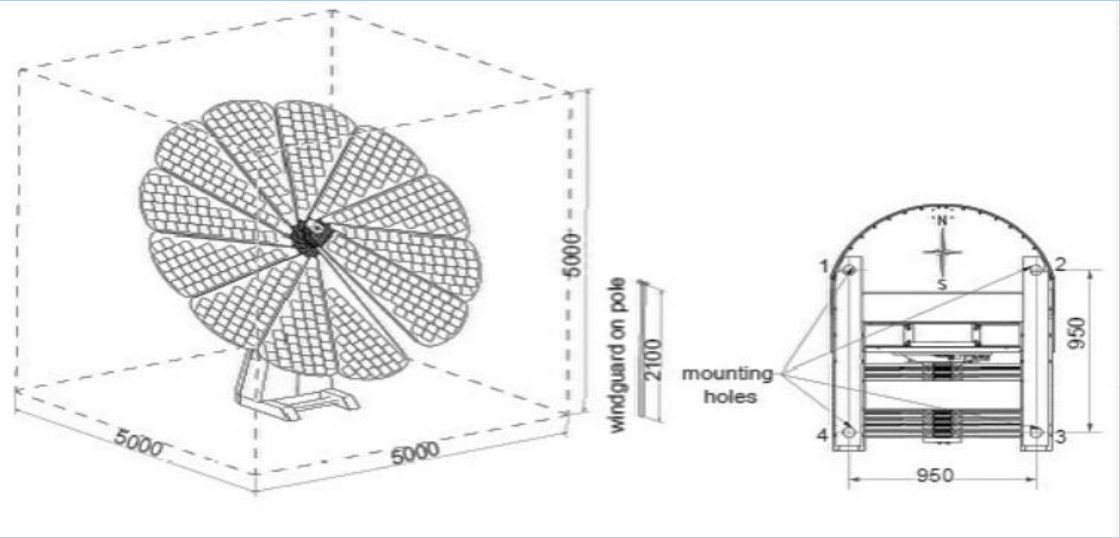

Fig1. Smart flower work flow

III. THE KEY OPTIONS OF A SUNFLOWER:

- **Work's sort of a Sunflower**: When the sun rises within the morning, the smart flower unfolds its petals mechanically, direct its standard star fan towards the sun and starts generating electricity. As a result of the dual-axle sun trailing, the fan moves in conjunction with the sun throughout the day.
- **Easy to Install**: Smart flower provides utility as associate all-in-one system associated becomes operational within an hour. There is no complicated assembly needed to put in the system. The system has been designed for optimum performance, and it is straightforward to use and maintain.
- **Smart Tracking**: Due to the integrated astronomical system, the standard star fan of Smart flower moves horizontally and vertically because the sun changes its position, notwithstanding a cloudy sky. This explicit feature ensures optimum alignment with the sun, that is, a particular angle of 90°. It works like this throughout the day, even once the sun is down on the horizon throughout the winter.
- **Self-cleaning**: Smart flower cleans itself from mud or snow by folding and evolving itself. Because of this, loss of energy output is reduced (up to 5%). So, Smart flower is a self-cleaning device.
- **Smart Cooling**: Solar modules that heat up produces less electricity than cooling modules. If the temperature is 10°C a lot of, the loss of output is five-hitter. Smart flower modules forever stay rear-ventilated, and hot air cannot build-up due to their construction. It suggests that smart flower modules square measure 10–20°C cooler and manufacture 5–10% more output than topside systems.
- **Portability**: Mobility may be an essential feature of smart flower modules over fastened topside systems. Disassembly smart flower is as straightforward as collecting them.
- **Safety**: When the smart flower operates throughout the day, the sensors keep watching the wind speed. If wind speeds go higher than 54 km/h, the smart flower mechanically folds into its secure position to avoid damages. If the wind intensifies to 63 km/h or a lot, the unit takes up the secondary

security position because it will work at night hours. The sensors still work, and once the wind speed reduces, the system unfolds once more and starts generating electricity.

- **Consistent Production Capacity**: Despite its lower coverage space, smart flower modules generate up to four-hundredth more output than a traditional topside system. Smart flower generates the same rate of energy throughout the day for employment and energy consumption. On average, the system produces about 4000 kWh output p.a. and may fulfil the common electricity demand of a unit within the central European region. The system achieves a substantial degree of self-utilization of nearly 60%, which may be a significant improvement compared to a top side unit. A conventional topside solar array has a mean utilization of around half-hour. Also, Smart flower reduces output losses by up to fifteen.

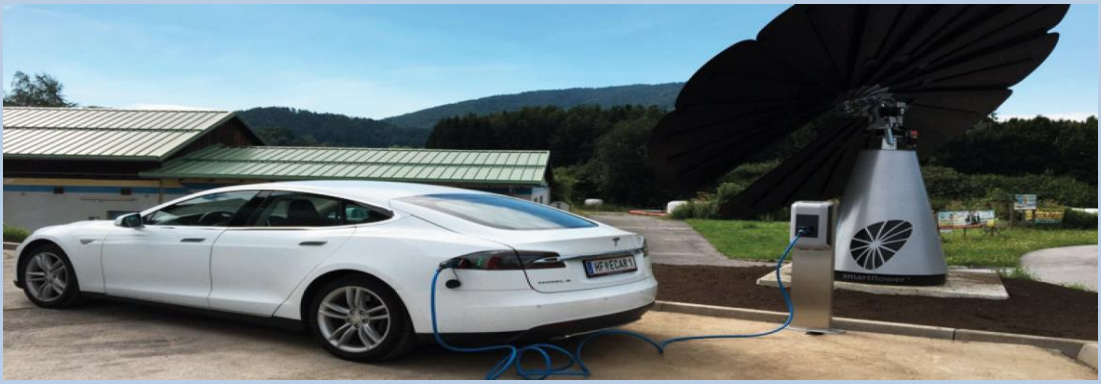

Fig 2: It breaks away fossil-fueled ways of the part and connects human technologies and nature.

IV. CONCLUSION:

Solar power is pollution-free and causes no greenhouse gases to be emitted after **installation**. It reduces dependence on oil and fossil fuels. **Switching to solar energy** will not solely help us solve the **electricity** crisis but also reduce the usage of conventional energy source.

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MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE IN PLANET-HUNTING

A Brief Overview.

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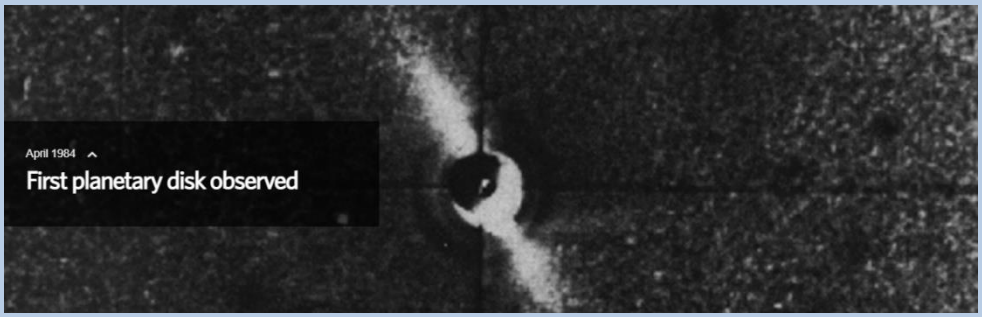
One of the fascinating elements of the 21st century is this- Machines can be taught to do things. What is more, they can be trained to learn the same by tweaking various parameters. The best part is its ever-evolving capability and broad scope in terms of areas of applications. Thus, we can call this the classical definition of Machine Learning- “the utility and development of computer systems that be taught to adapt without following explicit instructions by considering a combination of algorithms, statistical models and various programming techniques to analyze and draw conclusions from patterns in data.”
Artificial Intelligence has become a thing of omnipresence. Every encounter with technology involves A.I at some level. This article's primary aim is to throw light on a particular area of application of A.I and Machine Learning - Planet-Hunting.

Astronomy- One of the most dynamic fields of science. The sheer vastness of Data available makes it plausible for researchers to yield promising results compared to other fields such as particle physics. Yet, we can say that a lot of data that we currently hold is not correctly being analyzed.

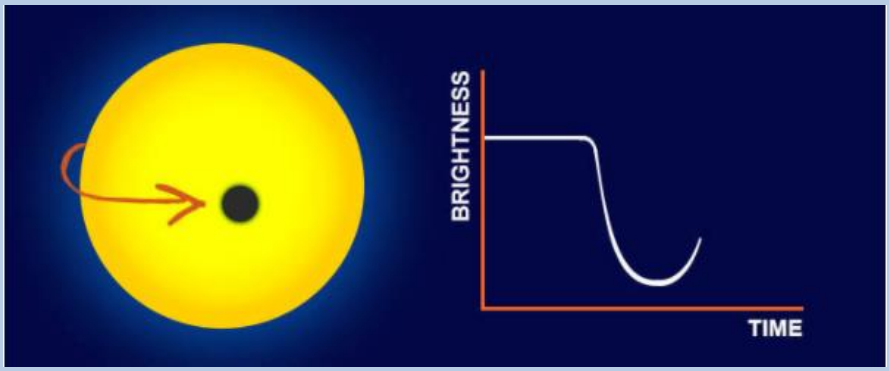
Let us start from the top. What is this "Data" in our context?

In 1984, the Du Pont telescope observatory in Chile discovered a disk of dust and gas around the star Beta Pictoris. That was our first planetary disk. Later in 1992, 2 rocky planets were discovered in the constellation Virgo. Today, NASA's Kepler satellite and Transiting Exoplanet Survey Satellite, a.k.a, TESS, have discovered a combined total of 4000 "confirmed" planets. Such is the progress in Planet-hunting.



By "Data", here we refer to all the information that TESS sends back to Earth. So let us examine in detail what TESS does and what role it plays in the bigger scheme of things. As the name suggests, TESS works based on the Transit spectroscopy method. When TESS looks for planets, it does not scan the skies for actual Exoplanets, as one may assume. It does this- Study stars capable of supporting planets (like our Sun!). The stars, or rather their brightness, is what matters the most in this equation.

Imagine a torchlight that is switched on, beaming light onto a wall. Any small object placed between the light source and the wall will affect the amount of light received, thus decreasing the overall intensity. Now lets us say the object is a tiny ant walking across the diameter of the torchlight. If we plot the intensity of light against the time the ant moved across, we can observe a drop in the graph caused by the ant's body obstructing the light. The intention behind this analogy was to illustrate precisely how TESS functions- the ant being planets and the torch being stars.

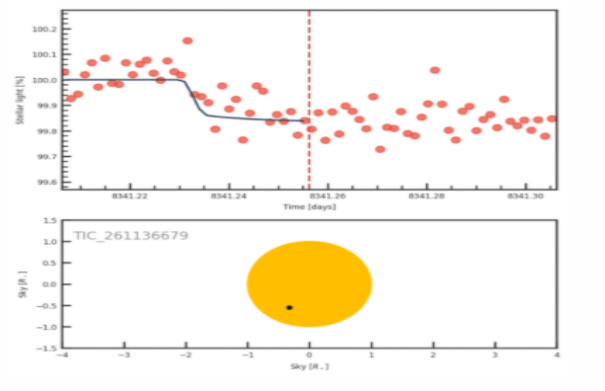


One may raise this question- The stars are gargantuan compared to planets, so will the decrease in intensity even matter? Will it show up? The answer would be Yes both times. Leave the mechanics of TESS to highly-skilled aerospace engineers of NASA, and we now have 27 GB of data being sent to us every day. When juxtaposed, that is the equivalent of about 6,500 song files beaming down to Earth every two weeks!

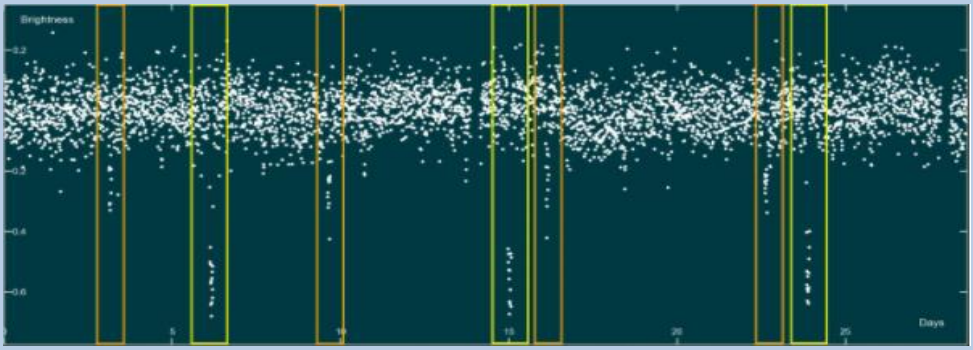
Where does all this Data go? Who gets to analyze all of it?
On July 4th of 2020, NASA's Transiting Exoplanet Survey Satellite (TESS) upon finishing its primary mission, imaged about 75% of the starry sky as part of a two-year-long survey. In the process, TESS has found 66 new Exoplanets beyond our solar system. About 2,100 astronomers are working to confirm this. TESS surveys 24-by-96-degree strips of the sky called sectors for about a month using its four cameras. As a part of the mission, the first year was spent observing 13 sectors of the southern sky while the consequent year imaged the northern sky.

The TESS data is made public through archives at the Mikulski Archive for Space Telescopes (MAST). Before release, the raw spacecraft data will be calibrated by the Science Processing and Operations Center (SPOC). There are websites such as zoouniverse.org that host planet-hunting data for the general public, and yes, ANYONE can access and help categorize this Data. What exactly are we supposed to do, you ask? Well, here is it.

The below picture roughly explains how the phenomenon occurs, but in reality, this is the kind of data that we receive as the star passes across the star. The dips in the light curves are what one must be precisely wary of.



In the next step, you will be asked to demarcate the dips that you can spot. It should look something like this:



Now, NASA has a huge section called "citizen science", where the general public is given access to Data and can help them classify, categorize or organize this information. The question is WHY?

Why should a massive organization like NASA have to take help from the masses? Undertakings such as TESS come with a lot of background research and human resource, yet, why are we called for help? Here is the simple answer- NASA already has complex machines and algorithms to sort through streams of data captured by TESS every two minutes. However, these algorithms are not perfect. Here are some complications that are like test cases that these pieces of code may not be able to crack :

- The vast majority of stars are not alone but instead exist in double or even triple systems of stars that orbit around on e another. When one of these stars passes in front of another (as seen by us), the brightness that we observe changes, similar to what happens during a planet transit. These are known as binary stars.
- Stars have star spots just as the Sun has sunspots, and as they rotate with the star, they result in periodic fluctuations in the observed brightness.

- Stars can also pulsate. This is when the radius of the star changes over time, and thus the brightness fluctuates. This effect ranges from being very rapid, on the timescales of a few hours, to extremely low, on the timescale of years.

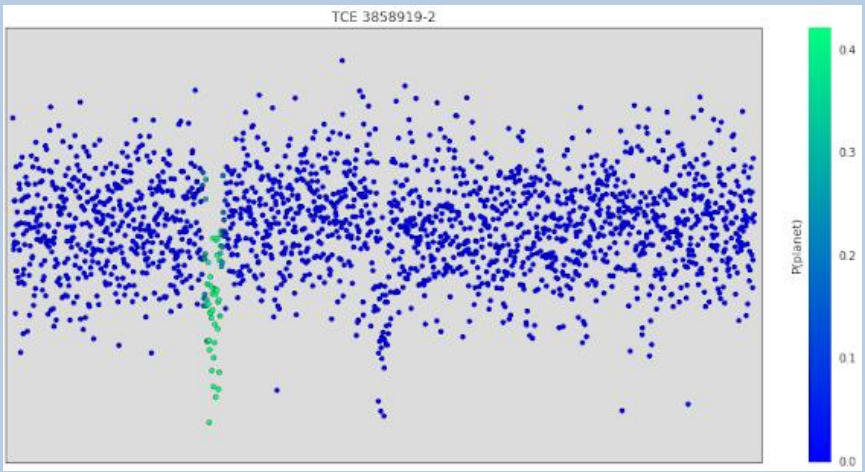
All such paradigm shifts make it difficult for machines to categorize and classify data. Thus, NASA releases its data to the public so some peculiarities can be recognized better and the system can "learn". Now that we know what role learning plays let us examine how the machines and the supposed algorithms work.
Since such intricacies require a calculated approach, the situation can be tackled by implementing the below routine.

1. Collect and construct a "Master" dataset from Kepler archives: The data from the Kepler space telescope has been nine years in the making. It collected multiple points of data by considering a wide range of variables.

2. Develop various models of classification: Each model must be able to accommodate one condition or exception accurately. These models must be independent of each other and may use varying methods to deal with the particular condition of exoplanet classification.

3. Create a generalized model that can accommodate all previously generated models- A composite-master model of sorts that can classify exoplanets with various exceptions in light curves.

4. Work in collaboration with an astronomer or an astrophysicist to validate newly-found exoplanets or to study peculiar classifications.



Andrew Vanderberg, a Google "brain team" member interested in astrophysics, collaborated with his friend Christopher J Shallue and created a Machine Learning model that implements the above-discussed methodology. Here is what they did:
Using a dataset of more than 15,000 labeled Kepler signals, they created a TensorFlow model to distinguish planets from non-planets. These 15,000 labeled signals are a subset of 30,000 signals that have been manually examined.

- The neural network trained was given two inputs of the light curve shown above- One with a broad view that allows the model to examine signals elsewhere on the light curve (e.g., a secondary signal caused by a binary star) and another with a zoomed-in view that enables the model to examine the shape of the detected signal closely (e.g., to distinguish "U-shaped" signals from "V-shaped" signals).

- Now some regions in the graph were systematically occluded to check whether and how it affected the predictions.

- The model was trained to recognize patterns caused by actual planets versus patterns caused by other objects like star-spots and binary stars.

This method was used to search about 670 stars out of a whopping 2,00,000 stars, with more to go. Upon testing by giving completely new input signals, it displayed an accuracy rate of 96 percent. Yet, this method is not very competent in rejecting the case of binary stars and instrumental false positives. There is much hope here since the methodology and code is now open-sourced.

Regardless, the public continues to work in this field as many enthusiasts use Astrobase and Lightkurve- two python packages that can be installed and used to classify the exoplanet data. These libraries come with tutorials that can guide you through the process. These are community-developed tools that are user-friendly and can give you direct access to NASA's Kepler, TESS, and K2 data. Many scientists have developed algorithms and found new star systems using these.

Missions like TESS are cardinal to broaden the frontiers of Machine learning concepts. The term "Data is the new oil" is well-founded only until the said Data is being utilized to the best of its potential. Be it Planet hunting or the Pandemic; Machine learning plays a vital role in analyzing pre-existing statistics and predicting future outcomes.

CRYPTOCURRENCY- The Money of The Future.

Priyanka Dhote, priyankadhote.2001@gmail.com

I. INTRODUCTION:

"Cryptocurrency" is a virtual currency that is designed to work as a medium of financial exchange that uses cryptographical functions to conduct financial transactions. These systems allow secure payments online, those denominated in terms of "virtual tokens", represented by ledger entries internal to the system. The word "Crypto" refers to the varied encryption algorithms and cryptographic techniques that safeguard the ledger entries, like elliptical curve encryption, public-private key pairs, and hashing functions. It does not have a physical form and is not issued by a central authority. They use decentralized control. Each of them works through distributed ledger technology, generally a block-chain, which serves as a public financial transaction database. This decentralize structure allows them to exist outside the control of governments and central authorities. Cryptocurrencies use blockchain technology to gain decentralization, transparency, and immutability.

II. HISTORY:

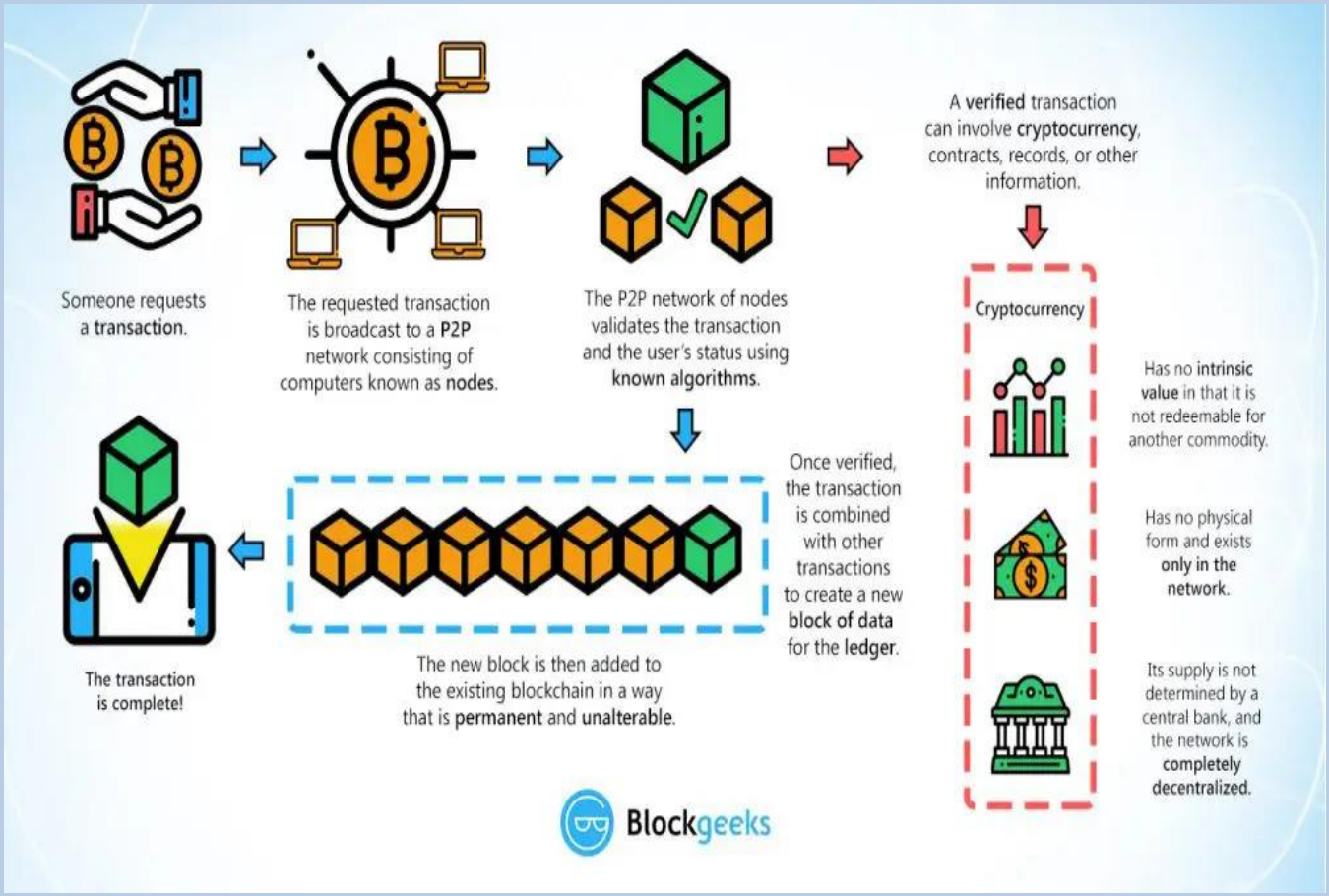
The beginning of Cryptocurrencies dates back to the early Nineteen Eighties. In 1983, an American cryptographer David Chaum conceived a pseudonymous cryptographic electronic money called ecash. Later, in 1995, he implemented it through Digicash, a form of cryptographic electronic payment. In 1998, Wei Dai published a description of "b-money", characterized as an anonymous, distributed electronic cash system. Shortly after that, Nick Szabo described bit gold.
The first decentralized cryptocurrency, bitcoin, emerged as a side product of another invention created in 2009 by presumably pseudonymous developer Satoshi Nakamoto. In late 2008 Satoshi, in an announcement of Bitcoin said, he developed "A Peer-to-Peer Electronic Cash System." After seeing all the centralized attempts fail, he tried to build digital cash system without a central authority. Similar to a Peer-to-Peer network for file sharing. Let us try to understand this in simple terms.

III. HOW DOES CRYPTOCURRENCY WORK?

A payment network consisting of accounts, balances, and transactions is required to recognize digital cash. That is understandable. One major issue that every payment network has to solve is preventing double-spending, which is preventing one entity from spending the same amount once again. This job usually is done by a central server that keeps a record of the balances.

In a decentralized network, this server is not needed. So it would help if you had every single entity of the network do this task. Every peer in the network must possess a list with all transactions to check whether future transactions are valid or an attempt to double spend.

But how is this done? How can these entities keep a consensus about these records?
If the peers of the network disagree about only one single, minor balance, everything is broken. They need an absolute consensus. But how exactly can the consensus be achieved without a central authority?



Before we try understanding this, let us talk about Blockchain.

IV. BLOCKCHAIN:

Blockchain technology created the mainstay of a new type of internet by allowing digital information to be distributed but not duplicated.

In simple terms, a blockchain is a "time-stamped series of immutable records of data that is managed by a cluster of computers not owned by any single authority". Each "block" of data is secured and bound to another other using cryptographic principles (i.e. chain).

The Blockchain is a simple yet innovative way of passing information from X to Y in a fully automated and safe manner. For a transaction, one party creates a block and initiates the process. Millions of computers distributed around the net verify this block. Once the block is verified, it is added to a chain stored across the net, creating a unique record, a record with a unique history. Forging a single record would mean forging the entire chain in thousands of instances, which is virtually impossible.

The three primary properties of Blockchain Technology that helped it gain widespread acclaim are:

- Decentralization
- Transparency
- Immutability

We will discuss each in characteristics of cryptocurrency.

V. CHARACTERISTICS AND PROPERTIES OF CRYPTOCURRENCY:

The three key attributes of Cryptocurrencies are:

- **Decentralized-** Decentralized systems have no core authority to dictate the truth to other participants in the network. The history of transactions can be accessed by every member in the network and can confirm new transactions.

- **Transparency-** While the person's real identity is secure, you will still see all the transactions done by their public address. This level of transparency never existed before in a financial system.

- **Immutability-** Once something has been entered into the Blockchain, it cannot be tampered with. The reason why it gets this property is the *cryptographic hash function*.

Properties of Cryptocurrency:

- **Irreversible:** After confirmation, a transaction cannot be reversed. By nobody. If your funds are sent to a scammer or a hacker stole them from your computer, no help can be provided. There is no safety net.

- **Pseudonymous:** Neither accounts nor transactions are connected to real-world identities. The addresses are random chains of about 30 characters on which you receive the bitcoins.

- **Fast and global:** Transactions are almost instantly generated in the network and are confirmed in a couple of minutes. Since these transactions happen in a worldwide network of computers, they are entirely unconcerned to the user's physical location.

- **Secure:** Cryptocurrency funds are securely locked in a public key cryptography system. A cryptocurrency can be sent only by the owner of a private key. Strong cryptography accompanied by the magic of big numbers makes it impossible to break this scheme.

- **Permission-less**: You do not have to ask anybody to use cryptocurrency. It is a freely downloadable software program available for everyone. There is no gatekeeper.

VI. BLOCKCHAIN AND CRYPTOCURRENCY:

Although the transaction is known almost immediately by the whole network, it is confirmed only after a specific time.

Confirmation is an important concept in cryptocurrencies. One can declare that cryptocurrencies are "All about confirmation".

As long as a transaction has a status of "unconfirmed", it is pending and can be forged. Once a transaction is confirmed, it is not possible to change it. One can no longer falsify it, nor can reverse it. It is part of an immutable record of historical transactions of the Blockchain.

VII. HOW MINERS CREATE COINS AND CONFIRM TRANSACTIONS?

Predominantly everybody can be a miner. Since a decentralized network has no entity to assign this task, a cryptocurrency needs some mechanism to prevent one ruling authority from misusing it. So, in order to qualify for this task, Satoshi set the rule that the miners need to invest their computers. The task is to find a hash, which is a product of a cryptographic function, that connects the successor block with its predecessor. This is called the "*Proof-of-Work*". In Bitcoin, this technique is based on the *SHA 256 Hash algorithm.*

Transactions can be confirmed only by miners. In fact, this is their only job in a cryptocurrency network. A transaction is stamped as legit and spread in the network. After a miner confirms a transaction, every node has to add it to its database. It is now a part of the Blockchain.
For completing this job, the miners get rewarded with a token of the cryptocurrency, for example, with Bitcoins. The individual coin ownership records are stored in a ledger existing as a computerized database using strong cryptography to secure transaction records, control the creation of additional coins, and verify the transfer of coin ownership.

Cryptocurrency list: More than 6,700 different cryptocurrencies are traded publicly, according to CoinMarketCap.com, a market research website. The first blockchain-based cryptocurrency was Bitcoin. Today there are numerous alternate cryptocurrencies with various functions and specifications. Some of the competing cryptocurrencies--daughters of Bitcoin's success--known as "altcoins," include Litecoin, Peercoin, and Namecoin, as well as Ethereum, Cardano, and EOS.

Today, the aggregate value of all the cryptocurrencies in existence is around $1.5 trillion. Bitcoin currently represents more than 60% of the total value.

Bitcoin- Bitcoin is the first and most famous cryptocurrency created in January 2009. It is the first digital currencies to use peer-to-peer technology to facilitate instant payments. Bitcoin's history as a store of value has been intense; this cryptocurrency skyrocketed up to roughly $20,000 per coin in 2017, but shortly after that, it was trading for less than half of its original value. The earliest virtual currency to meet widespread popularity and success--bitcoin has inspired many other cryptocurrencies in its wake.

Ethereum- Ethereum is relatively new in the cryptocurrency world, having launched in 2015. It operates similarly to bitcoin and allows people to send and receive tokens via an open network. These tokens are called "ether", and this is what is used as payment on the network. Ethereum can not only process transactions but also process complex contracts and programs. Contracts are scripts of code that can be deployed in the Ethereum blockchain.

#	Name	Market Cap	Price	Available Supply	Volume (24h)	% Change (24h)	Price Graph (7d)
1	Bitcoin	$11,382,240,050	$712.76	15,969,336 BTC	$67,288,200	-1.60%	
2	Ethereum	$904,848,975	$10.54	85,831,133 ETH	$4,069,260	-1.21%	
3	Ripple	$290,446,848	$0.008121	35,765,131,899 XRP *	$2,386,420	0.26%	
4	Litecoin	$184,904,214	$3.82	48,378,029 LTC	$2,258,970	-1.05%	
5	Monero	$83,466,495	$6.27	13,311,446 XMR	$3,134,490	5.38%	
6	Ethereum Classic	$80,817,441	$0.942637	85,735,486 ETC	$603,573	2.21%	
7	Dash	$66,519,213	$9.68	6,874,532 DASH	$596,632	-0.77%	
8	Augur	$52,038,360	$4.73	11,000,000 REP *	$396,072	6.38%	
9	NEM	$37,322,550	$0.004147	8,999,999,999 XEM *	$86,817	4.40%	
10	Waves	$35,727,500	$0.357275	100,000,000 WAVES *	$133,650	-3.94%	

VIII. CONCLUSION:

Bitcoin and other cryptocurrencies can be described as potential currencies or the money of the future. As of now, they are not widely accepted as a medium of exchange. There are significant reasons that hold them back from developing into fully-fledged currencies. In addition to this, there are also questions around whether cryptocurrencies are just part of a financial bubble. Though unlikely, there is a possibility that they could become widely used in the future as a medium of exchange. The potential use of the blockchain technology behind cryptocurrencies is also a matter of interest. This technology may be adopted for other purposes, including legal transactions, security programs, and voting systems.

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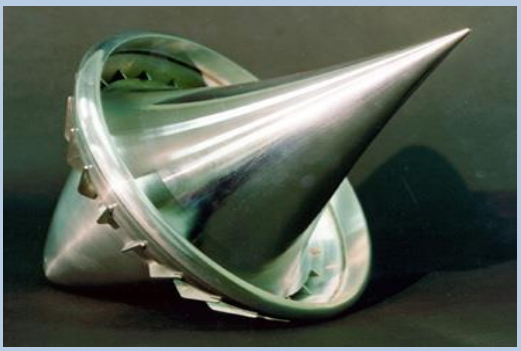
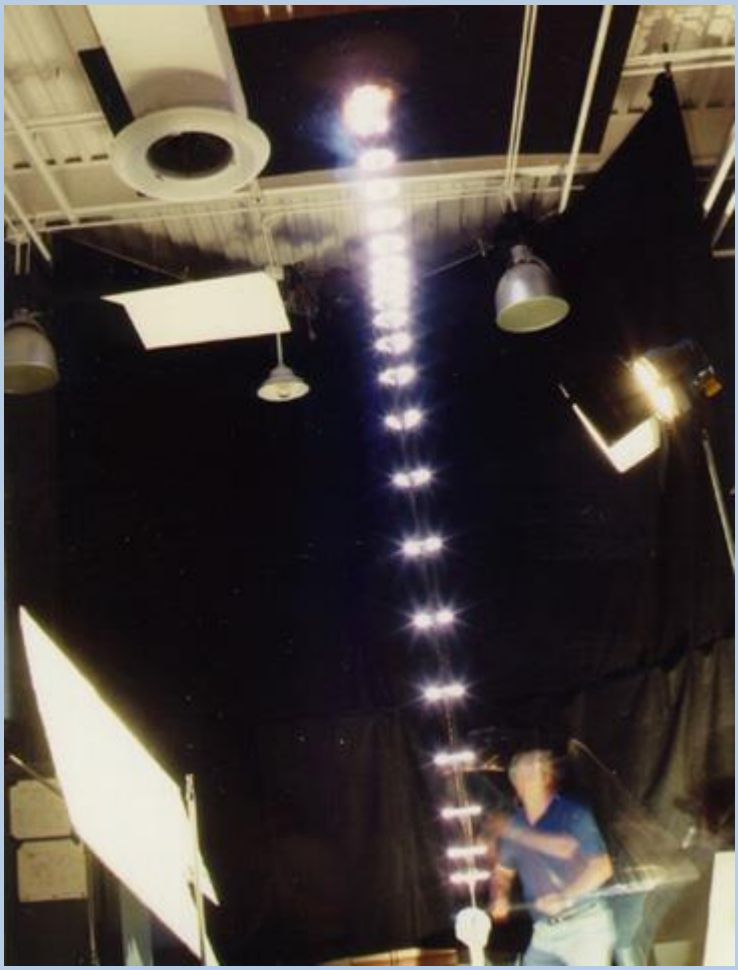
RIDING AN ENERGY BEAM TO SPACE

G. Haasya, haasyarao@gmail.com



Beam-Energy Propulsion is the usage of a beam of energy by directing it towards a space vehicle to either heat its propellant or deliver electricity to its engine. By removing the energy supply from the rocket itself, beam-energy propulsion has the potential to create launching space vehicle cheaper and additional reliable. In standard chemical propulsion, large amounts of energy are kept during a rocket's fuel, which makes up an essential quantity of its weight. Additionally, chemical systems are heated to temperatures higher than the freezing point of some materials within the rocket itself, says Alexander Bruccoleri, a research worker within the physics and physics department at university, recently received his master's in the area of "Propulsion Science". Bruccoleri gave a paper at the conference on August three on a comparison metric he fictitious to check beam-energy systems. Beam energy was dreamt up within the late Seventies by NASA Ames analysis Center and also the Calif. Institute of Technology. "The plan was to use lasers as a heat exchanger-take the energy and build a hot fluid that may expand out of the nozzle," Bruccoleri says.



Researchers are now exploring ground-based lasers systems that heat fuels like chemical elements to a temperature that's easier to manage. "The chemical element molecules will be accelerated double as quick as water molecules with a similar temperature, providing higher exhaust velocity-the thrust you get for the speed at that you are burning the propellant," says Bruccoleri. Victimization lightweight as associate external power supply will alleviate the burden of getting an aboard system, deed space for scientific payloads, as an example, and supply additional propulsive power. Such systems might be a reality in five to ten years; others are sceptical. Kevin Johnson, an area exploration and space vehicle propulsion manager at

Lockheed Martin area Systems in Mile-High City, expresses concern concerning the potential for part interference with the beam.

Greg McAllister, a senior employees propulsion engineer at Lockheed Martin, agrees associated says that an energy supply powerful enough to propel a rocket might additionally burn it up. (McAllister is presenting a paper at the conference on testing the heartbeat throttle thrusters used for the Mars Phoenix mission.) whereas the system might generate enough power from a ground-based station and cut back prices, it is "20-plus years" from being possible.

The Two Decade Journey

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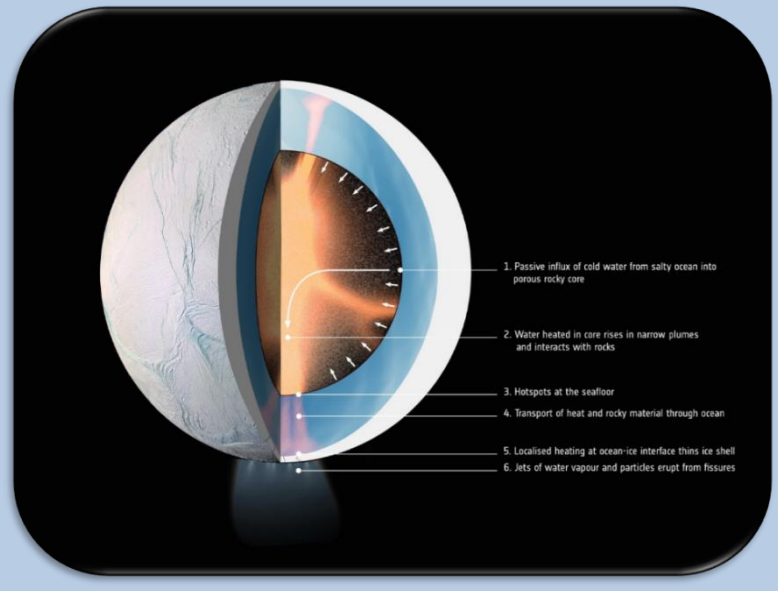
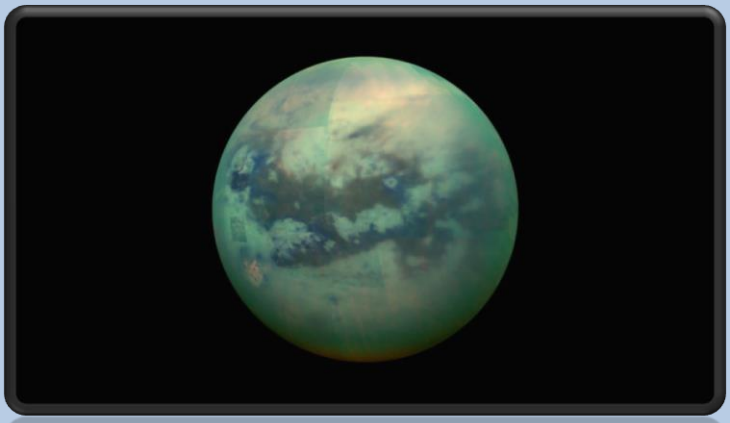
It all started on the 15th of October 1997 when they launched Cassini-Huygens towards a two-decade journey into Saturn's cold and icy world. It scaled a 5-year arduous journey to reach its destination. It also observed 2685 Mazursky on 23 January 2000, a Eunomian asteroid one of the biggest in its family during its journey. Huygens was supplied by the European Space Agency to investigate one of Saturn's biggest and famous moon TITAN, which led to a groundbreaking discovery, i.e., Titan holds promise for life. Huygens landed on Titan on 15th January 2005, later discovered that the engineers had failed to allow for the Doppler shift between the lander and the mothercraft. Thus, *Cassini*'s receiver would not receive the data from *Huygens* during its descent towards Titan. The chime of its success was only after 72 minutes of silence as it took time for signals from Cassini-Huygens to reach earth. It told about the land, minerals, air and even the presence of complex organic chemicals deducing the presence of life, as it found traces of water. This made TITAN a possible abode of life. One of the most remarkable and groundbreaking discoveries made by Cassini-Huygens was during a 2005 flyby across Enceladus (one of Saturn's moons). It discovered a stream of bursting geysers on its south pole.





This intrigued the scientists, which led to Cassini changing its course. Furthermore, on the 12th of March 2008, it took a closer flyby towards the geysers and discovered water, carbon dioxide and other complex hydrocarbons. Later, on the 3rd of April 2004, Cassini discovered a living salty ocean on Enceladus, which made Enceladus one of the prime possibilities of life and prime interest of study and future studies. This made Enceladus one of the most compelling planets in the solar system; it also led to the possibility of life on not one but two moons of Saturn.

ARTIFICIAL PHOTOSYNTHESIS

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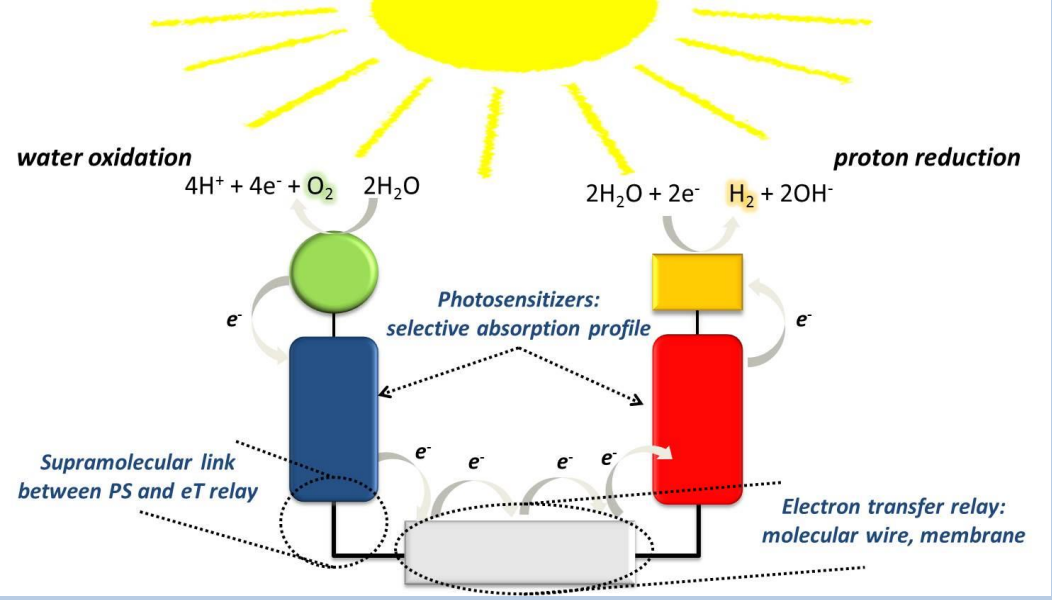
I. INTRODUCTION:

Artificial photosynthesis is a chemical technique that imitates the natural process of photosynthesis. It is a process that converts sunlight, water, and carbon dioxide into components such as carbohydrates and oxygen as mimics of the natural process. This process aims to capture and store the energy from sunlight in chemical bonds into solar fuel. It involves photo-catalytic splitting, which converts water into hydrogen ions and oxygen, involving a carbon dioxide reduction. This bio-mimetic of carbon fixation plays a significant role in research on artificial photosynthesis. The primary purpose of artificial photosynthesis is to produce fuel from natural sunlight. The fuel must hold a possibility of storage. We must be able to use it when sunlight is not available by using biological processes, that is, to produce solar fuel. By product will be oxygen, and the production of solar fuel can be cheaper than gasoline.



The creation of clean and affordable energy is the development of the photocatalytic division under solar light. This technique of sustainable hydrogen production is a significant objective for the development of alternative energy systems. It is an efficient way of producing hydrogen from water. The transformation of solar energy into hydrogen via a water-splitting process assisted by photo semiconductor catalysts is one of the most promising technologies in development. This method has the potential for large quantities of hydrogen to be generated in an ecologically sound manner. The conversion of hydrogen from solar fuel is one of the most significant challenges.

The two adaptable methods are generally for the construction of solar fuel cells for hydrogen production:

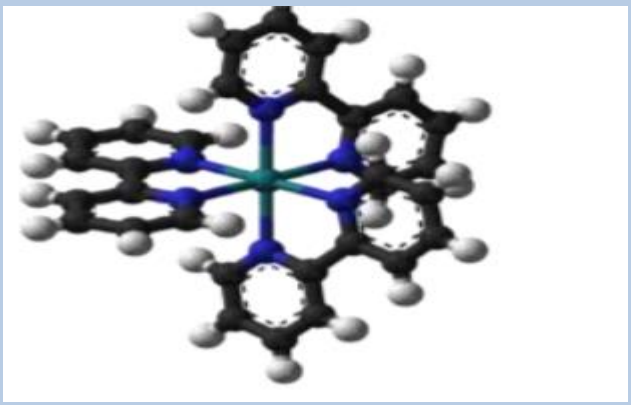
- The homogeneous system is such where the components are present in the same compartment. i.e., oxygen and hydrogen are present in the same compartment. This is the main drawback since they compose an explosive mixture, demanding gas product separation. In addition, all components must be active in approximately the same conditions.

- A heterogeneous system has two separate electrodes- An Anode and a Cathode. This makes it possible for the separation of oxygen and hydrogen production. Furthermore, various components do not necessarily need to work under similar conditions. However, the increase in complexity of these systems makes them more rigid and expensive.

Artificial photosynthesis was introduced by the Italian chemist Giacomo Ciamician in 1912. He put forth a switch from fossil fuels to radiant energy provided by the sun, thus capturing technical photo-chemistry devices. He ventured a guess that this switch from coal to solar energy would "not be harmful to the progress and human happiness". Ideally, this assembly could achieve three things- Oxidize water with one catalyst, reduce protons with another, and have a photosensitizer molecule to power the entire system. One of the most straightforward designs is where the photosensitizer is in tandem with a water oxidation catalyst and a hydrogen evolving catalyst:

The photosensitizer moves the electrons to the hydrogen catalyst when contacted by light, thus becoming oxidized in the process. This drives the water-splitting catalyst to donate electrons to the photosensitizer. In an assembly of the triad, such a catalyst is commonly referred to as a donor. The oxidized donor is capable of performing water oxidation.

Hydrogen catalysts: $2\ e^- + 2\ H^+ \leftrightarrow H^+ + H^- \leftrightarrow H_2$
Water-oxidizing catalysts: $2\ H_2O \rightarrow O_2 + 4\ H^+ + 4e^-$ Without a catalyst (natural or artificial), this reaction is very endothermic, requiring high temperatures.



Nature makes use of pigments, mainly chlorophyll's, to absorb a broad part of the visible spectrum. Artificial systems can utilize either one type of pigment with a wide absorption range or combine several pigments for the same purpose.

Photo-catalytic water splitting in homogeneous systems: Direct water oxidation by photo-catalysts is a more efficient use of solar energy than photoelectrochemical water splitting. This is because it avoids an intermediate thermal or electrical energy modification step. Bio-inspired manganese clusters have been proven to hold water oxidation activity when adsorbed on clay's along with ruthenium photosensitizers.

Although with low turnover numbers. An entirely functional artificial system is intended when constructing a water-splitting device. Varying trails have been made, one of which involves using a gold electrode to which photo-system II is linked. An electric current is detected upon illumination.

II. ADVANTAGES AND DISADVANTAGES:

- Solar energy can be immediately transformed and stored. In photovoltaic cells, sunlight is converted into electricity. This is then reconstructed into chemical energy for storage, with some necessary energy loss at the second level of conversion.
- The by-products of these reactions are environment friendly. Artificially photosynthesized fuel would be a carbon-neutral source of energy. This can be used for transportation or homes. However, there are certain disadvantages such as:
- Materials used for artificial photosynthesis often degrade in water. Thus, they may be unstable when compared to photovoltaic over long periods. Most hydrogen catalysts are highly sensitive to oxygen, being inactivated or decomposed in its presence. Moreover, photo-damage may occur over time.
- The cost is not advantageous enough to compete with fossil fuels as a financially sustainable energy source.

III. CONCLUSION:

With this, we can produce pure water for municipal water usage. Ocean water can be used to produce hydrogen and can be burned with the power plant to produce electricity for the grid. Various catalysts can be synthesized, or pre-existing ones can be improved. Oxygen vacancies have been induced in TiO2 to form enhanced catalyst Titania. Hetero-bimetallic material system is a predominantly used photo-catalyst, e.g., (Zr-Co-Silica) system.

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EVOLUTION OF OPERATIONAL AMPLIFIERS

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I. INTRODUCTION:

Operational Amplifiers, also known as OP-AMP, is a high gain, DC-coupled inverting feedback amplifier. It has two inputs, and hence, it is also known as a differential amplifier. Op-amps are available in the form of Integrated Chips or ICs of the name u741.

This is what everyone knows about op-amps. However, it has a vast history preceding it. We will discuss this here in detail. The evolutionary time-frame of the op-amp can be classified into the following sequence:

II. INITIAL PERIOD (1941):

In 1941, the first op-amp was developed by Karl D. Swartzel Jr. of Bell Labs in the US and filed a patent, through which it came into the limelight. It was designed using three vacuum tubes to achieve a gain of 90dB, operated on 350V to -350V, and has only a single inverting input, unlike the modern-day design. This was used widely during the Second World War as artillery director (to give estimations about a moving target to the firing crew) along with radar systems, notably SCR584.

The op-amp proved to be an extraordinary addition to the system, which improved the hit rate (around 90%), a lethal statistic. Following the success of this design, in 1947, John R. Ragazzini of Columbia University first formalized and defined op-amps. In the same paper, there was a footnote related to a design given by Loebe Julie, which has significant technical changes made to its predecessor. In this design, the non-inverting input was introduced, although its application was not specified in detail.

III. COMMERCIALIZATION OF VACUUM TUBE OP-AMPS:

In 1949, Edwin A. Goldberg designed the chopper-stabilized op-amp. This included an additional AC amplifier that runs along with the op-amp. It was a significant success as the gain increased with a simultaneous decrease in the drift current and DC offset. Although other designs were made during this period, none of them emphasized the non-inverting input. Thus, they remained as updated versions of Loebe Julie's design. During this period, i.e. in 1953, op-amps began to be produced on a commercial scale.

IV. INTRODUCTION OF ICS AND THEIR IMPACT ON OP-AMPS:

The invention of transistors in 1954 has paved the way for the production of Integrated Circuits (IC), which vastly reduced the sizes of the circuits. By 1961, op-amps were also being produced on a commercial scale in small circuit boards with edge connectors. In 1963, the first monolithic IC was designed by Bob Widlar at Fairchild Semiconductors. However, it was not as successful, and the consequent models did not provide desired results due to variable supply voltage, low gain, and other such issues.

V. THE INTRODUCTION OF U741 IC:

To overcome the drawbacks of uA702, the u741 was designed by Fairchild Semiconductors in 1968. The modification made helped avoid external compensation. A 30pf capacitor was now embedded into the chip. This design is the most prevalent one used to date.

VI. CONCLUSION:

So, this is the timeline of the op-amp from its invention to its present form. Technological advancements have made the design of the op-amp cheap. Nowadays, op-amps are primarily designed for low voltage supplies. Nevertheless, future advancements give hope for greater efficiency.

REMOTE PATIENT MONITORING AND ANALYZING BASED ON IOT SENSOR WITH AI FOR IMPROVING PATIENT ASSISTANCE

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ABSTRACT:

Nowadays, healthcare has become of prior importance by every country in the world with the advent of the novel coronavirus. So in this scenario, an IoT based health monitoring system serves as one of the best solutions for such an epidemic. Internet of Things (IoT) and AI (Artificial Intelligence) is the new era of the internet which is a fast-growing research area, especially in the health care assistance systems. With the increase in usage of wearable detecting devices and smartphones, these remote health care monitoring has evolved at such a pace. Monitoring of health constantly helps in preventing the spread of disease as well as to get a proper diagnosis of the state of health, even if the doctor is not at a reachable distance. The IoT devices utilize numerous sensor devices cable of collecting a large volume of data in different domains and processed by AI techniques to make the decision in assisting the problems. Traditional existing health care assistance systems developed fails to predict the exact patient health information, which reduces the accuracy of the patient assistance process. To resolve these issues, An IoT sensor with AI is used to predict the exact patient details such as fitness tracker, medical reports, health activity, body mass, temperature, and other health care information, which helps to choose the right assistance process. In this paper, all the existing systems are reviewed, and a portable physiological checking framework is proposed and displayed, which can constantly monitor the patient's heartbeat, temperature and room temperature and humidity parameters and control instrument to screen the patient condition and store the patient's information in the server through wireless communication (Wi-Fi Module) based remote correspondence. A remote health monitoring system using IoT is proposed where the authorized physician can access the data stored using any IoT platform and based on which the health condition is diagnosed.

Keywords: *Internet of Things, Health, Sensors, Artificial Intelligence, wearable devices*

I. INTRODUCTION:

Nowadays Internet of Things (IoT) has emerged as one of the effective technologies that help to interconnect computing devices and objects and can transfer data from one place to another place. Also, the IoT sensor helps to improve communication without requiring human-computer interaction or human-human interaction. It is seen that IoT sensor devices were effectively utilized in different applications such as hospitals, smart home maintenance, thermostats, lighting fixtures, home appliances, biometric systems and security systems. These applications were successfully connected with more ecosystems like smart speakers and smartphones. An IoT based environment is shown in fig.1. Among the above-listed applications, IoT sensors played a vital role in the health industry, where a large number of healthcare services is provided. With the growing population, an increase in a greater number of chronic diseases, which were sometimes difficult to identify.

For a great number of people and villages, which led to an increase in the affected ratio of chronic disease. IoT sensor-related services were provided to the healthcare sectors for improving people's hospitality in terms of ensuring accessibility to human-computer interaction or human-human interaction.

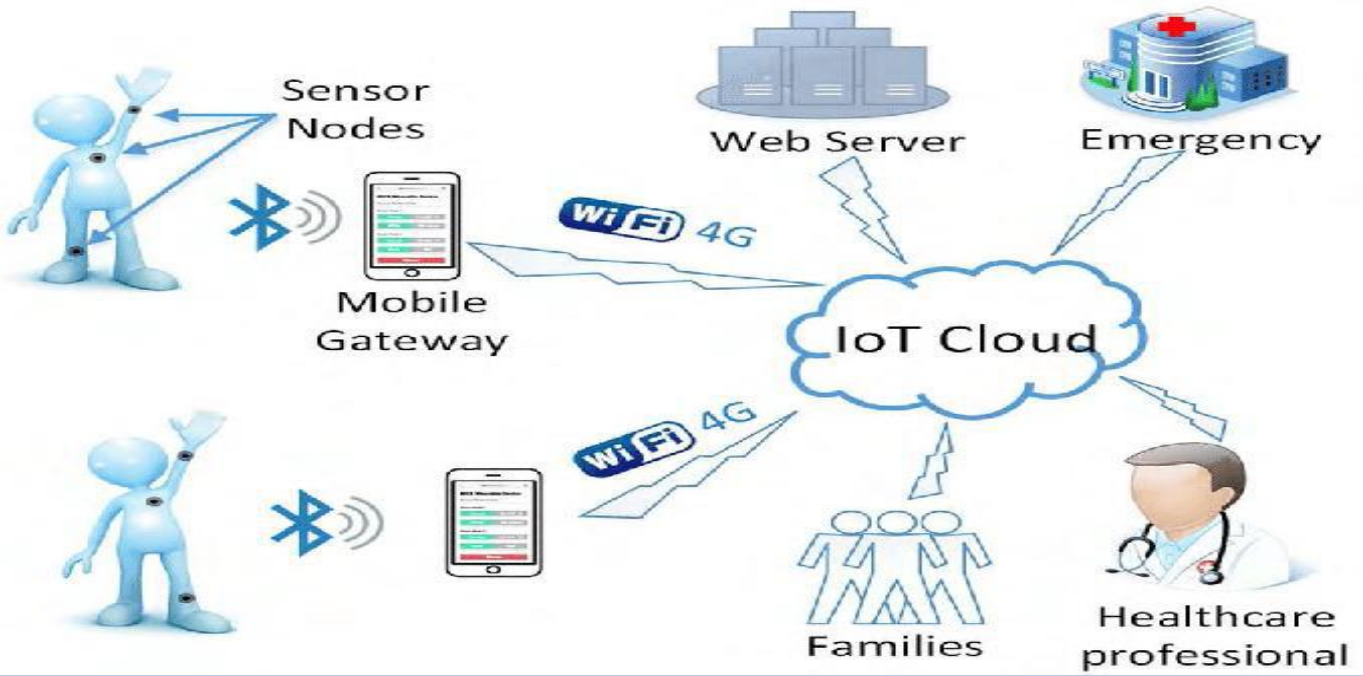

Fig.1 An example of IoT based health monitoring environment

Remote Patient Monitoring arrangement empowers observation of patients outside of customary clinical settings (e.g. at home), which expands access to human services offices to bring down expenses. The core objective of this paper is the design and implementation of a smart patient health tracking system that uses sensors to track patient health and uses the internet to inform their loved ones in case of any issues. The objective of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure. The sensors are connected to a microcontroller to track the status and displayed on an LCD screen, and additionally, remote access is allowed to exchange alarms. If the proposed design is triggered with any sudden changes in heartbeat or body temperature of the patient, it immediately alarms the authorized physician about the patients status over IoT and furthermore communicates subtle elements of the pulse.

These collected heart details reduced the heart failure cases by giving immediate remote assistance and temperature of patient live on the web. In this manner, IoT set up utilizes the web to screen quiet well being measurements, and spare persists time. There is a considerable capability between SMS based patient flourishing viewing and IoT based patient checking framework. In IoT based framework, subtle parts of the patient flourishing can be seen by different authorized clients. In most of the rural areas where the medical facility is not in a hand reach distance, people neglect to take medical assistance for minor health issues, which is shown in early stages by variation of vital elements like body temperature, heartbeat rate etc. Once the health issue has been increased to a critical stage and the life of the person is endangered, then they take medical assistance, which can cause an unnecessary waste of their earnings.

This also comes into account, especially when a certain epidemic is spread in an area where the reach of doctors is impossible. So to avoid the spread of disease, if a smart sensor-based wearable device is given to patients, who can be monitored constantly by a physician from a distance would be a practical solution to save many lives. This paper describes the proposed system and the experimental setup, including the circuit and the algorithm used in the implementation.

The embedded smart IoT sensor devices successfully gathered the patient information such as sugar level, ECG details, blood pressure, weight, and oxygen level successfully.

II. PROPOSED SYSTEM:

The core objective of this project is the design and implementation of a smart patient health tracking system. Fig.1 shows the overview of the proposed system. The sensors are attached to the patient body to capture the temperature and heartbeat the patient. Two more sensors are placed at home in a closed vicinity of the patient to sense the humidity and the temperature of the room. These sensors communicate the parameters to a control unit, which calculates the values of all four sensors. These calculated values are then transmitted through an IoT cloud to the base station. From the base station, the values are then accessed by the authorized physician for further diagnosis and treatment.

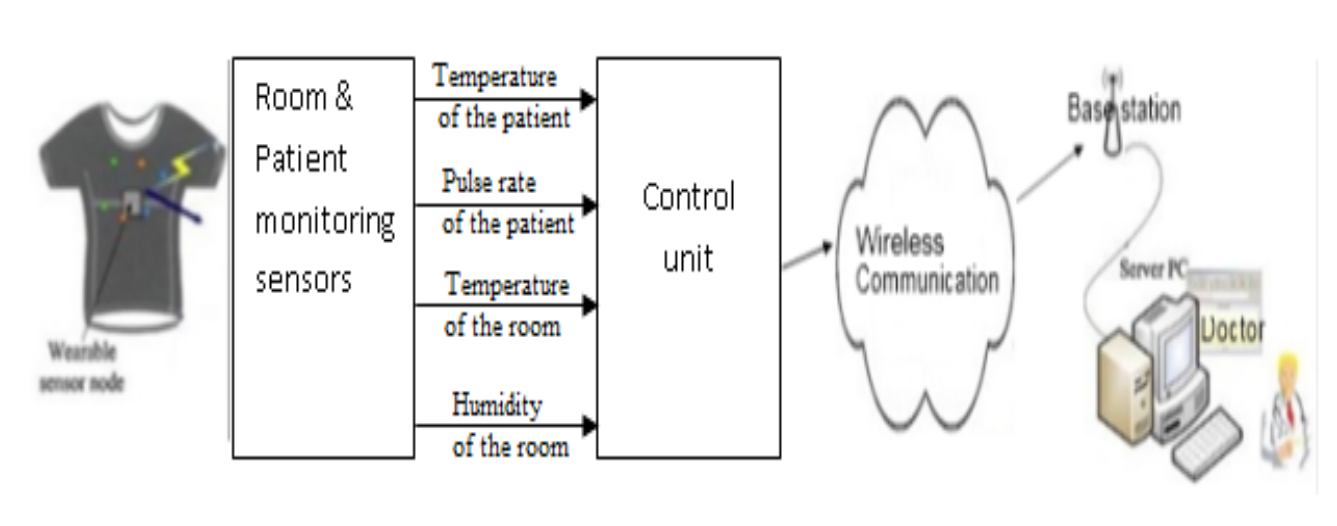

Fig.2 Proposed system

III. SENSORS:

Temperature Sensor:

The temperature sensor connected to the analog pin of the Arduino controller is converted into a digital value with the help of Analog to Digital Converter. Using this digital data, the controller converts it into the actual temperature value in degree Celsius using the equation:

Temperature (°C) = [raw ADC value * 5/4095 - (400/1000)] * (19.5/1000)

Heartbeat Sensor:
The heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body, which causes a change in the light intensity through that organ (vascular region). The digital pulses are given to a microcontroller for calculating the heartbeat rate, given by the formula:

BPM (Beats per minute) = 60*f, where f is the pulse frequency.

Humidity Sensor:

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. The relative humidity is calculated as given below:
Voltage = (ADC Value/1023.0) * 5.0;
Percent relative humidity = (Voltage-0.958)/0.0307;

IoT Server:
At whatever point the patient goes to the healing centre premises, sensors sense the physiological signs and these signs are changed over to electrical signs. Then simple electrical flag is changed over to an advanced flag (computerized information) which is put away in RFID. The put way computerized information is transmitted through Zigbee Protocol to the neighbourhood server Zigbee is an appropriate convention for this framework. It comprises the greatest number of cell hubs. It is more favoured for gadgets that are littler in measure and expend less vitality. From the nearby server, the information is exchanged to the therapeutic server through WLAN.

IV. CONCLUSION:

The Internet of Things is considered now as one of the feasible solutions for any remote value tracking, especially in the field of health monitoring. It facilitates that the individual prosperity parameter data is secured inside the cloud, stays in the hospital are reduced for conventional routine examinations and most importantly, that the health can be monitored and disease diagnosed by any doctor at any distance. In this paper, an IoT based health monitoring system was developed. The system monitored body temperature, pulse rate and room humidity and temperature using sensors, which are also displayed on an LCD. These sensor values are then sent to a medical server using wireless communication. These data are then received in an authorized.

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CAREER IN IMAGE PROCESSING

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Introduction

Image processing is the management of visual data either to attain an aesthetic feature or to derive information from it, and shore up an additional task. The major applications of image processing are to connect the gap between human perception and machine interpretations. It is quite obvious that our visual system does not see the world the way a computer or scanner does. Image processing helps to merge the two and remove some of the stark differences between them, so that devices move, interact and see the way how the human performs.

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools (Camera, mobile phone, scanning devices),
- Analyzing and manipulating the image,
- Output in which result can be altered image or report that is based on image analysis.

Purpose of Image processing

The purpose of image processing is divided into 5 groups. They are:

Visualization - Observe the objects that are not visible.

Image sharpening and restoration - To create a better image.

Image retrieval - Seek for the image of interest.

Measurement of pattern – Measures various objects in an image.

Image Recognition – Distinguish the objects in an image.

Fundamental steps in Digital Image Processing:

1. Image Acquisition

This is the first step or process of the fundamental steps of digital image processing. Image acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling etc.

2. Image Enhancement

Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. Such as, changing brightness & contrast etc.

3. Image Restoration

Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation.

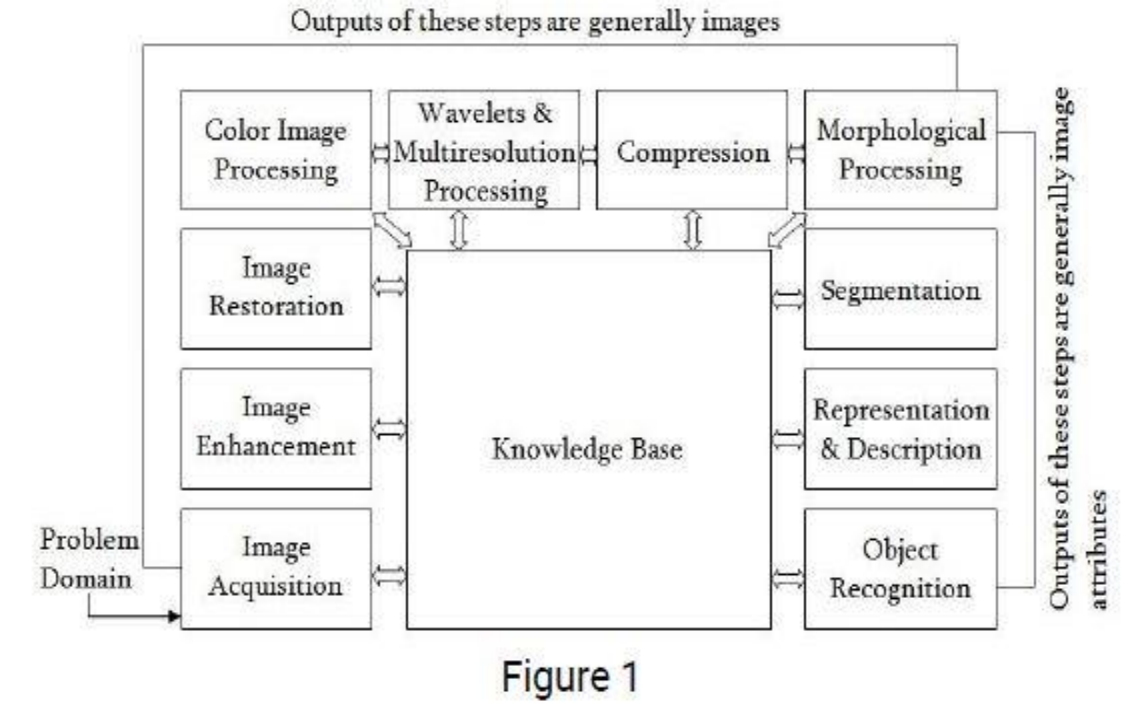

Figure 1

4. Color Image Processing

Color image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet. This may include color modeling and processing in a digital domain etc.

5. Wavelets and Multiresolution Processing

Wavelets are the foundation for representing images in various degrees of resolution. Images subdivision successively into smaller regions for data compression and for pyramidal representation.

6. Compression

Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

7. Morphological Processing

Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.

8. Segmentation

Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.

9. Representation and Description

Representation and description almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself. Choosing a representation is only part of the solution for transforming raw data into a form suitable for subsequent computer processing. Description deals with extracting attributes that result in some quantitative information of interest or are basic for differentiating one class of objects from another.

10. Object recognition

Recognition is the process that assigns a label, such as, “vehicle” to an object based on its descriptors.

11. Knowledge Base:

Knowledge may be as simple as detailing regions of an image where the information of interest is known to be located, thus limiting the search that has to be conducted in seeking that information. The knowledge base also can be quite complex, such as an interrelated list of all major possible defects in a materials inspection problem or an image database containing high-resolution satellite images of a region in connection with change-detection applications.

Importance of image processing

Within the scientific community and manufacturing industry, image processing is the controller of the technical revolution. This helps in bringing collectively real-time production and virtual data representation, making the process more liquefied and flexible. Therefore, the future of image processing will lay the framework for new technologies and business models. Assembly lines these days are being automated at a faster rate than ever before, industries are now very careful with regards to energy consumption, recycling, and scrap management, as they want to minimize resource wastage. In such a setting, it is only natural that technologies such as image processing help with automation and quality control.

For instance, machine vision systems help with measuring, counting, checking and inspecting products, at a rate much faster than humans. This helps in managing the last few stages of the production process. The process is fast and efficient, meaning that the total production time is brought down, leading to more efficient use of resources. Furthermore, smart cameras help in security and protection, working as a part of surveillance systems.

Usage of image processing

Digital image processing includes the manipulation of images via a computer system and mainly involves filtering or enhancing images in order to extract information from them. Over the years, fields which have used analog imaging for decades have shifted to digital systems, due to their flexibility and affordability. Some of the major fields that rely on such techniques are medicine, photography, feature extraction, remote sensing, computer vision, security monitoring, face detection, and optical character recognition.

- **Computer Vision** - Computer vision is used in artificial systems to acquire information from images or video signals to then decide the outcome or next action to be taken. Industrial robots and autonomous vehicles depend on such systems to navigate and get their tasks done.

- **Face Detection** - This method helps in the analysis and matching of integral facial features to help with the detection and identification of faces. Face detection is a type of object class detection and is used extensively in security and surveillance work.

- **Video Processing** - Much like signal processing, video processing is an important part of digital systems. It is used in television sets, DVDs and video players to run and display visual data.

- **Remote Sensing** - Remote sensing uses real-time wireless sensors to gather information about an object at a distance. This technique is used extensively by aircraft, satellites, and ships via ultrasound, Magnetic or even X-radiation methods.

- **Biomedical Analysis** - Image processing has found multiple uses in the field of medicine with it being a major source of image diagnosis. Also, it helps in the improvement of techniques such as Computed Tomography and Magnetic Resonance Imaging, helping doctors get better diagnostics, and hence, detect diseases faster.

Scope of image processing

While imaging was associated with security functions and surveillance missions, the term has grown to represent something larger in recent years. Thanks to advancements in science and technology, image processing is now an integral part of Artificial Intelligence systems.

Various new types of processing systems, which have come up recently help with chemical, thermal and molecular imaging. Furthermore, the use of such systems has led to tremendous growth in the field of space exploration. Most new satellites make use of different sensors to obtain useful information from outer space. Satellite imaging and military applications are regarded as future trends in the field of image processing. Furthermore, advances in broadband devices and mobile technology will help in the improvement of image processing systems in hand-held devices. To put things in perspective, the future of image processing looks bright and solid.

Future Applications

1. Sophisticated optical sorting
2. Improvements in Augmented reality
3. Traffic data collection
4. Medical imaging
5. Rise in industrial applications
6. Space exploration
7. Military applications
8. Fingerprint and retina recognition
9. Improvements in Stereography

10. Morphological image processing

Career with image processing

The answer to the above question is simple. You can start a career in image processing by developing some innovative projects related to it. By doing some projects, which helps in learning the concepts of image processing but also apply the concepts in real-time. Some of the image processing projects:

1. Surveillance robot

Robots are changing the way we function, by helping us with our work. Not only do they help in making us more efficient, but rather, they also help in keeping us safe and secure. Surveillance robots ensure that our dear and near ones stay safe, by keeping a watchful eye over them. In this image processing project, you will build a remote-controlled surveillance robot that captures live video footage using Raspberry Pi and Python Programming.

2. Computer vision – text scanner

Computer vision powers everything from autonomous vehicles to textual scanning. This project is a great way to get started in the field of Computer Vision. In this Computer Vision project, you will build a CV text scanner that can detect text in images. The main principle used in this project is that of the optical character recognition algorithm, and the other things you will learn include thresholding and perspective transformation.

3. Computer vision based mouse

You might be wondering why people would use computer vision to build a mouse. But then again, think about how people who are physically handicapped use a mouse. In this project, not only will you be learning new concepts related to Computer Vision, but you will also be putting them to use to build something that celebrates inclusion. The mouse you build can be moved by just pointing fingers, rather than through manual control. You will learn to implement the object tracking algorithm and Canny edge detection method.

4. Computer vision based smart selfie

Nowadays everyone is obsessed with selfies. Well, the technology that helps robots to see the world the way humans do can also help you look fantastic in every selfie you take. In this computer vision project, students will build a smart selfie that takes photos automatically when you smile by making use of a facial feature recognition algorithm.

Summary:

Image processing plays an important role in day-to-day life; career can be chosen with image processing with combination of artificial intelligence, machine learning and deep learning techniques.

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SAFER DISPOSAL OF PCBs USING BALL-MILLING METHOD

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ABSTRACT:

Printed Circuit Boards (PCBs) are the core of any electronic component in today's world. They come in many configurations and are made with a variety of materials. 30% of the elements in PCBs are metallic, while 70% are non-metallic. Due to the difficulty in their reusability, many PCBs are often burned or buried in landfills, polluting the air, soil, and water. The removal of non-metallic components—the prime factors of environmental and bodily damage—is tricky, unlike their metal counterparts. Researchers Xi Chen, Jie Zhu, Ye-tao Tang, and Rong-Liang Qiu determined that non-metallic harmful waste can be collected and neutralized through the ball-milling process.

I. INTRODUCTION:

PCB stands for - Printed Circuit Board. A thin board is used to mechanically support and connect the electrical/electronic components in a device. PCBs are used almost everywhere-- from radios, digital cameras, cell phones, and tablets to CT scanners, microwaves, power inverters, and accelerometers.

II. STRUCTURE OF A PCB:

In Layman's terms, a PCB is a plastic board that is reinforced with glass. A copper layer, consisting of copper lines and pads attached, is latched on to this board. These copper lines, also known as traces, allow the flow of electrical charge through the PCB and provide power to the different components situated on the board. The copper traces function as an alternative to wires and guide the electricity to the correct destination.

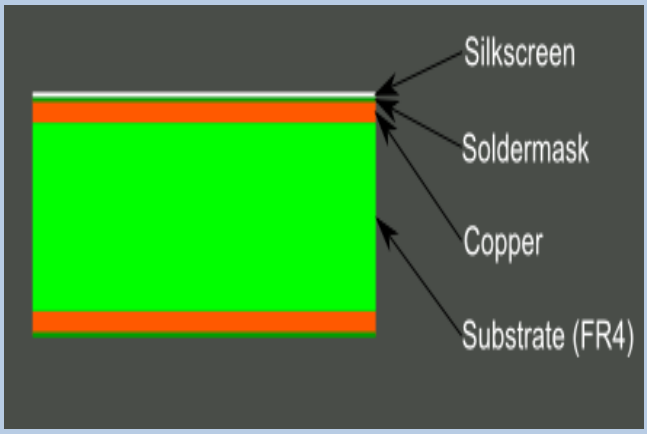

Fig 1

III. MATERIALS USED FOR PCB MANUFACTURING:

PCB generally consists of four layers—Silkscreen, Soldermask, Traces and Substrate--which are heat laminated together into a single layer. There are several types of PCBs: rigid, flexible, single-sided, double-sided and multilayered, so the layering material depends upon the type of PCB desired.

LAYER	MATERIAL USED (mostly)
Silkscreen	Non-conductive epoxy ink
Soldermask	Epoxy liquid
Traces	Copper
Substrate	FR-4, CEM-3, FR2 phenolic paper, Polytetrafluoroethylene (PTFE), Polyimide, PEEK

IV. WASTE PROCESSING OF PCB:

30% of PCB components are metallic, while 70% are non-metallic. The metallic components are recovered from crushed circuit boards through magnetic and high-voltage electrostatic separations. At the same time, the non-metallic particles like resins, reinforcing materials, brominated flame retardants, and other additives are left behind.

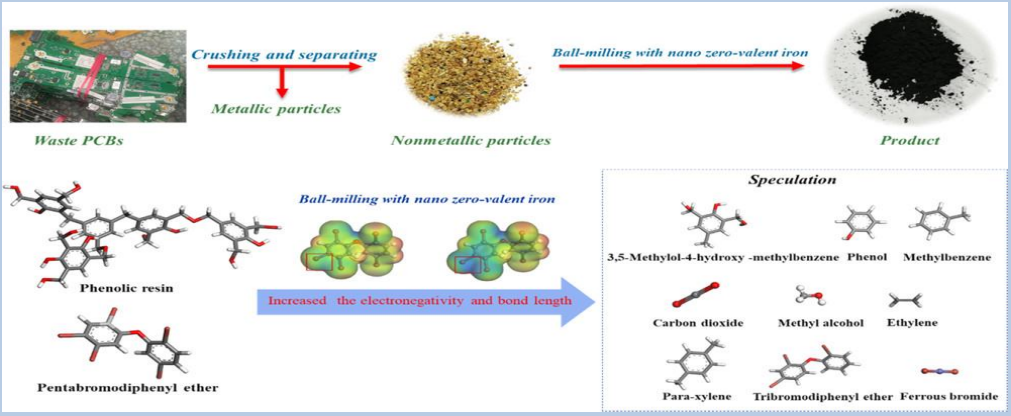

Fig 2

In general, three different processes can be used to recycle PCBs: Hydro, Pyro, and Electrochemical methods. Until recently, most countries used Pyrolysis--the destruction of chemical bonds by heating in the absence of oxygen--as the primary disposal method for waste PCBs. In this process, the non-metallic particles are first pyrolyzed and then converted into fuel and residual materials. These are recycled into commercial fuel oil and fillers for building boards, respectively.

V. WHY IS IT HARMFUL?

Non-metallic particles from waste-printed circuit boards are toxic due to their brominated flame-retardant (BFR) content. Until recently, scrap PCBs, which have been made of cheap material and thus cannot be utilized for recycling, have either been burned in the open air, or directly buried in landfills, resulting in severe air, groundwater, and soil pollution. Pyrolysis can also produce several brominated dioxin compounds and cause environmental pollution.

These BFRs contain polybrominated biphenyl ethers, which play a significant role in propagating endocrine disorders and fetal tissue damage. The burning of BFRs in the open air also generates a wide range of pollutants. Some of these pollutants are polybrominated dibenzo-p-dioxins and dibenzofurans. Therefore, the proper disposal of non-metallic particles from waste PCBs is crucial.

VI. BALL-MILLING METHOD: HOW DOES THIS WORK?

Ball-milling is the process of grinding a material into a fine powder using a cylindrical device filled with the material to be processed and the grinding medium. Here, the kinetic energy of the grinding medium, a.k.a balls, is transferred to the material and balls placed inside the container. The rotation of this container imparts kinetic energy to the balls and ultimately helps in reducing the size of the material.

The addition of a co-grinding material promotes the transfer of electrons and the generation of free radicals, thereby reducing the operation time and speed required for the reaction. In non-metallic impurities, iron powder (NZVI-Nano-zerovalent Iron) proved to be an excellent co-grinding agent for removing the halogen bromine.

VII. FINDINGS

The addition of NZVI along with the molecular decomposition process during the ball-milling broke the molecular bonds. It was observed that the main chain broke, and there was an occurrence of benzene polymerization combined with ring-opening and bromination. Moreover, graphite was produced, and organic bromine was converted into inorganic bromine (mainly FeBr2). The debromination process was promoted by electrons provided by NVZI and thus, increase the bond length of C—Br. It was also observed that in the pentabromodiphenyl ether molecule, the C—Br bond that was in the para position of the benzene ring had more Br content, and the C—O bonds were broken first.

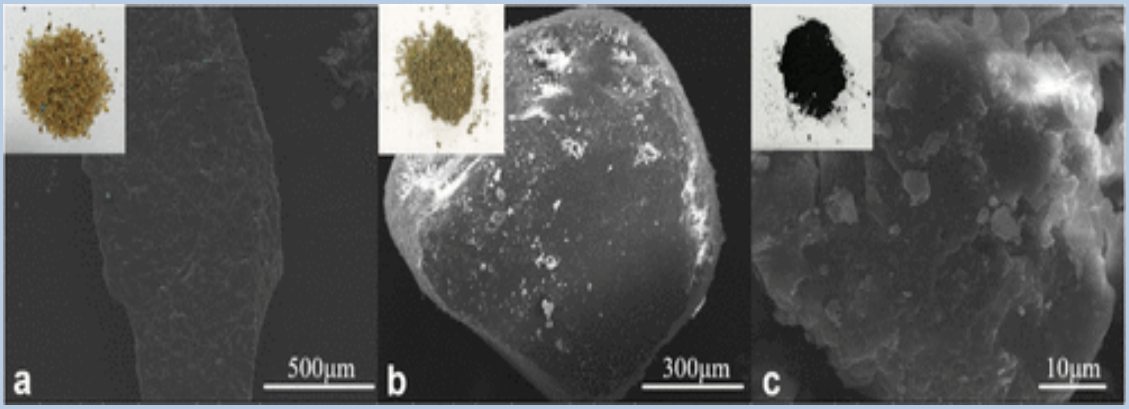

Fig.3

a) Photograph and SEM image of raw non-metallic particles recovered from crushed waste PCBs; (b) photograph and SEM image of a non-metallic particle sample without NZVI; (c) photograph and SEM image of a non-metallic particle sample milled with NZVI.

VIII. SCOPE:

The minuscule materials formed during the ball-milling process will be beneficial as they can be used for future treatment of the non-metallic particles. Moreover, the materials generated (e.g. graphite) can be used in other industries after proper processing.

IX. CONCLUSION:

The adoption of the ball-milling method to treat non-metallic particles from waste PCBs proved to be largely successful. With the help of this method, it will be easy to process both the metallic particles of a PCB and the non-metallic ones. The addition of NZVI as a co-grinding material further helped reduce the time and accelerated the process. Through this process, organic bromine was converted to inorganic bromine, thereby reducing the material's toxicity. Consequently, this process caused a decrease in

destructive effects on the environment and the human body. This discovery is an essential step in the sustainable development of waste resin resources.

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MISSION: COLONIZATION ON MARS/HEY RED, HERE I COME

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I spy something red in the sky. Yup, indeed I do. It seems like the concept of life on Mars has taken over people's thoughts for a while now. When the "Building blocks of life" were discovered on this planet, life on Mars did seem like a part of your sci-fi novel coming to life. Scientists at NASA believe that humans would most definitely inhabit Mars in the future and want to have people there by 2033. While SpaceX, on the other hand, is making its preparation to make this idea possible even sooner, that is, by 2026. So is something like this possible with the technology of now? Can the human race survive and thrive on another planet?

The Red planet, as we earthlings lovingly nicknamed it, lost its magnetosphere 4 billion years ago. Now it consists of an atmosphere that is mostly carbon dioxide. Thus, it is too thin, exposing the surface to deadly solar radiation. When compared, the atmosphere of Mars is about 1% that of the Earth's at sea level and, the surface gravity happens to be a mere 38% of that of Earth's. The region is frequented by dust storms which can last up to months. The surface is so cold that it struggles to maintain water in a liquid state, a key ingredient to sustaining life. In other words, Mars is a planet with a toxic atmosphere where one can't have a breath of fresh air without oxygen tanks, where one can't walk with their heads intact without suiting up. So how do we pave the way to our destiny against all these odds?

One of the first obstacles that we'd be facing is perhaps that of landing. The landing system must be built to prevent docking on mountains, rocks, or craters, making sure the astronauts and colonists reach the surface safely. At present, NASA is capable of landing a 1-ton vehicle on the surface of Mars. So to make a vehicle for humans to land requires utmost precision. As discussed before, the weather conditions on Mars are extreme, so we must wear spacesuits all the time. So once we've made it to Mars, what would be next on our checklist? To build a place to live in, a habitation. NASA has already dipped its toes into testing and building full-size, deep space habitat prototypes. By 2018, about five companies submitted their concepts on the designs for possible habitat prototypes. These physical enclosures were designed, keeping in mind the necessities to support humans. These are spaces with sealed domes of a self-sustaining atmosphere capable of supporting life over time. Assuming we miraculously succeed in these endeavors, how do we plan long term survival?

Creating an environment to grow our product might be the best way to go, but it's not as easy as it seems. The idea of terraforming is to alter and adjust the atmosphere, temperature, topography, or ecology of a celestial body so that it is similar to Earth's environment. But according to NASA, terraforming on Mars is not possible with present-day technology. Even if we succeed, processing all the resources present on Mars would only make up to 7% of Earth, still a far cry from what is needed.

Mars has captivated human thoughts and imagination for quite a few decades now. Though movies like The Martian have given us a good glimpse of how living on the red planet looks like, the real-life version of this is a challenging terrain for humans to thrive. In 2016, tech mogul and the founder of SpaceX, Elon Musk, revealed his ambitious plan to get humans on Mars by 2026. This is seven years ahead of the timeframe NASA aims for its astronauts to step foot on to the red planet. One million people are being planned to be sent on to Mars by 2050. Though the lack of advanced technology holds us back from achieving our mission for now, once we've had a firm foothold in it, nothing can stop us. We have stretched our knowledge past the stars and planets, but imagination crosses boundaries and goes beyond the galaxy.

VEHICLE TO EVERYTHING (V2X)

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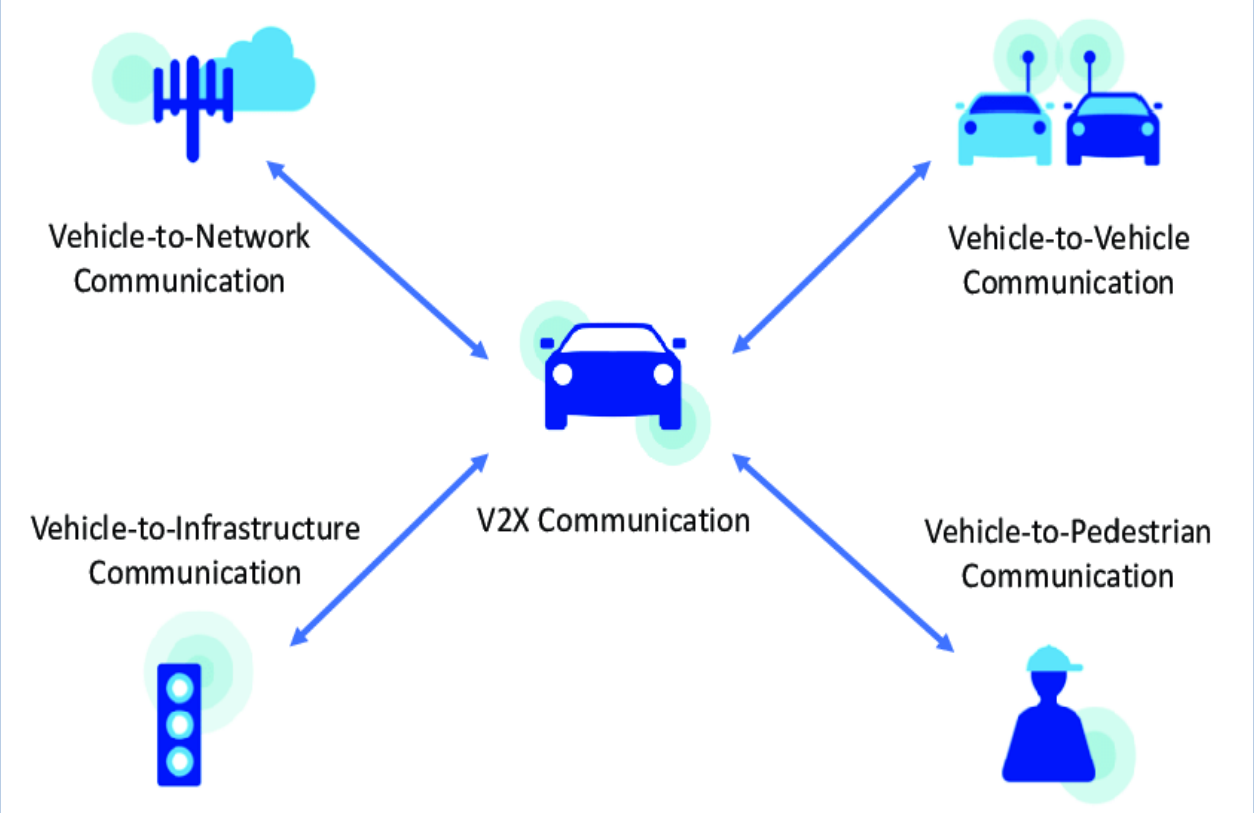
"A transport communication system that supports the transfer of knowledge from a vehicle to moving components of the tragic system."

V2X could be a communication system that permits vehicles to speak with alternative vehicles and also the infrastructure around them. Most parts of a car to Everything (V2X) embody vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication systems. Most edges of V2X systems embody exaggerated road safety, fuel savings, traffic potency, and alternative road management.

WHAT IS A "VEHICLE TO EVERYTHING"?

Vehicle to Everything (V2X) could be a transport communication system that supports the transfer of knowledge from a vehicle to the moving components of the traffic system that affect the vehicle. The first purpose of V2X technology is to enhance road safety, energy savings, and traffic potency on the roads.



HOW VEHICLE TO EVERYTHING (V2X) WORKS:

In a V2X communication system, the knowledge travels from the vehicle sensors and alternative sources through high-bandwidth, high-reliability links, permitting it to speak with alternative cars, infrastructure like parking areas and traffic lights, and Smartphone moving pedestrians. By sharing data, like speed, with alternative entities around the vehicle, this technology improves the driver's awareness of potential dangers and helps cut back the severity of injuries, road accident fatalities, and collision with alternative vehicles.

The technology additionally enhances traffic potency by warning drivers of forthcoming traffic, suggesting various routes to avoid traffic and distinguishing offered parking areas.

COMPONENTS OF V2X TECHNOLOGY-

The key parts of V2X technology are V2V (Vehicle to vehicle) and V2I (Vehicle to Infrastructure). Whereas V2V permits vehicles to speak with alternative vehicles on the road, V2I can alter vehicles to speak with external entities, like traffic lights, parking areas, cyclists, and pedestrians. These technologies improve road safety, cut back fuel consumption, and enhance the expertise between drivers and alternative road users, like cyclists and pedestrians.

When V2X systems are integrated into ancient vehicles, drivers will receive important data regarding weather patterns, near accidents, road conditions, road works warning, an emergency vehicle approaching, and activities of alternative drivers' mistreatment an equivalent route.

Autonomous vehicles equipped with V2X systems could offer a lot of data to the prevailing navigation system of the vehicle. The systems additionally create it doable for autonomous vehicles to scan the encircling setting and create immediate choices supported by the knowledge received.

DEVELOPMENT OF V2X TECHNOLOGY-

Although the V2X market continues to be in its earlier stages, most makers have started incorporating the technology, and vehicles are more and more changing into connected to alternative vehicles and infrastructure around them. Vehicles also are changing into intelligent, and that they are equipped with systems that need less human involvement. As a result, users enjoy safer, greener journeys with reduced carbon emissions because of accommodative controller and sensors.

However, the total edges of V2X systems can take time to be actualized for a vehicle to speak with an associate degree entity that has got to be equipped with V2X technology. Most entities like parking areas, traffic lights, and ancient vehicles do not have V2X systems, making it impossible to speak with the vehicles already mistreatment the system. As the V2X market expands, vehicles can communicate with alternative vehicles, traffic systems, and alternative road users like cyclists equipped with V2X systems.

VEHICLE TO EVERYTHING STANDARDS OVERVIEW-

The following are the V2X competing standards:

- **IEEE 802.11P:**

The IEEE 802.11p is that the original V2X normal, and it uses wireless fidelity technology. It links vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) once 2 V2X senders get about to every other variety. The 802.11p normal does not need any communication device to figure, and such a capability makes it ideal in less-developed areas.

The IEEE 802.11p normal exceeds the road of sight sensors, like radiolocation and camera, and it delivers data like toll payments and collision warnings. The essential characteristics of 802.11p embody low latency, short-range (less than 1km), unlicensed five.9GHz band running.

In addition, the quality delivers performance while not being laid low with climatic conditions, like fog, rain, or snow, and the technology will scan the encircling setting even in adverse weather.

CELLULAR V2X:

The Cellular V2X (C-V2X) is an alternate to 802.11p, and also the 5G Automotive Association (5GAA) and Qualcomm support the utilization of the technology. It uses LTE because the underlying technology and C-V2X functionalities are supported the technology.

One of the key blessings of Cellular V2X is that it includes operational modes that users will select from. The primary mode involves direct communication between vehicles over the PC5 interface. PC5 is the point of reference wherever the user instrumentation directly communicates with alternative instrumentation over the channel.

Cellular V2X is intended for active safety warnings like road hazard warnings and alternative things involving V2V and V2I. The mistreatment of these C-V2X systems will defend alternative road users like cyclists and pedestrians by obtaining the PC5 interface integrated into smartphones. This will facilitate observing pedestrians and cyclists' mistreatment, an equivalent road to forestall accidents and injuries.

Apart from direct communication over the PC5 interface, cellular V2X permits the device to use the vehicle-to-network (V2N).

AUTONOMOUS DRONE WITH LIVE VIDEO FEED USING GPS

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Abstract:

A quadcopter can achieve vertical flight in a stable manner and be used to monitor or collect data in a specific region such as loading a mass. Technological advances have reduced the cost and increase the performance of the low power microcontrollers that allowed the general public to develop their own quadcopter. The goal of this project is to build, modify, and improve an existing quadcopter kit to obtain stable flight, gather and store GPS data, and perform auto commands, such as auto-landing. The project used an aero-quadcopter kit that included a frame, motors, electronic speed controllers, Arduino Mega development board, and sensor boards and used with the provided Aero quad software. Batteries, a transmitter, a receiver, a GPS module, and a micro SD card adaptor were interfaced with the kit. The aero quad software was modified to properly interface the components with the quadcopter kit. Individual components were tested and verified to work properly. Calibration and tuning of the PID controller was done to obtain proper stabilization on each axis using custom PID test benches. Currently, the quadcopter can properly stabilize itself, determine its GPS location, and store and log data. Most of the goals in this work have been achieved, resulting in a stable and maneuverable quadcopter.

INTRODUCTION

The work is to design an autonomous flying drone, specifically a quadcopter. The drone is fitted with a GPS tracking system and programmed to be able to autonomously fly from one location to another using GPS coordinates. Significant consideration is given to safety and ruggedness due to the possibility of collision with a variety of objects. In addition to collisions, the drone is also rugged enough to operate during moderately windy conditions.

The goal of the project is to act as a proof of concept for small scale autonomous aerial delivery similar to that nearing deployment by Amazon. A Drone or Quadcopter is a Vehicle has large potential for performing tasks that are dangerous or very costly for humans. Examples are the inspection of high structures, humanitarian purposes or search-and-rescue missions. One specific type of Drone is becoming increasingly more popular lately: the quadcopter (Fig.1). When visiting large events or parties, professional quadcopters can be seen that are used to capture video for promotional or surveillance purposes. Recreational use is increasing as well: for less than 50 Euros a small remote-controlled quadcopter can be bought to fly around in your living room or garden. In these situations, the quadcopter is usually in free flight. There is no physical contact between the surroundings and the quad copter and no cooperation between the quadcopters If would have the capabilities to collaborate the number of possibilities grows even further.

Fig.1.Designed drome

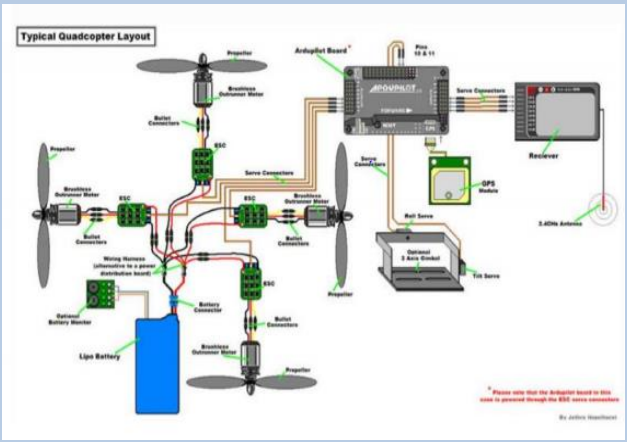


Fig.2.Layout connections of the drone

For example, a group of Drone would be able to efficiently and autonomously search a missing person in a large area by sharing data between. Or, the combined load capacity of a group of quad copters can be used to deliver medicine in remote areas. This bachelor thesis focuses on the use of a commercially available quadcopter platform, the Drone, to perform a task that requires physical collaboration and interaction: moving a mass. In this way a clear interaction between the quadcopters and their surroundings is present. As preliminary step towards the view of collaborating aerial robots the choice was made to perform this task in an indoor scenario where position feedback is present. Starting off with position control, additional controller logic can be implemented to counteract the forces imposed by a mass connected to the quadcopter. The choice is made for the Drone, a generalized approach is chosen where possible to encourage reuse of this research's outcome and deliverables. (1) A helicopter is a flying vehicle which uses rapidly spinning rotors to push air downwards, thus creating a thrust force keeping the helicopter aloft. Conventional helicopters have two rotors. These can be arranged as two coplanar rotors both providing upwards thrust, but spinning in opposite directions (in order to balance the torques exerted upon the body of the helicopter).

CONCLUSION:

Grand visions abound for applications of drones. While Amazon, Google, and others have made great strides towards package delivery, etc., drones remain an unacceptable hazard to persons and property. By comprehensively addressing IMU failure through GNSS – a failover completely orthogonal to inertial methods, Safety Net progresses the state of the art in drone safety.

STUDENT ARTWORK

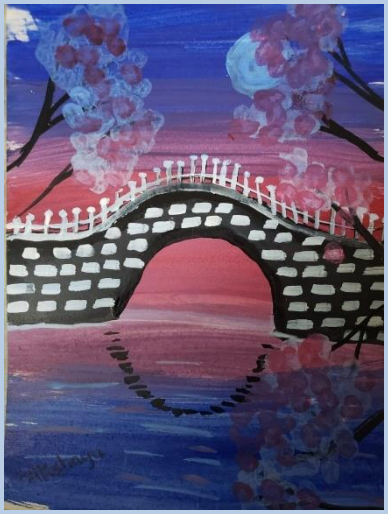
NIHARIKA BODA
[ECE 2C: 4A2]

NANDINI. M
[ECE 3D: 4H5]

JAVVADI SNEHA
[ECE 3D: 4G7]

SHRAVANI REDDY. V
[ECE-2E]

G. AKHILA
[ECE 3B:463]



AKSHAYA. P
[ECE 2D]

NANDINI. M
[ECE 3D: 4H5]

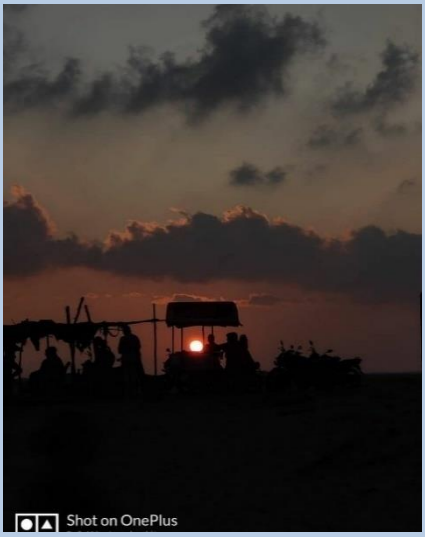
JAVVADI SNEHA
[ECE 3D: 4G7]

NANDINI. M
[ECE 3D: 4H5]

SUMANASARVANI.V
[ECE 3D: 4K1]

STUDENT PHOTOGRAPHY

SAHITHI SURATHU



PAVAN KOKKURA [DOPY]

NITHIN [DOPY]

"SAYING TO SELF" WORKED WELL FOR ME

Bhujanga Rao Sanapala, Professor, braosanapala@yahoo.com

Born in a small rural village in India, like many, I enjoyed the first decade of my childhood with almost complete freedom of doing whatever my playmates and I wanted. Many of our deeds were not acceptable to elders, and some were mischievous indeed. My mother, who never went to school, used to bother me and bother about me only when I was late for food. Perhaps, for that reason, we used to love her more than anyone else. My father was an elementary school teacher. He used to mentor and monitor my progress regularly but would often cut my playtime in the evenings and holidays. Whenever angry with my siblings or me, he would say, "Like many in our village, you will be toiling day and night in the agricultural fields for just three meals a day, unless you study well". Under the care and tutelage of my father and another teacher, I completed my elementary schooling successfully. I was ready to go to a high school in a town 2.5 Km away from our village.

***

There was no road of any kind between our village and the town. One had to walk or ride a cycle over narrow ridges of agricultural fields to reach the city. A walker had to jump off to give way to the proud owners of bicycles. Fortunately, there were only four bicycles in the entire village. We students used to run along the cyclists to show them running was faster than cycling, particularly on rainy days. We were a small group of proud students from the village going to a high school. We used to enjoy the 40-minute walk each way more than anything else. In our group, three senior students were interested in everything except sitting in classrooms. But they were very regular and punctual in leaving home in the morning and reaching back in the evening. They used to smoke beedis, not attend classes, play in a park or garden nearby, tell lies to parents and teachers to cover up lapses. But they never forced others to follow their ways. At that age, one could easily be influenced by being in a bad company for a long time, and I was. I started smoking, cutting classes, telling lies to teachers for not completing homework. The consequences were terrible, sad and disgusting.

***

One evening, I smoked a beedi on my way back from school, and my mother smelled it while giving me a snack, she asked me to explain, and I did not give any reply. That was the first time I saw my mother's face in anger. I felt awful and said to myself, "I should never again make my mother angry."

I did not eat food that night as my mother kept food but did not talk to me. The following day, I ate my meal with the intervention of my paternal grandmother. In the evening, I went to my mother and said, "Amma, I have stopped smoking". She immediately responded with a beautiful smile and gave me a hug and many snacks to eat. After a few months, I started smoking again but washed my mouth thoroughly to prevent smell detection.

***

There was a quadrangle in the middle of our house, where four or five elders, including my father, used to sit and chat in the evenings covering everything they wanted. My mother would prepare tea and snacks sometimes and ask my siblings or me to serve the guests. As the staircase to the terrace of our house was situated in that quadrangle and as I was the most frequent visitor to the small but beautiful rooftop, I used to overhear the elders' conversations sometimes. I used to enjoy some of my evenings alone on the terrace. There, I would compose songs of my own and sing as I liked, watch birds flying back to a huge tamarind tree nearby and solve word and number puzzles. I watched the smoke of cooking escaping through thatched roofs, greet boys and girls on their terraces and most significantly **"saying something good to myself".** In what follows, I share with you the positive impact I experienced of **"saying to self"** when the mind was ***calm*** and the environment ***serene***.

***

It was in April 1963 that our final results were declared. I was not promoted to the next grade. It was so with most of our group members. That created a gloomy atmosphere in my house. Everyone was sad, and I was ashamed to show my face to anyone. I went to the terrace and started recalling the sequence of events that had resulted in the sad and dire situation in my family. That was the longest duration I spent on the terrace skipping a meal. Several days went off. **O**ne day my father broke the long silence by saying to me, "You failed only in one subject – physical sciences. Why don't you go for coaching this summer?". Immediately and happily, I replied, "Yes, nanna". Fortunately, I was under the care of an excellent teacher who taught me English grammar, Natural Sciences, Mathematics apart from physical sciences. Things were getting better for me.

***

One evening, the quadrangle meeting was taking place, and there was a discussion about our lousy group of students, many of whom failed in the final examinations. Three elders and my father were in the meeting. One of them was heard saying to others, "Bhujanga Rao is neither interested nor fit for studies. But he is good at agriculture. So, it's better he discontinues studies forthwith and takes up farming". The other two elders fully endorsed that idea. My father was heard saying, "he used to be an outstanding student earlier. I am sure he got spoiled by being in bad company. He is going for a private coaching this summer. Let me see for one more year and then decide". The other elders did not like that idea, and one of them said, "it may be a waste of effort and one more year. Anyway, it is your decision".

***

A few days later, I went to my favorites spot on the terrace. It was a pleasant evening; my mind was calm, and I was alone. I once again recalled the sequence of things that led to several unpleasant situations in the past couple of years. I was able to identify reasons. The most prominent reason was that I was not heedful of my

teachers' instructions, parents' advice, and well-wishers' warnings. I firmly resolved to say something to myself and to follow it without any deviation. I said to myself, ***"I must disassociate myself with the spoiled students in the group. I must not smoke even a single time forthwith. I must prove to my parents, my teachers and my entire village that I am an excellent student of the village".***

I could see the transformation taking place in my academic performance. I was rated a good student in the half-yearly exams, a favorite student of several teachers after the annual exams. I was a student among toppers in the following higher grades. I secured a Bachelor of Science degree with distinction marks. I was the second topper in my college, which helped me secure an engineering seat in the prestigious Madras Institute of Technology (MIT). I was in my village during that summer when my B.Sc. degree results were published in daily newspapers. I remember even today that happiest moment in my life: My father was so pleased and excited that he went round our small village with a Telugu newspaper to show my result to one and all and share his happiness. It was a great festival like situation in and around my house. I was delighted that I heeded whatever ***I said to myself***, and the results were extremely gladdening.

SRUJANASTRA CLUB

Beginnings, there is something special about them. What takes place in between a beginning and an end is what makes that moment special. Recently, the Department of ECE started a new student club called the Srujanastra. The club is overseen by faculty coordinators Mrs M. Laxmi and Prof K. Somasekhara Rao, who handpicked the club members over a while. Once the club took off, the responsibilities were officially handed over to the members on the 10th of March, 2021. The club Srujanastra goes by the motto 'Creating value through convergence'. The club members believe that their humble team will always welcome any student who is willing to learn something beyond their academics.

The club's activities include conducting various technical events like workshops, guest lectures from several dignitaries of their respective fields, project creation, etc. The Srujanastra provides a perfect platform for young and budding engineers who want to enhance and refine their skills. They provide an array of opportunities for the students to learn and grow in their own time and space. During the early stages of their debut, they conducted their first major event, (non-technical) logo designing competition on the 20th of March. As time went by, they also ran a series of quiz competitions called the Mind zone, which was a great success among the students. While K. Prerana of ECE-3C won the first part of the series, D. Anuhya of ECE-3C triumphed in the second. The club also plans to conduct some more workshops, guest lectures, quizzes, peer learning sessions, etc., in this academic year.

One single step is all it takes to begin a journey. It is a start, and the path you have chosen might terrify the life out of you some time or the other, but that is okay. The Srujanastra club is one place where you could seek guidance and grasp opportunities that could bring you closer to your goal.

POETRY

Phone You Are…

Phone you are wireless
You are friend to a person of loneliness
You vanish the stress brings back happiness
But don't make them useless;)
Your birthday was in vented by Graham bell
Everyone's birthday wishes done by your ring bell
Which makes everyone surprise well
But don't make them I'll^_^
You are a beautiful creation
We can get lot of information
Anyone can do animation
But don’t lead to any destruction; -
You are my world
But don't take me into your world.

- MOLUGU SAISRUTHI
ECE-2B

Above The Ordinary…

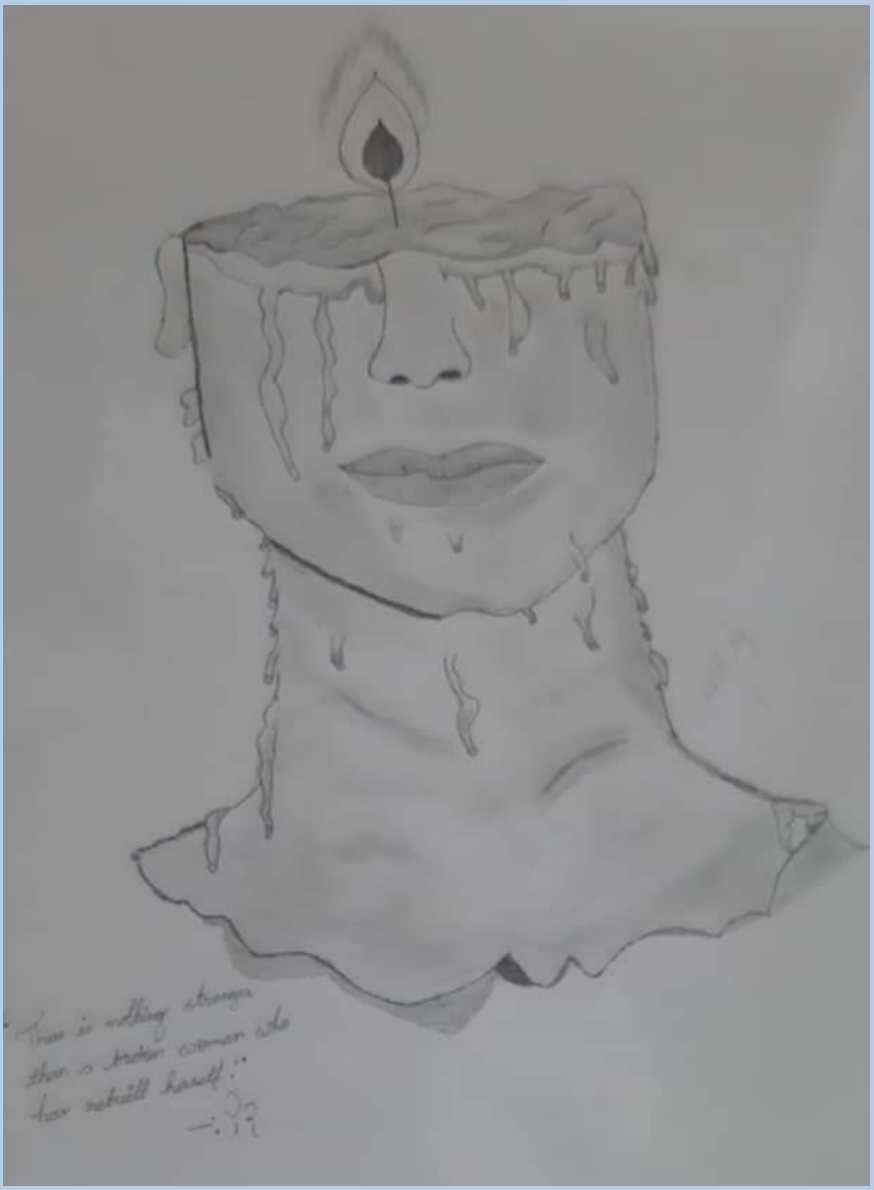
With the dawn of a new world
Earned were those free reins
The bygones still inked fresh
As if it were just yesterday
For she was challenged at
Every step of the way.
A story of not long ago
About what we reap is what we sow.
An archaic world of inequality

A woman's life and its harsh reality.
Bounded was she with roles of uncertainty
Was shackled up with responsibilities
Burdened with the norms of society
Haunted by standards of conformity
Acknowledged only for her docility
Undermined was her ability.

From being primped up to walk down the aisle
Before she could even grasp the worldly affairs
To the coerced hand on her shoulder
Saw her as nothing more than just a need
To the feticide of her unborn child
And mauling up her sanity
To burning into ashes with her companion
No will of hers was taken into regard
Her pain was often overlooked
Her pleas were deemed as madness
No cries were ever let to be heard
Was cast away in this cruelty
She tolerated and suffocated
Until she could no more.

So as the times changed, so did she
Now she stood up for what she believed
Raised her voice for equality
Brought down the walls of supremacy.
Criticized from time and time again
She held her head high and moved forward
For she was not just any woman
She was a mother, a force of nature to be reckoned with

A sister, a protective shield bonded with love
She was a better half, a shrouded warmth
of promise and strength
A daughter, a symbol of the nation's prosperity.



- SUMANA SARVANI
ECE-3D

Senior Says…

Despite the growing number of engineering graduates in India, the country remains almost stagnant in producing "qualified graduates"—students with all-around performance in academic, co-curricular and extra-curricular activities. Many students are searching for a one-shot pill that will make them the perfect candidate for their future endeavors. As a result, they succumb to stress, unhealthy socio-academic balance, and unethical means to achieve the ideal image.

As seniors, we can offer no immediate advice except for one. This concern, of today and tomorrow, has no quick solution and can only be tackled by slow and consistent efforts. So we tried to make it less difficult for the juniors and compiled a list of goals that, when achieved, will bring you closer to your dream future. This is directed primarily towards students who would like to pursue their Master's degree.

These are some things that we wish we knew and worked on right from the start.

1) GPA is essential:

Whether it is campus placements or a Master's degree, the most rudimentary parameter to judge students is their GPA. Maintaining a solid 8.5 till the end is nothing less of an achievement. However, it is much easier to score well above that (up to 9.5!) in the first four semesters. These are crucial as they compensate for any score plunge faced in the future semesters. So we recommend starting with a bang and finishing strong!

2) MOOCs:

A well-developed skill-set is more significant than any other treasure in college. MOOCs (Mass Open Online Courses) can help achieve this goal. Platforms like EdX and Coursera give tons of free courses that help you develop your personalized skill-sets. Some of these courses are entirely free, while the others require payment. As of now, we can all audit Coursera's programme for free. These courses also expose you to various fields and help you decide your future interests. Eventually, once you figure out your area of interest, these MOOCs can guide you for specific internships and earn certificates from various institutes. So we recommend you take the time to sharpen these tools to help you in battle!

3) Online/Offline Internships:

Internships are a great way to push your boundaries and meet new people. They sharpen your skill-sets help you gain professional workplace exposure (plus, they look good on your resume!) Many of the internships today are a combination of online learning and project completion. Apply for as many internships as you can. A couple of good internships will give you the much-needed boost to go forward and get that dream job!

4) Projects:

It is unmistakable that our Bachelor's degree's major and minor projects play a crucial role in the path we pave for our future. However, many other tasks a student can start working on right from the first year. With guided projects to the rescue, students can fuel their profile and get a solid perspective to help them decide their future. So we recommend working on a driven project every semester so that you can clear out any ambiguity regarding your future.

5) Papers:

Our college encourages many events/competitions like Paper Presentation, poster making, project expo etc., that provide the opportunity for students to explore their fields in detail. Every semester we have tech fests like Bhaswara, Electrika, Manotron, Alfamatica that expose students to the diverse technological world around them and encourage them to push their boundaries by providing financial benefits like prize money (yay!). There is no better and more fun way to do this than with friends.

We recommend starting small and then going for bigger things. Students can work on one or two papers every year to gain experience and then present papers in technical seminars or submit them to scientific journals.

6) Extra/Co-Curricular:

There are a vast number of ways through which one can develop this aspect of one's profile. The best place to start is through clubs that get our ideas going. We recommend that you join a club that reflects your interests and actively participate in it. Our college has amazing clubs ranging from technical ones like Srujanastra, GLUG, IETE, IEEE, to non-technical ones like NEN, literature, photography, short films and many more. These clubs might be exclusive to students or a combination of both students and professors working together to create phenomenal projects and memories! Who knows? You may even end up starting your very own club someday!

Learning a foreign language is another tremendous co-curricular asset that a student can have, be it French, German or Spanish. Learn a new language and widen your scope!

7) MUN:

Model United Nations, abbreviated to MUN, is a great platform to develop your public speaking, presentation and networking skills. These conferences--held online and offline--mainly aim to discuss the trending concerns of our world and focus on coming together as a committee to form solutions. One might mistake them as trivial, but through these platforms, one can improve their general knowledge, public speaking, negotiation, and develop a solid work ethic. We recommend dabbling in this diverse world, which, though intimidating at first, can eventually give you some worthy certificates and a broader network that will be fruitful in the future!

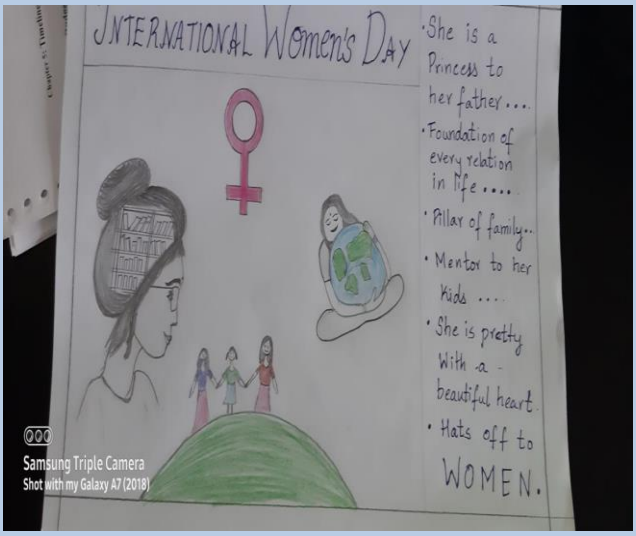
Please do remember that all of this must be combined with a good sleep schedule and healthy physical and mental habits to get optimum results! We hope that these recommendations will help you pursue your dreams and make them a reality. We wish you the best of luck!

A. VAISHNAVI(3C)

V. SRIJA(3C)

SEMESTER HIGHLIGHTS

A day went by, then two. It went from a week to almost a year. Despite the pandemic, our college opened its gates for students to begin the new semester. Normal doesn't define how the situation is, but we Geethanjalites try to make the most of it. So, when the month of March came along, the college once again breathed to life with lively chatter, students around the campus, and their playful banter. The month also throws a spotlight on the celebration of womanhood and its achievements. It was on the 8th of March, as part of the Women's Day celebrations, competitive events, namely poetry, poster making, and painting, took place. By the end of the day, the walls were decked with inspiring posters and colourful art. Lines depicting how a woman is a great mother to her children, a sister to her siblings, and a proud daughter to this nation brought meaning and vigor amongst the students.



So as the days rolled by, the recruitment for the NEN club was announced. The event took place from the 22nd to the 26th of March, where the students were interviewed by a panel of Elected Leads based on their ideas, interests, and visions. The results for the new Team Leaders and Team members were later announced on the 28th of March. As serious as the whole process looks out to be, playing a part in their club is just as fun.

Though one might get suspicious with the bizarre pranks that usually take place during this month, the start of a new student club in the ECE department, Srujanastra, was surely not one. The club events include monthly quizzes, technical programs like workshops, and project model creation and expos. Midzone, a quiz competition series, was recently conducted by the club. On the 9th of April and on the 7th of May, K. Prerana and D. Anuhya of ECE-3C emerged out as winners of the first two editions.

At times like these, aiding the ones in need is a blessed deed. The GIT-GLUG club, which works along with the Swecha Projects, had a site meeting on the 30th of April regarding their voluntary services to the ones in need. Recently they've also conducted a Swecha Hackathon on the 25th of April, at 10 am. Our college's very own GCTC portal, COVID support, works hand in hand with the GHSF club, provide unrewarded services to the ones who seek help.

A pandemic, this might be, but it doesn't stop one from learning new things. Our college, too, has taken this to heart and has encouraged students to enroll themselves at Coursera, an online learning platform. By the end of the 4th of May, a number of students registered for this in hopes of learning and enhancing their skill sets.

It takes more than a shove to knock us down. The will to stand up and fight against what we believe is what makes us unique. The battle against this virus will continue, and one day again, we'll be to not taste but breathe in the freedom without any restrain.

- SUMANA SARVANI
ECE-3D

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