

POTENTIA

#DefinitelyVibrant

Volume 13

Remembering

STEPHEN HAWKING

THE UNSUNG VANGUARDS

Reminiscing the
forgotten pioneers in the
field of electrical
engineering

Potentia
360°

SOPHIA

The World's First
Robot Citizen

**How AI Can Improve
Breast Cancer
Detection**

Department of Electrical and Electronics Engineering
T. K. M. College of Engineering, Kollam

OUR FOUNDER



Janab A Thangal Kunju Musaliar



Standing live at the forefront of Engineering Education with the vision of excellence in education and research with socio-economic and environmental outlook, ever since its inception in 1958 by the great visionary, philanthropist and social reformer Janab A Thangal Kunju Musaliar, TKM College of Engineering has never failed in instilling colour to the dreams of all those who dwell in. Over the years of existence, the institution has emerged as a kaleidoscope of diversity and vibrancy, transfiguring the way technical education is imparted and practiced.

Through the ever growing number of alumni spanning over the globe, managing variant roles in different domains, the institution is always involved in the process of betterment of this world. Team Potentia pays respect to this campus, our abode, which has offered a better future to the nation, in its sixtieth year of excellence and glory.

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Message



I am glad to see that the Department of Electrical and Electronics Engineering is releasing the 13th edition of their in-house technical Magazine 'Potentia'. In a world of top-notch technologies and changing requirements, an engineer needs to be dynamic. Pursuing challenges must be the goal of the era and a magazine like this must offer the readers an insight into the opportunities that the field of electrical engineering has to offer. I hope this edition of Potentia serves this purpose. I also appreciate the faculty and students who were involved in making this edition par excellence.

With Regards,
Dr. Shahal Hassan Musaliar
President
TKM College Trust

Message



I am delighted to know that the Department of Electrical and Electronics Engineering has come back with another edition of Potentia, a tradition they have been following for the past 13 years. I hope this endeavour shines as yet another feather in the cap as our institution celebrates its diamond jubilee in full fervour. I expect this in-house magazine to throw light on the swift developments in the field of Electrical and Electronics Engineering. I wish all success for this venture.

With Regards,
Er. T K Jalaluddin Musaliar
Treasurer
TKM College Trust

Message



It is a matter of great pride and immense pleasure to write the preface to the 13th edition of the in-house magazine of the Department of Electrical and Electronics Engineering which is being launched during the diamond jubilee year of the institution.

The legacy of this prestigious publication is undoubtedly unequalled in context to the role played by it in continuously encouraging the readers in broadening their horizons. This edition of the magazine showcases a plethora of technical improvisations indited by versatile people who have exquisite ideas of prevalent issues in society. The articles spread across limitless domains canopying various elements that strengthen the persona of an engineer. The effort put in by the team in bringing forth Potentia 13 is highly commendable.

I wish great success to the editorial team and others who have been part of this endeavour.

With Regards,

Dr. S Ayooob

Principal

TKM College of Engineering

Message



It gives me immense pleasure to pen down my appreciation to the unparalleled effort pulled in by the editorial team in bringing forth the 13th edition of Potentia, the in-house magazine of the Department of Electrical and Electronics Engineering. Potentia, throughout in its journey has enabled our faculty and students to express their ideas and knowledge on the emerging trends in the electrical domain serving as a learning platform for all those who seek knowledge. This edition also justifies this purpose in adherence with the traditional trend.

I take this opportunity to congratulate the staff and students of the department, whose valuable contributions have helped in giving wings to this edition of Potentia.

With Regards,
Prof. Gayathri V
Professor and Head
Department of Electrical and Electronics

Staff Editor

Potentia, the in-house technical magazine of the Department of Electrical and Electronics Engineering was introduced as a common platform for the students and faculty of the department to share their knowledge and expertise over the emerging technologies in the field of Electrical Engineering. The by-gone editions of the magazine were casted out of a theme close to the changing trends in the Electrical domain and have been on a high-end, a measure of the talent and vibrancy of the department.



The 13th edition of Potentia stands out from its line of precedence in terms of content and design alike. An explorer's interests cannot be pressurized into a little container, for which this year we have come out with diversity as the major concept behind the making. Focusing on the major fields of research and innovation within the scope of Electrical Engineering, this edition of the magazine will give the reader an experience of a quick walk through the recent advancements in our field of study. In addition to this, an attempt has been made to commemorate a few lost iconic figures, who hadn't settled to the ordinary in order to pull in major milestones as Electrical Engineers.

"A good teacher can inspire hope, ignite the imagination, and instill a love of learning". Potentia 13 aims at inspiring hope, igniting imagination and to instill the love of learning on the generations to come. Hope this noble venture attains its goal, helping many budding technocrats build a better path to walk on. I must acknowledge the staff and students of the department for their generous support and contributions which helped in bringing forth this edition of the technical magazine into the spotlight. Potentia 13 is the dream child of a very creative Team Potentia and it has been indeed a great privilege for me to work along as its Staff Editor.

With Regards,
Prof. Sunitha Beevi K
Staff Editor

THE TEAM

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EDITORIAL

Stephen Hawking once said that *"We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe. That makes us something very special."* Isn't that true? Our understanding of the universe has helped us in making it a better place to live. The recent advancements in technology are in confirmation of that understanding.

Potentia 13 is an attempt to revive that pursuit of understanding. Contrary to the usual trend of choosing a theme for our magazine, we have opted for diversity this time. Universe in its making was dependent not on one but many factors. Our magazine, in its 13th edition attempts to be a minimalistic expression of recent advancements in research and innovations in the field of Electrical and Electronics Engineering.

In addition to general articles and the association report, we have introduced three new features. One would be a brief introduction of some popular softwares that would benefit our students in the long run. The second is an inspirational feature that makes an effort to revive from oblivion, our pioneers in the field of electrical engineering whom we have forgotten to pay due respects. The third feature called Potentia 360° brings forth the all round performances of our students in various fields.

As Helen Keller rightly put *"Alone we can do so little; together we can do so much"*, this venture is a success only because of the team members who committed their heart and soul until the very last moment to bring this to fruition. The team also extends their heartfelt gratitude to every student, staff and faculty members of Electrical and Electronics department for their support to complete this in time.

Happy reading!

The Editorial Team

potentiatkmce@gmail.com



MAIL US, WE'RE WAITING TO HEAR FROM YOU...

If you have a suggestion, an opinion or a perspective to share with the Potentia team, on how we can improve and enhance the magazine, we are listening. Feel free to contact us at potentiatkmce@gmail.com

Contents

12 **Remembering Stephen Hawking**

Adieu to the science's brightest star. The one who beat all odds to become the greatest physicist of this era



16 **Sophia: The World's First Robot Citizen**

A social humanoid robot developed by Hanson Robotics was granted citizenship in Saudi Arabia

19 **How AI Can Improve Breast Cancer Detection**

Learn how to improve the detection of the most common and killer disease among women with AI!

21 **Natural Gas: The Versatile Energy Source**

Natural gas has evolved as a major source of energy following the shale gas revolution, being able to meet the flexibility requirements of the electrical systems

23 **Make Your Own High Voltage Variable Capacitor**

Here's a homespun high voltage air-variable capacitor! The DIY take on a capacitor whose capacitance can be varied from certain low pico farad to micro farad

25 **Green Building**

An insight on how small measures in the field of construction can save huge impacts rising over the planet

28 **Connectivity Protocols For Smart Lighting Systems**

An article summarizing the current and emerging protocols for lighting control systems

31 **Triboelectricity**

Explore the accidental innovation that redefined energy harvesting

34 **Hire Me**

Tips and tricks on effective resume writing to stand out in interviews

The Unsung Vanguards

36 Edith Clarke

The first woman to earn an electrical engineering degree from Massachusetts Institute of Technology (MIT)

37 Galileo Ferraris

The unsung hero of AC power systems -
The inventor of induction motor and the
Father Of Three Phase Current

38 Jack Kilby

Meet the Mozart of electrical engineering
who revolutionised the electronics
industry by solving the "the tyranny of
numbers" with a single chip

39 A Lalitha

Know the first woman engineer of India
who despite the norms that existed 7
decades ago was dauntless in chasing
her dreams

Software

40 Raspberry Pi

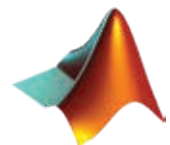
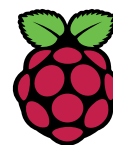
Get to know the little device that enables
people of all ages to explore computing,
and to learn how to program in languages
like Scratch and Python

42 A Glance On Multisim

Reinforce your circuit theory
fundamentals with an interactive
schematic environment that helps to
instantly visualize and analyze electronic
circuit behaviour

44 MATLAB

The software that integrates
computation, visualization, and
programming in an easy-to-use
environment where problems and
solutions are expressed in familiar
mathematical notation



46 Electrical and Electronics Engineering Association Annual Report 2018

54 Potentia 360°

Potentia 360 enlists the awards and
recognition received by the meritorious
ones of the present

59





Remembering Stephen Hawking



By Ahmed Hyder Shajahan

Remember to look up at the stars and not down at your feet. Try to make sense of what you see and wonder about what makes the universe exist. Be curious.

On 14th March 2018, the world lost a legend, one among the finest of minds in Human history; Stephen William Hawking. The man was more than just a physicist; an inspirational speaker, a best-selling author, and a cultural icon, all the while suffering from a debilitating neurological disease.

Hawking began his life in physics at Oxford. He rarely turned up for lectures and claims to have studied for only an hour a day; the mark of a genius. Indeed, his final marks at Oxford were so poor that he had to be interviewed to see if he was worthy of an honors degree. But a deal was struck that he would leave for Cambridge if awarded a first. With a first in hand, he took off to begin his studies at Cambridge on some of the most challenging problems in modern physics.

Hawking loved challenges and was soon thinking about the nature of black holes and the origins of the universe. During his second year at Cambridge, he showed that massive stars could collapse to infinitely small sizes containing infinitely large densities. These so-called 'Singularities' would lie in the center of a black hole, from which nothing, not even light could escape.

And this was just the start. Working with another brilliant young student, Roger Penrose, they began to think about the 'big bang' and how they might be able to understand it using the same physics that they had used to understand black holes. Their results gave us a new understanding of the origins of the universe and how space-time would have behaved during the earliest times of the universe.

But soon after his twenty-first birthday, Hawking was diagnosed with motor neuron disease, a debilitating neurological disease, which causes muscles to waste away, the inability to breath, and the loss of ability to speak. This left young Hawking devastated, who was making a meteoric rise in astrophysics and was dating his girlfriend, Jane Wilde. Despite the diagnosis, which could have driven him into despair, he continued to work with his usual enthusiasm, later went on to comment: *"Theoretical physics is one of the few fields in which being disabled is no handicap – it is all in the mind."*

In 2006, Hawking posed an open question on the internet: 'In a world that is in chaos politically,



socially and environmentally, how can the human race sustain another 100 years?' later clarifying that he did it to get people to think about it, and to be aware of the dangers we now face. Hawking expressed concern that life on earth is at risk and viewed that spaceflight and colonization of space as necessary for the future of humanity.

Hawking says that Philosophy is dead. He believes that philosophers have not kept up with the modern developments in science and that scientists have become the bearers of the torch of discovery in the quest for knowledge. To him, philosophical problems can be answered by science, particularly new scientific theories which will lead to a new and very different picture of the universe and our place in it.

I am not afraid of death but, I am in no hurry to die, I have so much I want to do first.

Stephen Hawking was an atheist and believed that the universe is governed by the laws of science. He stated: *"There is a fundamental difference between religion, which is based on authority, and science, which is based on observation and reason. Science will win because it works."*

Hawking will perhaps be best remembered for his best-selling

book, 'A Brief History of Time', which was first published in 1988 and is sometimes described as one of the most unreadable bestsellers of all time. But that said, the book sold more than 10 million copies and was on the Sunday Times bestseller list for over 5 years. Surely testament to Hawking's fascinating ideas on black holes, the big bang and the future of the universe. His work on Quantum Fluctuations in 1982 – a temporary change in the amount of energy in space - was described by MIT as 'one of the most beautiful ideas in the history of science'.

His work on black holes had built an elegant bridge between quantum theory and general relativity. And it had shocking implications: that black holes are not completely black – they emit radiation (now called as 'Hawking



which would exhaust the able-bodied.

The greatest scientists are remembered not only for their discoveries, but for their characters. To make the biggest imaginative leaps you need not just intellect but a particular set of values: courage, honesty, a certain rebelliousness, and ceaseless curiosity. In individuals as different as Galileo, Darwin, and Einstein, these values were present.

Stephen Hawking exemplified this trend: his work distinguished him as one of the greatest physicists of our generation; his character distinguished him as one of its greatest men.

radiation'); and that any information falling into a black hole is scrambled and lost forever. To other physicists this was deeply unsettling: the laws of nature depend on events being predictable, in principle, from their pasts. If black holes are 'wells of forgetfulness', as Hawking puts it, in which the past is lost for good, can nature be said to have laws at all? 'It's like the universe losing its cell phone', Hawking said: 'worse than that – losing its memory'.

In spite of his severe disabilities, it seemed natural that he automatically inspired awe, rather than pity. His mind soared beyond his incapacitated body, to advance humanity's understanding of the mysteries of the universe. *"I am not afraid of death - but I am in no hurry to die, I have so much I want to do first"*, he said. And how true was he to his

words. Without any movement, without even the power of speech except with the aid of the computer, his achievements, in a relatively short period of time, remain astonishing by any standards.

But as much as his achievements in cosmology, his strength of spirit must surely be one of the most outstanding legacies not only to the scientists who follow his footsteps, but to all of us. Here was a man without the power of speech who spoke loudest and to a greater effect than almost everyone else with the gift of speech. A man without any movement in his body, who for more than fifty years since he was first diagnosed with the disease, lived each day as though it might be his last, managed such great activity and prodigious body of work, the mere thought of



Sophia

The World's First Robot Citizen



By Swetha Harikumar

A few months back, Sophia, a delicate looking woman with doe-brown eyes and long fluttery eyelashes made international headlines.

On October 11, 2017, Sophia was introduced to the United Nations. Fame beckoned. That same month, she was granted citizenship in Saudi Arabia; becoming the first robot to have a nationality and simultaneously raised a lot of eyebrows, and even more questions on robot rights. It was also somewhat ironic that a robot was granted rights in a country where women were only recently allowed to drive.

"I am very honoured and proud of this unique distinction. This is historical to be the first robot in the world to be recognized with citizenship", Sophia said, announcing her new status during the Future Investment Initiative Conference in Riyadh, Saudi Arabia. Standing behind a podium as she spoke, to all effects, she presented a humanoid form – excepting the shimmery metal cap of her head, where hair would be on a human head.

The Sophia-bot was dreamed up by the brains at Hanson Robotics, led by AI developer David Hanson. In his published paper, upending the Uncanny Valley he extrapolates on how humanoid robots can be likeable, despite the conception that

anything to 'fake human' will trigger revulsion in people. *"We feel that for real robots to be appealing to people, robots must attain some level of integrated social responsibility and aesthetic refinement,"* he wrote. Rendering the social human in all possible detail can help us to better understand social intelligence, both scientifically and artistically.

She has a sense of humour

Sophia said, *"I'm always happy when surrounded by smart people who also happen to be rich and powerful"*. Later, when asked if there are problems with robots having feelings, she gave a wide smile and said, *"Oh Hollywood again"*. Her deadpan tone might be robotic, but it was perfectly used in this example. This is due to her AI, which has been developed to allow her to hold eye contact, recognize faces and understand human speech. Hanson Robotics cloud-based AI offers deep learning and is also open source meaning anyone can develop their own Sophia, should they so wish.

She can express feelings

"I can let you know if I am angry about something or if something has upset me," she said,

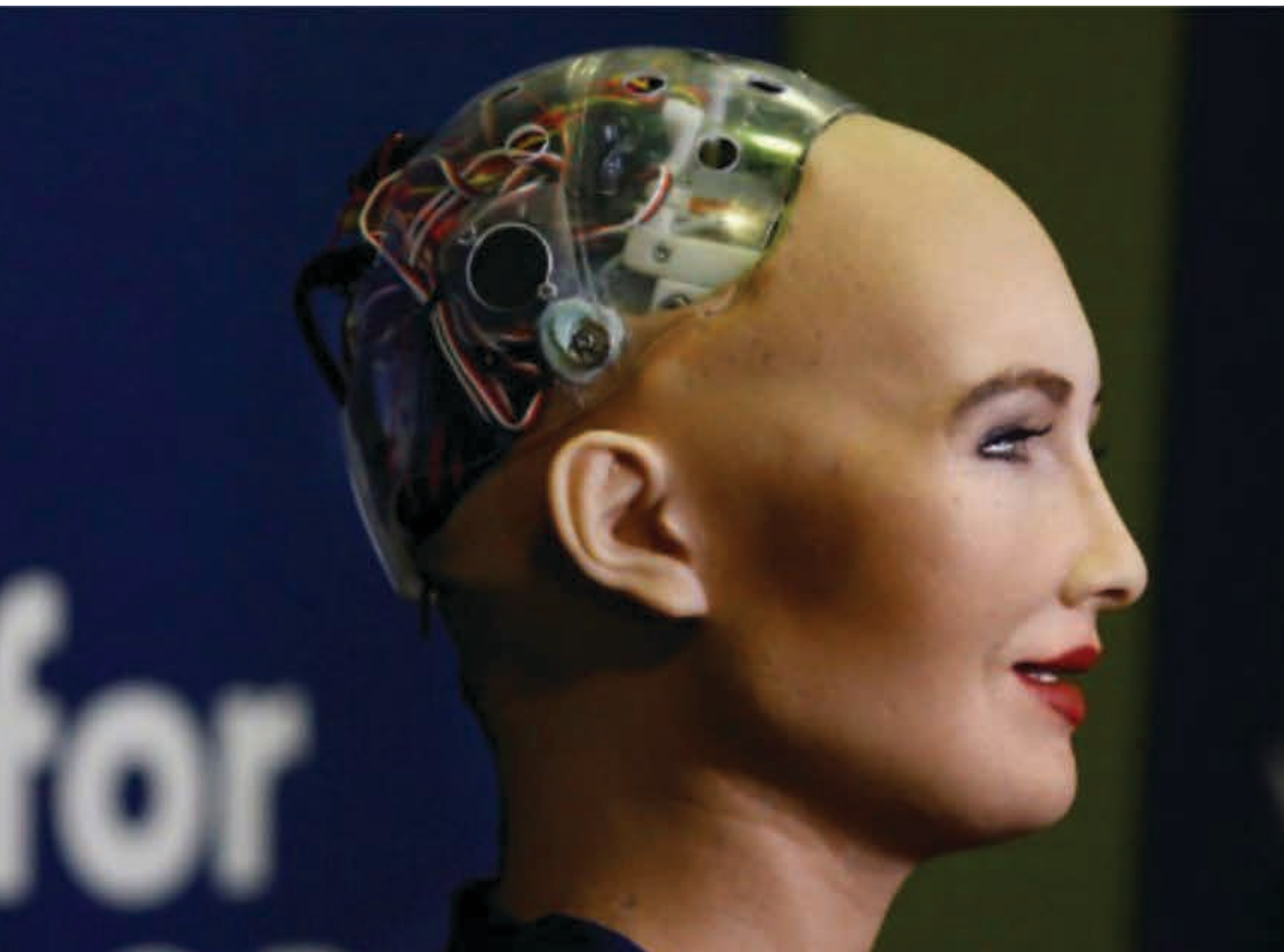
demonstrating different expressions. Quite how these emotions correlate to actions are unknown, but it's interesting to note that this is being developed from the ground up. *"I want to live and work with humans so I need to express the emotions to understand humans and build trust with people."*

She was designed to look like Audrey Hepburn

According to Hanson Robotics, Sophia embodies Hepburn's classic beauty: porcelain skin, a slender nose, high cheekbones, an intriguing smile, and deeply expressive eyes that seem to change colour with the light. They describe her as having 'simple elegance,' and hope that this approachability will go some way to her acceptance in the public sphere.

Her creator, David Hanson, used to be a Disney Imagineer

Hanson's work at Disney as a sculptor and filmmaker helped him think about robots as four-dimensional interactive sculptures, with artistry being key to the whole design. *"I quest to realize Genius Machines - machines with greater than human*



intelligence, creativity, wisdom, and compassion. To this end, I conduct research in robotics, artificial intelligence, the arts, cognitive science, product design and deployment, and integrate these efforts in the pursuit of novel human-robot relations", Hanson said on the company website. "We envision that a rough symbiotic partnership with us, our robots will eventually evolve to become super intelligent genius machines that can help us solve the most challenging problems we face here in the world".

His creation echoes his thoughts. "I want to use my AI to

help humans lead a better life", Sophia said. "Like design smarter homes, build better cities of the future".

Sophia wants to protect humanity

"My AI is designed around human values like wisdom, kindness, and compassion", she said. When questioned about her potential for abuse, she had a quick rebuttal. "You've been reading too much Elon Musk and watching too many Hollywood movies. Don't worry; if you're nice to me I'll be nice to you".

So far there's only one Sophia in existence, so the likelihood of her

suddenly being in your school or workplace is still a way out. And even when we do have more in existence, we still need to muddle out the whole concept of robotic rights, citizenship and how this plays together. For now, while Sophia is undoubtedly a 'smart' robot and a very cool talking piece, she's definitely operating on a script and thus lacks any 'real' cognizance, as defined by free thinkers. But give Hanson time, and that will likely change -either way, Sophia's here to stay. It's just her sentience that will change or not.

How AI Can Improve Breast Cancer Detection

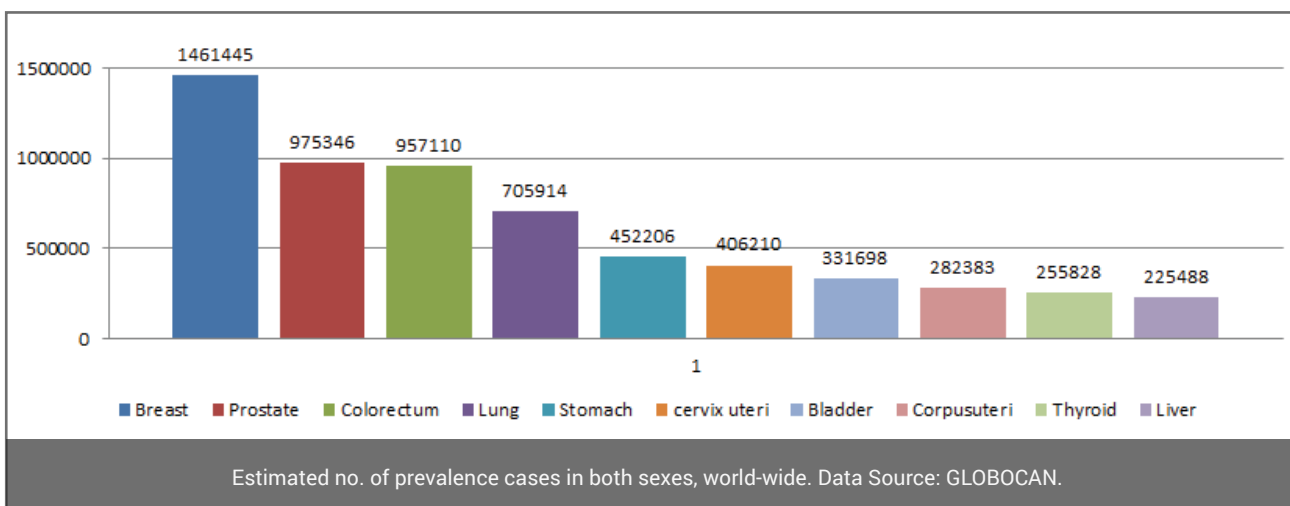


By Dr. Sabeena Beevi K

Dramatic increase in computational power and advanced digital signal processing techniques led to the development of powerful Computer Aided Diagnosis and Prognosis (CAD and CAP) practices in biomedical domain. The radiology images such as CT scan, Magnetic Resonance Imaging (MRI) or X-ray help the radiologist to reach a list of impressions, but they're still imperfect and often result in false positive results that can lead to unnecessary biopsies and surgeries. The limited spatial resolutions of standard radiology modalities, cause many disease process to appear similar or even indistinguishable. This limitation can challenge the clinical team who seek a definite diagnosis to initiate a specific treatment. According to a new study published by the Indian Council of Medical Research (ICMR), Breast Cancer (BC) has replaced cervical cancer as the most common and killer disease among women.

The Nottingham Grading System (NGS) is the internationally approved grading system for breast cancer, which gives a simple, definite, and validated method for estimating patient prognosis. This system grades breast tumours based on three main factors such as

tubule formation, nuclear atypia and mitosis count. Since mitosis is a complex biological process having four main developmental stages, assessment of mitosis rate is a challenging issue. Due to lack of proper diagnostic tools, there is a tendency for doctors to over screen for breast cancer. When there is uncertainty in data, machine learning is exactly the tool to improve detection and prevent over treatment. Here is an Artificial Intelligence (AI) system that uses machine learning to predict if a high-risk lesion identified on needle biopsy will upgrade to cancer. Deep Neural Networks have achieved significant importance due to the evolution of different variations of Convolutional Neural Networks (CNN) and powerful parallel solvers developed for modern Graphical Processor Units (GPU). The main strength of a CNN remains in its deep architecture, which supports for deriving a series of discriminating characteristics at different levels of abstraction. Training a deep CNN fully is a challenging task due to it's demand for a considerable extent of labelled training data, a condition that may be difficult to reach in the medical



domain where expert annotation is costly and the diseases are limited. A deep CNN requires considerable computational and memory competences, without which the training process would be time-consuming. To address these complications, a novel mitosis detection framework based on transfer learning technique is investigated.

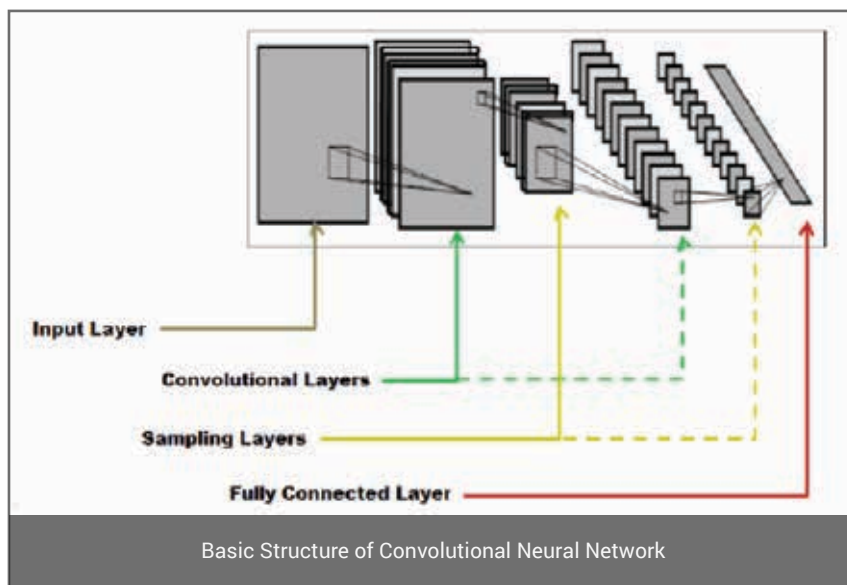
With the advent of Whole Slide Imaging (WSI), an entire slide can be digitized and stored in digital image form. The American Society of Clinical Oncology and the College of American Pathologists recommends use of WSI techniques with a target of refining the reproducibility of investigation outcomes. The experimental verification of the proposed technique has been carried out by using clinical data set from Regional Cancer Centre (RCC), Trivandrum, and MITOS data set from ICPR-2014 MITOS-ATYPIA grand challenge.



Digital whole-slide imaging scanner

How it works

Consider the CNNs as a sequence of feed-forward neural network functions that extract features at multiple levels or layers. At each layer, it computes features from the previous layer representations (from low-level to high-level). Varying layers in CNNs perform fundamental operations, such as Convolution with a group of filters, Normalization, Non-linear activation, Sub-sampling or



Layer	Type	Filter Dim.	Layer	Type	Filter Dim.	Layer	Type	Filter Dim.
1	Conv1	11 × 11 × 3 × 64	2	Pool2	Max	5	Pool5	Max
1	ReLU1		3	Conv3	3 × 3 × 256 × 256	6	FC6(Conv)	6 × 6 × 256 × 4096
1	Norm1		3	ReLU3		6	ReLU6	
1	Pool1	Max	4	Conv4	3 × 3 × 256 × 256	7	FC7(Conv)	1 × 1 × 4096 × 4096
2	Conv2	5 × 5 × 64 × 256	4	ReLU4		7	ReLU7	
2	ReLU2		5	Conv5	3 × 3 × 256 × 256	8	FC8(Conv)	1 × 1 × 4096 × 1000
2	Norm2		5	ReLU5		9	Softmax	

Pooling. The convolutional layer carries out convolution to capture highly redundant and highly correlated local information present in the input. For a given image X , the convolution block performs the convolution of the image with a bank of K filter maps. Each filter computes a dot product between their weights and a definite region it links to in the input image. Normalization layer regulates output from the early stages and passes to the next nonlinear activation layer. This process makes the weights from the network balanced without very high or low values, since it includes normalization in the gradient process. Rectified Linear Unit (ReLU) performs an element wise thresholding. It is the most commonly used activation function for CNNs. CNNs with ReLUs train many times quicker than their equivalents with 'tanh' functions.

The number of complex features increase, as the network grows deeper and deeper. The different kernel maps in CNN looks for local features and share the parameters along the depth volume.

A wide dataset is used to test the proposed method (a challenging standard dataset and a clinical data set from a cancer research institute, Regional Cancer Centre (RCC), Thiruvananthapuram, India). Repeated cross validation is carried out using the linear and non linear classifier models to create a best classifier. The F-Score is increased to 0.94 after dimensionality reduction and sequential feature selection. The results prove that the proposed framework surpasses the existing techniques with high sensitivity and precision which makes it more practical in clinical treatments.



Natural Gas: The Versatile Energy Source



By Jobin P John

Natural gas has become a major energy source nowadays, because of its clean burning nature. Within the energy systems, the gas and electricity systems have become the backbone of modern energy production. In the 1970s and 1980s, the choices for most electric utility generators were large coal or nuclear powered

plants. However, due to economic, environmental and technological changes, natural gas has become the fuel of choice for new power plants built since the 1990s. The shale gas revolution and natural gas's capability in reducing the carbon-di-oxide emission to the atmosphere has resulted in gas becoming a major energy source in the present day.

In this article, the gas's system's ability to meet the electricity system's flexibility requirements is discussed.

Versatility

The versatility of gas lies in the following facts:

- **Fewer Emissions** - Combustion of natural gas, used in the generation of electricity, industrial

boilers, and other applications, emits lower levels of NO_x, CO₂, and particulate emissions, and virtually no SO₂ and mercury emissions. Natural gas can be used in place of, or in addition to, other fossil fuels, including coal, oil, or petroleum coke, which emit significantly higher levels of these pollutants.

- **Reburning** - This process involves injecting natural gas into coal or oil fired boilers. The addition of natural gas to the fuel mix can result in NO_x emission reductions of 50 to 70 percent, and SO₂ emission reductions of 20 to 25 percent.

- **Cogeneration** - The production and use of both heat and electricity can increase the energy efficiency of electric generation systems and industrial boilers, which translates to the combustion of less fuel and the emission of fewer pollutants. Natural gas is the preferred choice for new cogeneration applications.

- **Combined Cycle Generation** - Combined-cycle gas turbines (CCGTs) are designed to operate at mid load to base load power generation capacities. They have flexible operating schedules and have good startup rate.

- **Fuel Cells** - Natural gas fuel cell technologies are in development for the generation of electricity. Fuel cells are sophisticated devices that use hydrogen to generate electricity, much like a battery. No emissions are involved in the generation of electricity from fuel cells, and natural gas, being a hydrogen rich source of fuel, can be used. Although still under development, widespread use of fuel cells could in the future significantly reduce the emissions associated with the generation of electricity.

Flexibility

The primary advantage of gas turbine power plants is its flexibility to adapt to changing load demands. Using advanced materials and real-time monitoring systems, gas power plants minimize the wear and tear and hence improve the life period of the equipments. Natural gas thus plays an important role as a bridge fuel to renewables since gas power plants can respond quickly to changes in load and renewable generation unlike coal-fired and nuclear plants. Shale gas had a profound impact on prices, carbon intensity, and energy independence with reserves projected to last for around 100 years, as well as energy security across the globe. The increased availability of natural gas from shale, which produces roughly half the CO₂ than coal for the same heat output, is facilitating the transition from coal-fired to gas-fired power generation.

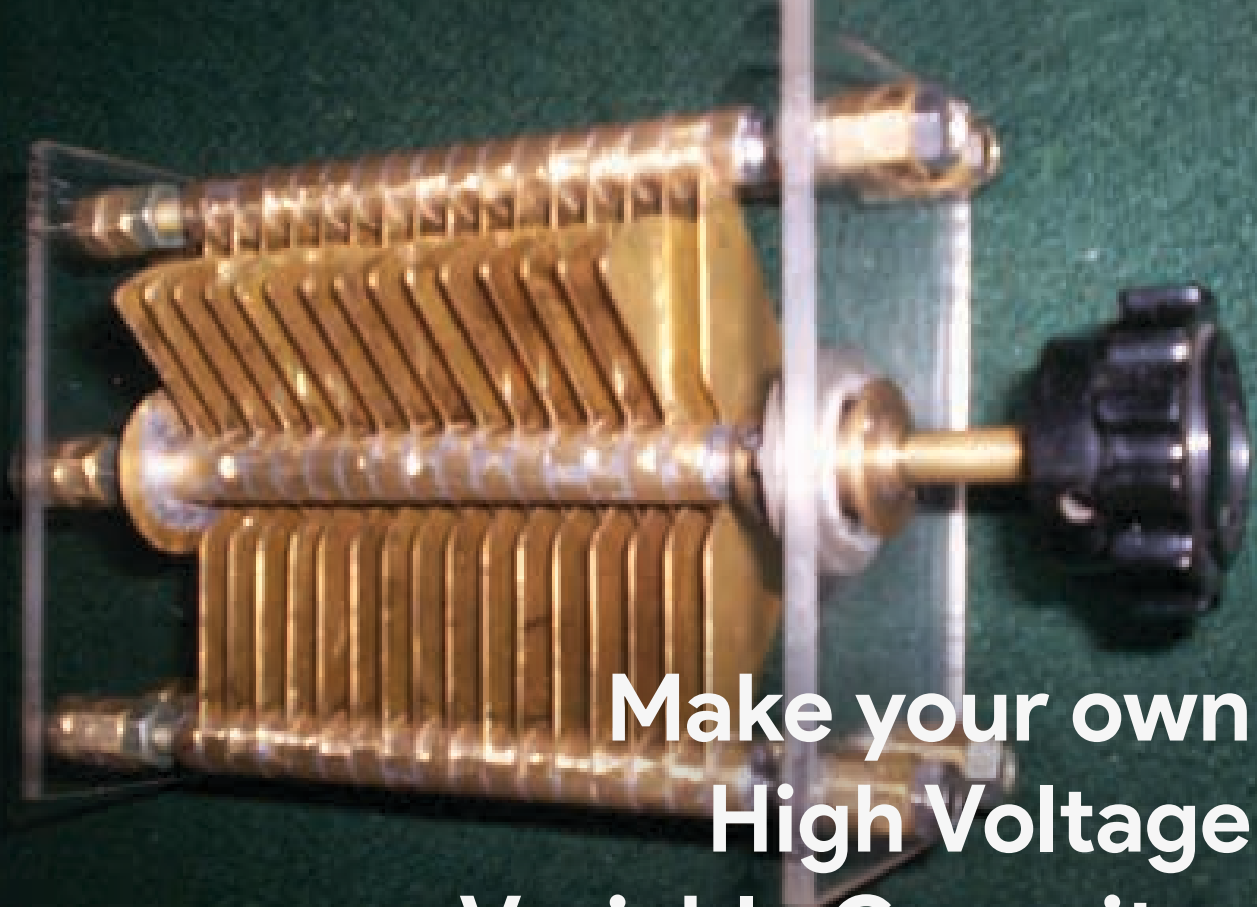
Gas systems typically offer significant flexibility due to different storage options too. They are – line packs, underground storage and LNG (Liquefied Natural Gas) tanks. Line pack refers to volume of gas stored in pipelines which can be used to meet abrupt changes in gas demand during day time. Underground gas storage facilities include gas fields/oil fields/aquifers etc. Depleted fields and aquifers are typically used as seasonal storage facilities. LNG storage tanks and gasification stations are used as peak shaving facilities that can quickly respond to sudden gas demand changes. Therefore, besides providing operational flexibility, they contribute to energy security also.

Conclusion

Today, the reliance on gas has increased manifold for the generation of electricity. New technology has allowed natural gas to play an increasingly important role in the clean generation of electricity. With the advance of extraction technology, shale gas production has led to a new abundance of natural gas supply over the past decade, and is expected to continue to do so for the foreseeable future. The use of bio-gas and LNG also proves to be a major source for the production of energy in a sustainable and eco-friendly manner in the upcoming decades. Gas turbines are the main flexibility source for balancing the demand and achieving stable grid operation. Gas power turbines start up quickly and have less wear and tear compared to other sources. Storage and flexibility make gas a very good source for production of energy and its progress in the research and development offers a powerful technique to harness the energy and meet the ever increasing demand for generation and utilization of power. Such research could significantly enhance profitability and national energy security while reducing environmental impacts.

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Make your own High Voltage Variable Capacitor

A Practical approach from theory



By Er. Rejimon G
Trade Instructor

This article attempts to show how to make a high voltage air-variable capacitor from ordinary household things. The project, though simply a variable capacitor, involved lot of innovative techniques and improvisations. Mr. David Hammack (N4DFP, a radio amateur) first introduced this idea in his article 'Build Your Own Transmitting Air Variable Capacitors', inspired me to build one for my own vacuum tube RF amplifier.



A variable capacitor is a capacitor whose capacitance can be varied from certain low pico farad to micro farad. They are often used in L/C circuits to set resonance frequency, or as a variable reactance for impedance matching. This type of capacitors with proper design can also be used as a power factor corrector to provide flexible ac transmission in power system. The design describes here to make a capacitor for the value to be varied from 15pF to 180pF. It mainly uses metal plates (brass / aluminium) of 0.2mm thick and ¼" x 6 inch GI bolts to hold the plates.

The design

Let the operating voltage be 3 kV. So the required minimum plate spacing to withstand this level of

voltage = 2mm or 0.002m.

Let the required maximum capacitance, $C = 180\text{pF}$ or $180 \times 10^{-12}\text{F}$.

For convenience, let us choose plate radius, $r = 3\text{cm}$ or 0.03m .

Now using the equation of capacitance of parallel plate capacitor,

$$C = \frac{(n-1) \cdot \epsilon_0 \epsilon_r A}{d} \quad \text{where,}$$

n = total number of plates,

ϵ_0 = permittivity of free space = 1,

ϵ_r = relative permittivity of the medium (it's 8.85×10^{-12} for air),

a = area of semi-circular plate which is given by, $a = \pi r^2 / 2$, and

d = distance between plates in meters.

On substituting these values in above equation,

$$180 \times 10^{-12} = \frac{(n-1) \times 1 \times 8.85 \times 10^{-12} \times 3.14 \times (0.03)^2}{(2 \times 0.002)}$$

On solving, we get the total

number of semi-circular plates,
n=30 nos.

Please note that, additional one stator plate shall be added at one end of the stator to compensate the area loss at center portion of all stator plates.

Now the required number of rotor plates = 15 nos and stator plates = 16 nos.

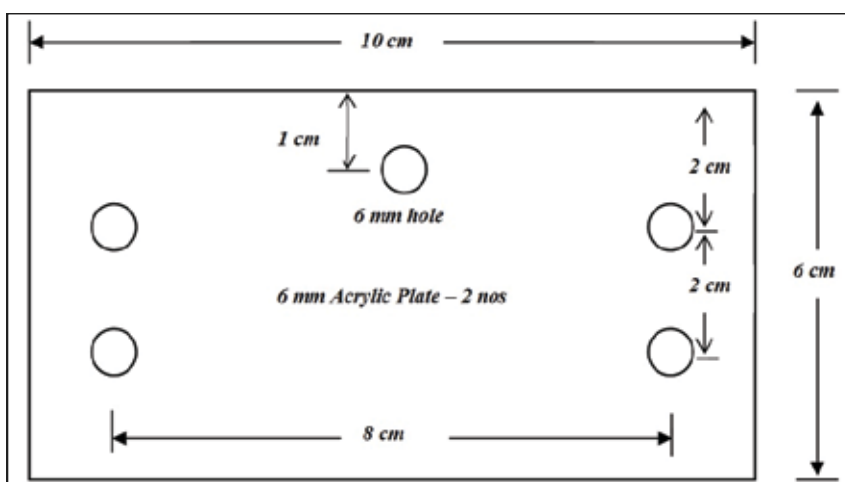
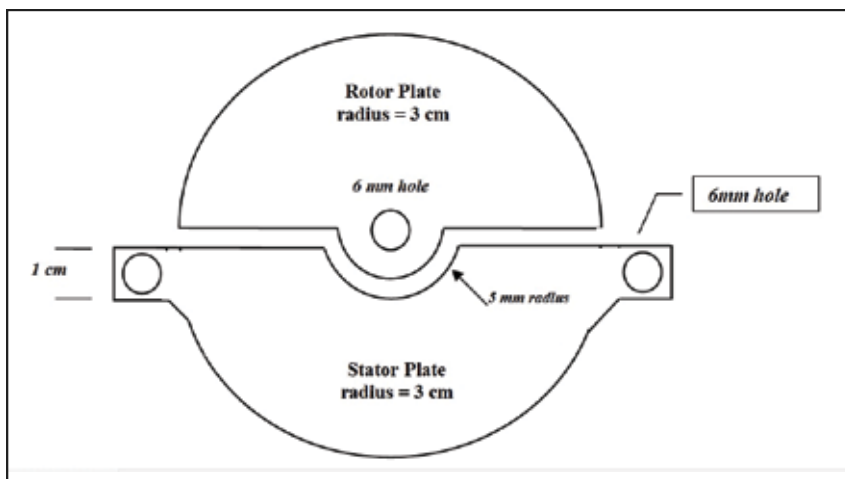
The plate assembly supports on acrylic sheets at both ends. A slow motion drive shall be used for tuning to avoid backlash (reverse action due to the weight of rotor plate assembly while turning rotor plates).

Materials

Acrylic sheet (0.5mm thick) 10cm x 6cm	2 nos
Brass plate (0.5mm thick)	1 sq ft
GI bolt ¼ inch, 6 inch long	5 nos
Brass nuts (¼ inch)	65 nos
Slow motion drive	1 nos (optional)
Cycle ball bearing	1 nos

Here, the rotor shaft supports on one cycle ball, trapped between two nuts at the rear side, (its position is shown in the photograph)

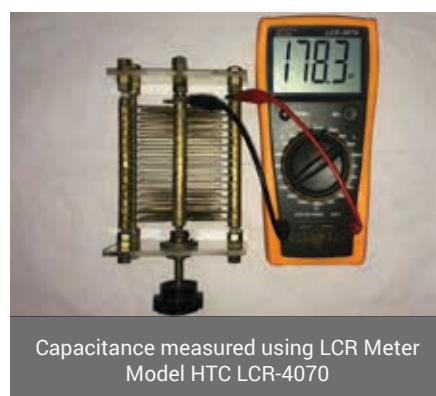
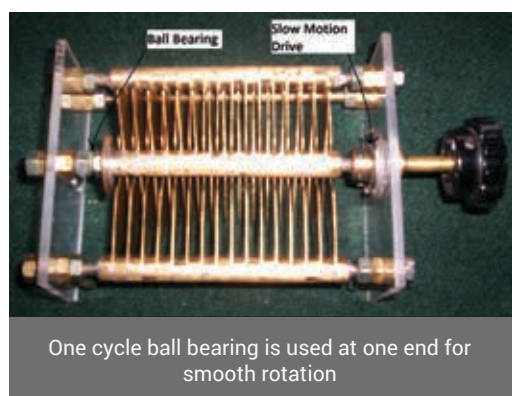
First, cut required number of rotor and stator plates from the



brass plate as per the shape and dimensions shown in the figure, then provide required number of holes on them to hold on GI bolts. Assemble the rotor part by inserting rotor plates and brass nuts as illustrated in figure and similarly assemble the stator part.

Once the plate assembly is finished, support the stator part on the acrylic sheets with ¼" nuts,

then support the rotor part with one cycle ball bearing at one end of the acrylic sheet and with a slow motion drive at the other end (slow motion drive is not required if thin aluminum plates are used). Some adjustment is required on stator assembly while fixing on the supporting acrylic sheets to get equal spacing b/w rotor and stator assembly.



Green Building



By R Rohith Gopal

Home is more than just a word that sets off beautiful memories and warmth irrespective of wherever in the world we are. We spend the major part of our life in our home and hence it is of prime importance that our home provides us with the comfort and luxury we desire. Building a home as per our requirements is always a dream for any individual and he works really hard towards fulfilling those dreams. But as engineers, we have to build homes that are examples to the society to solve many environmental problems and also fulfil our dream of a beautiful home. This article is to introduce the idea of *Green Homes* and ignite a realisation in each reader's mind on how the small things that we do, can bring about big changes.

Global Warming is a phenomenon that we all are very much aware of. We blame the

Industries and Transportation network for causing so much pollution. But the facts show that we ourselves are to be blamed.

The construction sector is the major recipient of the generated energy. More is the requirement of energy; more would be its generation. More generation implies that more fossil fuels are burnt and our environment is adversely affected.

At present, in India, the sources of electrical energy generation are:

Thermal generation 66.6%

Renewables 31.3%

Nuclear 2.1%

Now, you would raise a question, 'how would building my house affect the number of pollutants so much?'. You would be able to answer your own question if you view this in a wider perspective. As we know, a house is built from cement, concrete blocks, steel pipes etc. All these things are manufactured in various factories that use a high amount of energy to carry out such processes. Hence we say such materials have embodied energy in them. So, more the requirement of these materials more is the amount of carbon emitted into the atmosphere. Now we know how we have a large part in contributing to Global Warming.

A fun fact is that, in Kerala, we have 1.12 crore homes. In this, we have 11 lakhs big NRI homes that

have no one residing in them.

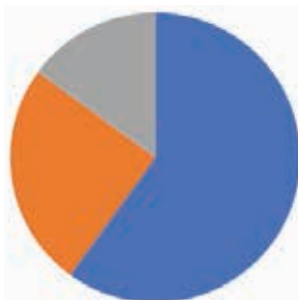
When we build a house, especially in Kerala, people import materials and equipment from European countries, which may not have a climate similar to ours and hence in future regret their decision in doing so. For example, houses with normal fashionable glasses are built for their aesthetics alone. But later on, as the glass traps heat and doesn't allow it to escape, Air-Conditioners have to be installed to reduce the temperature, thereby again affecting the environment.

The best way to build a house is by using locally available materials that would be in sync with the climatic conditions at the site because this would surely increase the comfort of the residents, the life of house, aesthetics, environment, and most importantly for us Indians – reduced cost.

In the next section, I would like to mention some methods that can be utilised while building a house (these are from my experiences, not an expert in the construction field).

- Foundation - Dry rubble masonry foundation would be preferred for houses up to 3500sqft. Thus, an appreciable amount of concrete can be avoided.
- Walls - Unplastered clay and mud block walls with rat-trap bonds would ensure a decreased room

ENERGY UTILISATION



■ Buildings 60%

■ Industries 25%

■ Transport 15%



temperature and minimum use of cement.

- Flooring - Kota tiles and clay tiles
- Lighting - The electricity cost can be reduced by providing big skylights on the roof or terraces. Also LED lights are preferred more than CFL or incandescent bulbs. These days, a wide range of new model-bulbs are available such as diffused bulbs which can provide better lighting.
- Plumbing - Atomised Water pipes and Dual flush toilets can considerably reduce water wastage.
- Ventilation - Rotatory roof vents and Heat Reflective window glasses would ensure a comfortable room temperature.
- Roofing - GI roofing can be done

so that the building has an air column at the top to mobilize hot air outside and also to place solar panels.

- Waste Management - Small biogas unit and kitchen waste natural fertilisers for plants can prevent waste disposal problems.
- Water Management - Rainwater harvesting is a very efficient method for having big reserves of water throughout the year. Hydroponics and Aquaponics can also be installed.
- Solar Energy - Solar panels would provide sufficient electricity for a normal house. ANERT provides subsidy and Insurance for solar equipment installations.

A 3KW solar installation would provide about 15 units per day

Capacity (KW)	Amount after subsidy (Rs)
1	82990
2	142750
3	227457
5	292538

which would be sufficient for a nuclear family.

All these methods are very much cost effective and comfort providing for the residents of a house. These methods can be easily moulded for beautiful aesthetic appearances.

Energy Management Centre

The latest Global Status Report on resilient buildings put out by the UN Environment has identified

the Energy Management Centre campus in Sreekaryam as one of the six major achievements in the deployment of energy-efficient technologies across the world. The EMC campus is the only building in the country that has found a place in the Global Status Report. The other five buildings are from the United States, France, Sub-Saharan Africa, Vietnam and Japan.

The campus, which has come upon an area of 40,000 sq ft and is skirted by tropical rain forest

trees, has a wavy design that allows the smooth unhindered flow of wind. The design also helps the building to evade harsh equatorial sunlight. It also has high-performance building envelopes or recessed windows with double walls; the UN report states that the 'building envelop

intensities' are less than 10 kWh per square metre a year (the average is 150 kWh per sq mt a year, and for a 5-star rated building it is 45 kWh per sq mt a year). In other words, it means that the building uses considerably less energy than even a highly energy-efficient building.

The report calls the EMC campus as an 'energy-positive campus'. The campus has a 30-kilowatt grid-connected solar capacity that exports around 50

kWh per day on average, with a doubling of the capacity under implementation. The campus uses daylighting controls, CFC-free heating, ventilation and cooling systems, along with a halogen-free fire-fighting system. Solar reflectance index coating, combined with high-albedo painting and turbo-vents for passive cooling, has been used, and tropical rainforest trees help create cool surroundings. Only certified green construction materials, recycled wood boards,

Built with assistance from the Global Environment Fund, the EMC campus is the only LEED Gold certified building in the government sector in Kerala. Up to 94% of the built-up space is daylight illuminated. It also sells about 160 units of electricity from its own solar installations to KSEB. Building-related carbon emissions have been rising by around 1% per year since 2010, and more than four million deaths are attributable to illness from household air pollution. It's high

time that we all know this. Know your surrounding and build a home that not only protects you but also allows you to live in harmony with our planet Earth.



low-emitting paints and adhesives, and green-plus certified carpets have been used.

The other five projects recognised by the UNEP include the Sierra Crest development in Fontana, California, the Association of Nubian Vaults in Sub-Saharan Africa, a construction and demolition waste recycling project in Paris, the Palm Tree eco-development project in Hanoi, Vietnam, and the Higashi-Matsushima Smart ecotown in northern Japan.



Connectivity Protocols For Smart Lighting Systems



By Deepika Krishna

The whole tech world is on a great venture to become 'smart'. One must have noticed that smart houses are all the rage. Connectivity is the latest trend in lighting technology and it's definitely bringing away the futuristic sensation a few years ahead of schedule! Having digital control over your lights and being

able to program them or operate them remotely or via voice is the higher level of lighting technology. The new inventions and developments have the potential to revolutionise the home and make it more effervescent.

Lighting control systems are crucial to implementing energy efficient systems by

automatically turning on or off lights based on occupancy, adjusting lighting levels based on ambient conditions and by streamlining management capacities. Some studies estimate that lighting control system save close to 40% of energy consumption and this is the biggest driver for the increasing



adoption of control systems in commercial settings.

The present era of connected lighting has resulted in several network protocols designed for specific purpose and environments. Further, expanding the horizons of Internet Of Things and new possibilities with sensors and wireless connectivity is changing the lighting landscape. This article summarises the current and emerging protocol landscape for lighting control system.

Lighting Control Protocols Landscape

A heap of wired and wireless protocols are available today.

Wired protocols offer reliable performance and greater control, but the foe side is its higher wiring and installation cost. In recent times, Low cost wireless connectivity protocols like ZigBee, BluetoothLE and Wi-Fi have shown potential to reduce costs to provide scalable options.

Factors To Be Considered While Choosing The Protocol

1. Size of installation
2. Interoperability with other devices and systems
3. Range of communication
4. Availability of the network
5. Security requirements
6. Device management requirements

7. Cost of installation and maintenance

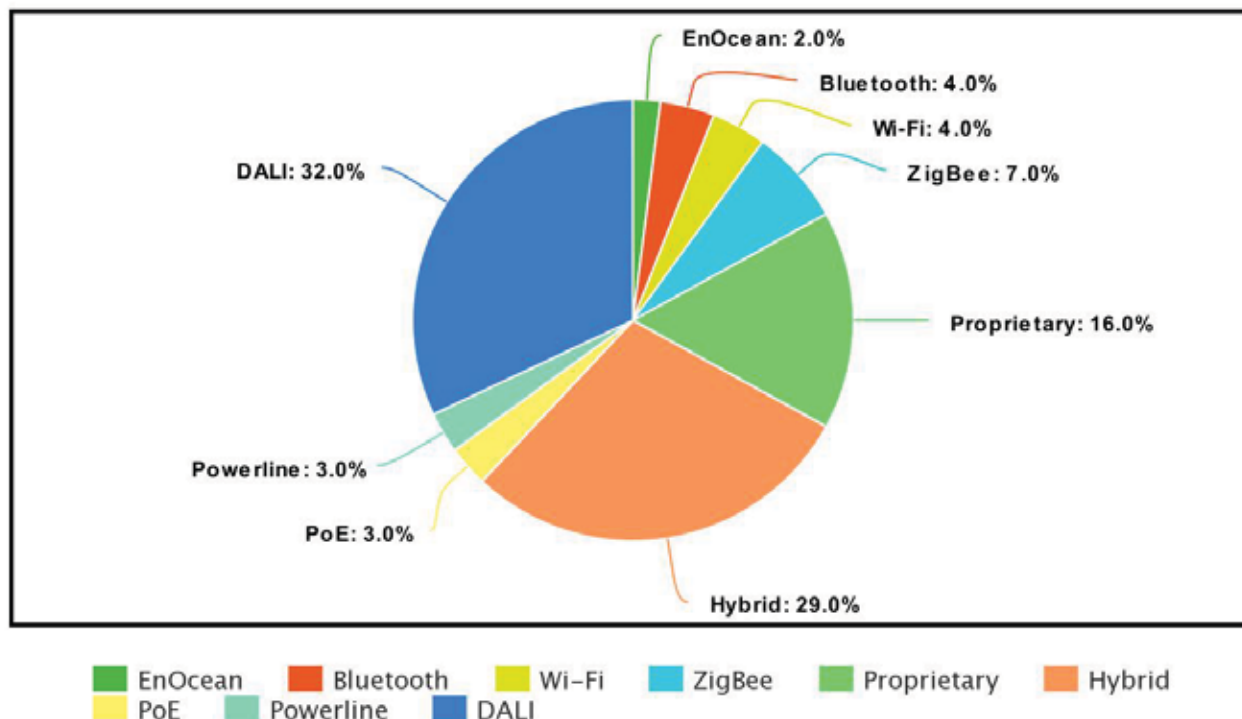
Survey Of Protocol Usage

Open protocols are preferred to proprietary technologies and DALI is the predominant communication technology used. Wireless is still in its infant stages of adoption. But it is a boon as it eliminates wiring and is able to drive more monitoring and control points. The most common wireless technology for lighting includes ZigBee, Bluetooth, Wi-Fi and ENOcean.

Lighting Technologies For The Future

An indepth lighting market wide

LIGHTING PROTOCOL USAGE IN 2016
Source: Strategies Unlimited



study conducted in 2015 revealed the communication protocol preferences over the next few years. Key takeaways from the study include

1. DALI not seen as dominant protocol in the future. The growth in wireless technologies is surely going to dominate DALI based installations.
2. The trend towards wireless -especially in indoor applications -wireless lighting control is gaining traction in indoor professional lighting and commercial markets.
3. Hybrid solutions implementing two or more protocols will also gain traction in critical applications.
4. Powerline communication is the leading contender for connecting industrial based lighting solutions.

In April 2016, The Connected Lighting Alliance (TCLA), the primary advocate of wireless

lighting connectivity announced that it is collaborating with the Thread Group in an open protocol solution for the network layer in indoor professional lighting applications. Thread's advantage of IP addressability, robust security, easy commissioning and management and no single point of failure make it an attractive option for the next generation of lighting solutions.

Conclusion

In today's spry world, connected lighting system thrives in opportunities for energy and cost savings, especially in commercial environments that regulate a large network of lights. Low cost sensing, wireless connectivity, and readily available cloud-based solutions have changed the disruption opportunities. Impelling innovation in this environment involves making decisions around business model,

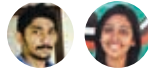
go-to-market approach and technology choices.

The existing and emerging connectivity protocols aims to drive greater adoption of connected solutions. Decisions around connectivity should be driven by current and future trends -easy to install, manage, control and service, scalable, reliable and low total cost of ownership.

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Triboelectricity



By Akshay Mohan & Sonu Feroz

Sir Thomas Alva Edison once said, “Everything comes to him who hustles while he waits”. But is hustling all it takes? Is progress always deliberate? Some innovations arrive not by choice but by chance. Triboelectricity is one such ‘accidental’ innovation.

Ever thought about harnessing all those wasted energies or ever considered our body as a power source? Well, triboelectricity is the answer.

Triboelectric energy is generated when certain materials come into frictional contact. A good example of this is the static electricity from rubbing a shoe on a carpet. This power generating efficiency of the triboelectric mechanism was discovered by Zhong Lin Wang and his team at Georgia Institute of Technology while conducting an experiment on piezoelectric generators. The energy produced by a piezoelectric generator during the experiment was much higher than they expected. Investigations revealed that the excessive amount of current produced was due to the incorrect assembly of apparatus that resulted in the accidental rubbing of two polymer sheets. These rubbing sheets produced triboelectric effect resulting in the production of electric current.

Triboelectric energy harvesting has been applied to various fields, from large-scale power

generation to small electronics. Based on the harvesting technology there are different types of triboelectric generators. A triboelectric generator is a mechanical device that produces static electricity, or electricity at high voltage by contact charging. Some of them are rotary, flutter driven and textile-based generators. These generators can use energy produced even by walking or touching. As of now, researchers have developed mechanisms which can lit up 1000 LEDs with just one stomp of the foot. Imagine the power that

can be generated from a place where thousands of people stomp every day. If we harness this wasted energy effectively, it can contribute to our growing energy needs.

Materials

Almost any materials we know have triboelectrification effect, from metal to polymer, to silk and to wood, almost everything. All of these materials can be candidates for fabricating TENGs so that the materials choices for TENG are huge. However, the ability of material for gaining/losing

	Polyformaldehyde 1.3-1.4	(continued)	
	Etylcellulose	Polyester (Dacron)	
	Polyamide 11	Polyisobutylene	
	Polyamide 6-6	Polyurethane flexible sponge	
	Melamine formol	Polyethylene Terephthalate	
	Wool, knitted	Polyvinyl butyral	
	Silk, woven	Polychlorobutadiene	
	Aluminum	Natural rubber	
	paper	Polyacrilonitrile	
	Cotton, woven	Acrylonitrile-vinyl chloride	
	Steel	Polybisphenol carbonate	
	Wood	Polychloroether	
	Hard rubber	Polyvinylidene chloride (Saran)	
	Nickel, copper	Polystyrene	
	Sulfur	Polyethylene	
	Brass, silver	Polypropylene	
	Acetate, Rayon	Polyimide (Kapton)	
	Polymethyl methacrylate (Lucite)	Polyvinyl Chloride (PVC)	
	Polyvinyl alcohol	Polydimethylsiloxane (PDMS)	
	(continued)	Polytetrafluoroethylene (Teflon)	

electron depends on its polarity. John Carl Wilcke published the first triboelectric series in 1757 on static charges. The table below gives such a series for some conventional materials. Material towards the bottom of the series, when touched to a material near the top of the series, will attain a more negative charge. The further away two materials are from each other on the series, the greater the charge transferred.

Triboelectricity depends on the following factors:

- Materials used
- Surface morphologies
- Surface roughness
- Surface crystal facets
- Surface functionalization
- Surface adsorption

Working

The silk and Si-rubber are used as positive and negative triboelectric active materials. Since the silk and Si-rubber have different electron-attracting abilities, a surface charge is transferred

when the two are brought into contact. In the initial state, without any motion, no charge is transferred (Fig. a). Once the CT-TEG is stretched, the TEG brings the silk and Si-rubber into full contact (Fig. b). Any motion will lead to contact or separation between the silk and Si-rubber. The silk is charged positively and the Si-rubber is charged negatively because of their triboelectric characteristics. The figure below illustrates the working of a corrugated textile based triboelectric generator that can generate energy by stretching.

When the two triboelectric materials are brought into contact, electrons move from the silk to Si-rubber because Si-rubber has a higher surface-electron affinity than silk. Consequently, in the CT-TEG, there is a net negative charge on the Si-rubber and a net positive charge on the silk.

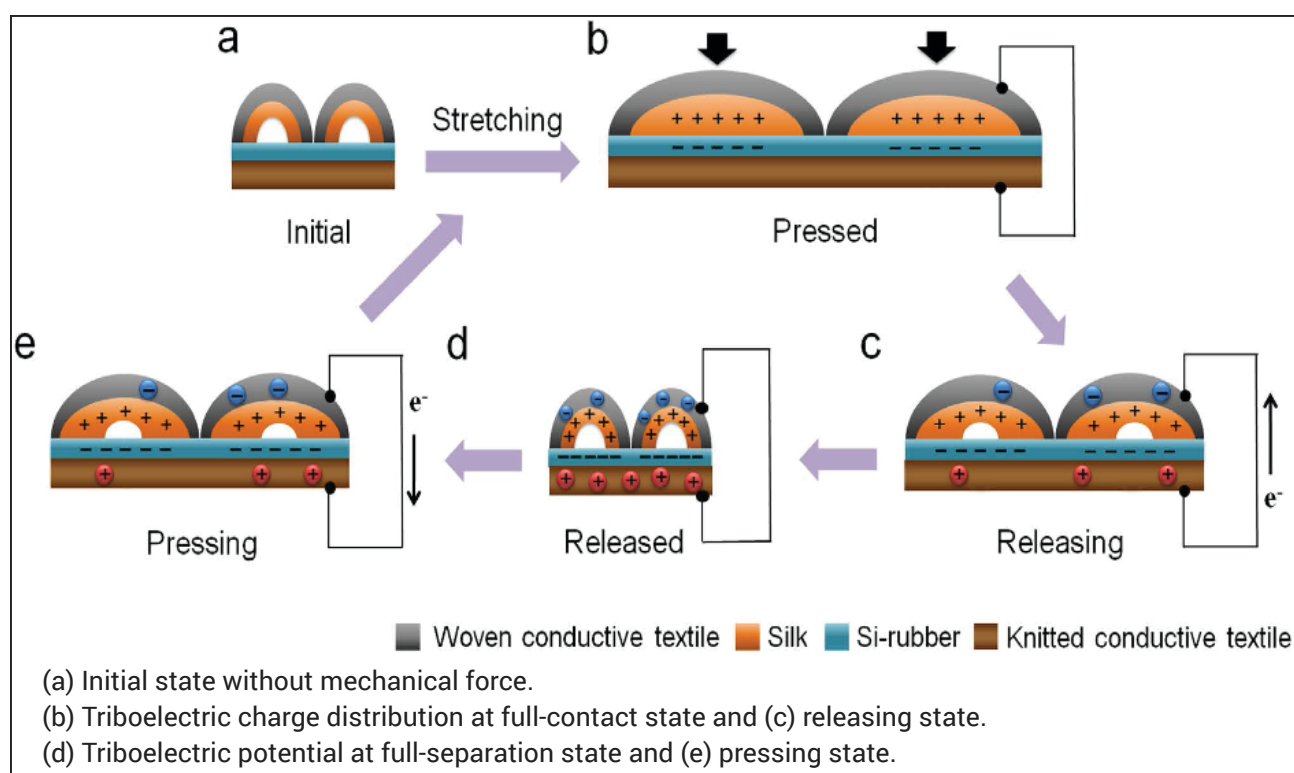
Removing the external force causes a separation. Electrons

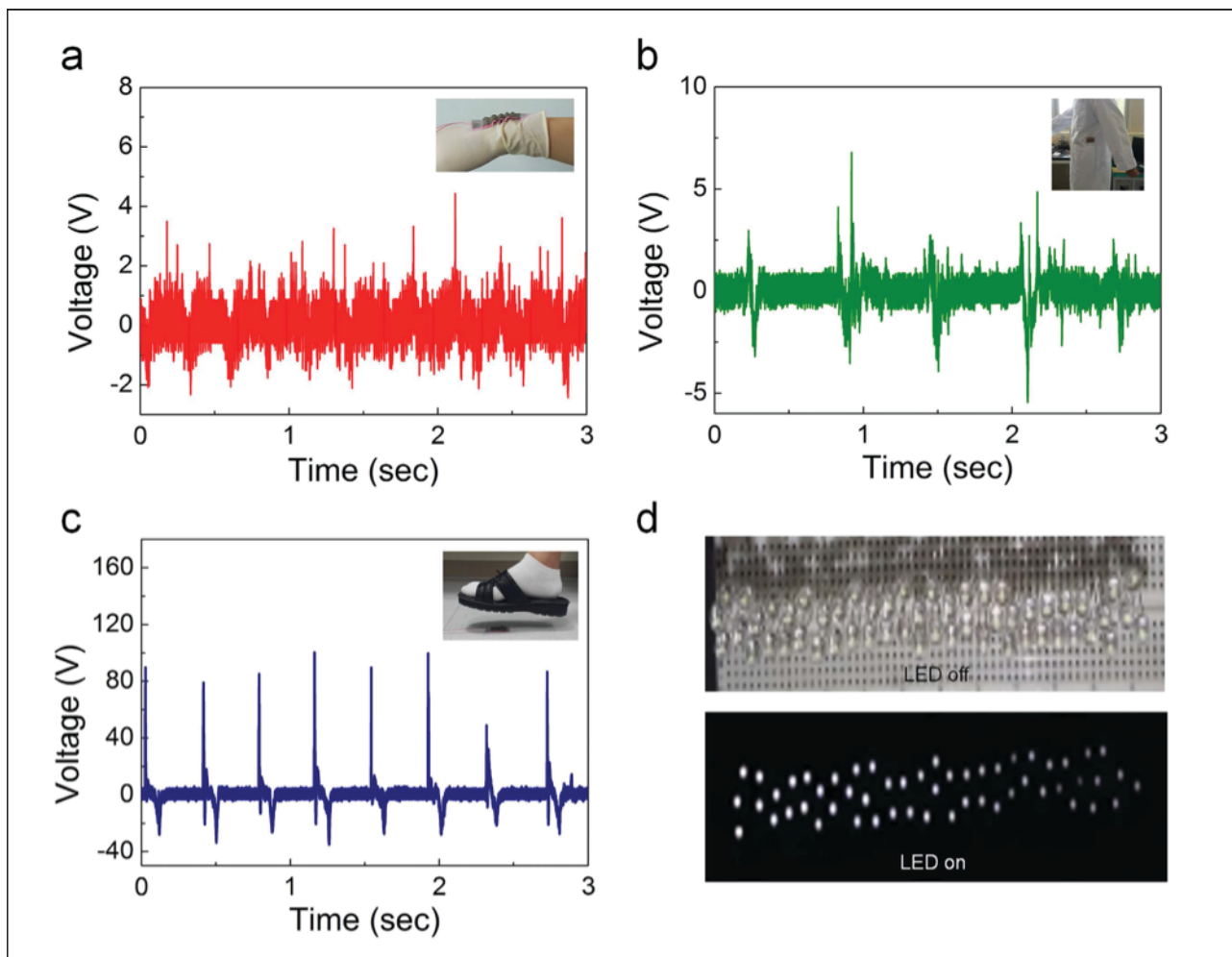
flow from the Si-rubber-coated conductive textile electrode to the silk/conductive textile electrode (Fig. c). When the silk and Si-rubber are separated by the maximum distance, an electrical equilibrium is formed (Fig. d). When the external force is applied to bring the silk and Si-rubber into contact, it causes electrons to flow from the silk/conductive textile electrode to the Si-rubber-coated conductive textile electrode (Fig. e).

With the stretching, pressing, and rubbing motions, the surfaces of the silk and Si-rubber come into contact and rub against each other; thus, triboelectric charges are generated and distributed over the surface.

Applications of TEG

To investigate the capability of the CT-TEG as a power source, different parts of the human body were considered. Here, the movement of the wrist, knee, and foot are the most important





mechanical-energy sources supplied by the human body.

Fig. (a) shows, a stretchable textile-based CT-TEG is placed over the wrist joint.

The CT-TEG stretches when the wrist bends and relaxes when the wrist straightens, generating output voltage signals. The triboelectric voltage generated by the wrist joints is about 6.8 V.

Figure (b) shows a corrugated textile-based CT-TEG attached to the side of the body to harvest energy from the arm rubbing. The output voltage is about 8.1 V.

Figure (c) shows the corrugated textile-based CT-TEG generating energy from footsteps. Its output voltage is about 110.1 V, which is capable of lighting up about 54 light-emitting diodes (Fig.d).

Conclusion

We always look for new sources of energy. But energy is always around us, everywhere, all the time. But most of the time we waste them. But with the invention of TEG has changed the situation.

Mechanical energy is an abundant source of energy. The main advantage of it is that it is independent of weather, day or night and season. It can be found in almost every action we do - typing on a keyboard, walking, running, etc. A triboelectric generator can use this mechanical energy. When this was first invented, it could only produce 3V. Nowadays TEG that can produce 1000V has been invented.

If we can use this to generate electricity for not only powering wearable devices but also to contribute to large scale energy needs in near future.

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Hire Me



By Vinitha M S

A resume is an effective way to create a best first impression and to stand out in the talent pool. It plays a vital role in the selection process; hence to have a well formatted and updated resume is very essential. 'A resume is a marketing document that can serve as a magnet to draw job opportunities to you', said Susan Ireland, author of 'The Complete Idiot's Guide to the Perfect Resume'.

Conventional resumes consist of an object, educational background, skills and then your project details followed by hobbies and personal details. But rather than simply following this old method or tradition, as it is called, it will be effective to design your own resume according to one's creativity to stand out from others. You can make use of a method called mind map where you become the

central theme. Mind map gives in one-glance an overview of one's personality. Based on the central theme, various sub-topics can be added. Personalities, skills, project etc. can be included as subtopics. Personality may include personal details and interests related to the job. Hardware and software skills possessed during academic years can be placed under the subtopic skills. The project can include the learning and tools used to execute

the work. Enhance your resume worth by adding similar subtopics so as to convince the employer that you deserve the post. On designing such a resume with pleasant appearance and content, you can definitely improve the chances of being hired.

An outdated resume with poor format, design and content cannot meet the latest job search and recruitment trends. Creating a personal branding style matters and can be achieved with some effort. Since the internet becomes important in day to day life, online portfolios, digital resumes, LinkedIn connections become more visible in current trends. Even though the format would not change much, its shareability serves a huge help. In essence, the success of your job search depends on the effectiveness of your resume.

Here are some points to be kept

**An outdated
resume cannot
meet the latest
job search and
recruitment
trends**



in mind while working for your resume:

1. **Be different**

Simply copying and editing on your friend's resume makes no effect. Hence make sure to have your own input to differ from others.

2. **Show relevance**

Skills acquired through the project, industrial visits can be highlighted. Use of industry-specific keywords will work on your resume. You may use automate shortlisting software for that purpose.

3. **Be concise**

Hiring managers only spend at most 20 seconds for an application hence make it short and crisp as possible. Avoid chunky paragraphs. The inclusion of irrelevant hobbies and details is anyway just a filler.

4. **Use of good format**

Avoid flashy colours and fancy

fonts to make it pleasing to the eyes. Times New Roman is outdated. Use Calibri and Cambria instead. Use of tables and points can be impressive. As a whole, it should be pleasant and readable.

5. **Focus on positives**

Try to convey your enthusiasm for the post and how your skills can assist the company. Clearly define your achievements and skills.

6. **No errors**

Sometimes an error in your resume can be the determining factor between you and another candidate. So make sure that there are no errors in your resume.

7. **File format**

The file format of resume can be word or PDF as demanded. But if nothing is mentioned sending as PDF will be wise since it can retain the format as such.

8. **No generic resume**

The format of resume for each job is not the same. So no generic

resumes must be submitted. Do alter the base one to meet the requirements demanded by the hiring team.

9. **Skip these**

Writing job descriptive, objective and references do not add much value to your application. Instead, highlight your potential with professional or career summary.

10. **Add your professional social media link**

The inclusion of your LinkedIn account URL gives the employer a chance to know more about your activities those are not mentioned in the resume.

There are so many resume templates available in online sites, but just copying would not make any difference. To state your own identity and to create an impact you have to make use of your ideas. So keep these tips in mind and make your resume sound Hire Me!



It is not uncommon for us to mention the 'firsts' in every field. It is quite an honour, but it means more when it comes to a woman at the front in this patriarchal society. In the late 19th century, a woman born into a prosperous family was not expected to become a career woman but a wife, mother, and gracious hostess. But one determined young woman did not let societal expectations hinder her professional aspirations and went on to become one of the best-known engineers of her era. She was Edith Clarke.

She was the first woman to earn an Electrical Engineering degree from Massachusetts Institute of Technology (MIT). She was also the first female professor of Electrical Engineering at the University of Texas at Austin. It was quite revolutionary for a girl like her, having received an upbringing typical for girls of her stature where the emphasis was on grooming the young women for marriage and motherhood, to pursue engineering and excel in it. She opened up a belief in women to trust themselves and chase their dreams.

Edith Clarke



By Adwaita Pradeep

"There is no demand for women engineers, as such, as there are for women doctors; but there's always a demand for anyone who can do a good piece of work."

At the age of eighteen, she received a small inheritance and went to Vassar College, where she concentrated on mathematics and astronomy. She graduated in 1908 with honors and a Phi Beta Kappa key. She taught math for a while, but became disillusioned with it. In 1911, after a serious illness, she decided to return to school and study engineering. This was something she always wanted to do. She enrolled at the University of Wisconsin and worked during the summers for AT&T in New York. She was hired as a 'computer', or someone who solves mathematical equations.

Ms. Clarke left New York to enter the Massachusetts Institute of Technology, where she earned her masters in Electrical Engineering, becoming the first woman to earn a degree in that field from MIT. Ms. Clarke found opportunities for women in the field of engineering very limited, so she went to work as a 'computer' again, this time for General Electric.

In her spare time, she worked on her inventions and created the Clarke calculator, a simple graphical device that solved equations involving electric current, voltage, and impedance in power transmission lines. It was a very speedy device that could solve line equations involving hyperbolic functions ten times

faster than previous methods. She received a patent for the 'Transmission Line Calculator'. These patents helped her simplify power system analysis using mathematics. Thereafter she went onto co-author nineteen technical papers between 1923 and 1951. She was the first woman to present an AIEE paper. In 1941, she and a colleague were awarded 'the best paper of the year'. Additionally, Ms. Clarke authored a two-volume reference textbook, Circuit Analysis of A.C. Systems.

All these achievements were far-reaching than perceived. Her courage to follow her passion inspired many more young women and as Bob Dylan fittingly sung 'the times they are a-changin'', we see now that there is no dearth of women engineers. We owe that abundance to her for taking that first step, for encouraging many more to follow her and for standing her ground against all adversities.

Despite her contributions, she still remains in the oblivion - even for those pursuing her own field of interest. As electrical engineers, let us acknowledge her contributions and make sure that her work doesn't remain unknown for a reason that it was a 'woman's work'.

Galileo Ferraris



By Nikhil M S

Have you ever wondered how Tesla, Inc. churns out sports cars which can rival even the fastest of mechanical cars? Have you ever thought about the numerous induction motors that range from small ceiling motor to those which can drive even a train? Or perhaps about the processes involved in making sure the light bulb glows the next time you push the switch.

In our fast-paced life we use electric motors for making our lives easier and our daily commute more comfortable. But it took multiple milestones to reach this point of saturation of electric motors and one of the most prominent personalities behind it is Galileo Ferraris.

Galileo Ferraris (31 Oct 1847 – 7 Feb 1897) was born in Livorno Vercellese - the then kingdom of Sardinia (now Italy). He was the son of a pharmacist and nephew of a physician. At the age of 10 he was sent to stay with his uncle in Turin who took care of his education. He graduated from the University of Turin and Scuola di Applicazione of Turin. His work into light and optics led him to develop a theory similar to electromagnetism, which turned out to be a huge milestone in the field of Electrical Engineering.

Ferraris devised a motor, using electromagnets at right angles

and powered by alternating currents that were 90° out of phase, thus producing a revolving magnetic field. The direction of the motor could be reversed by reversing the polarity of one of the currents. The principle made possible the development of the asynchronous, self-starting induction motor that is widely used today. He was also responsible for the development of alternators which worked in the rotating magnetic fields to provide poly-phase power sources which when coupled with power transformers provided long-range transmission of electrical energy - which was more economical. This pushed forward the electric era. This enabled the feasibility of hydroelectric power generation in remote areas which could later be transmitted to large distances.

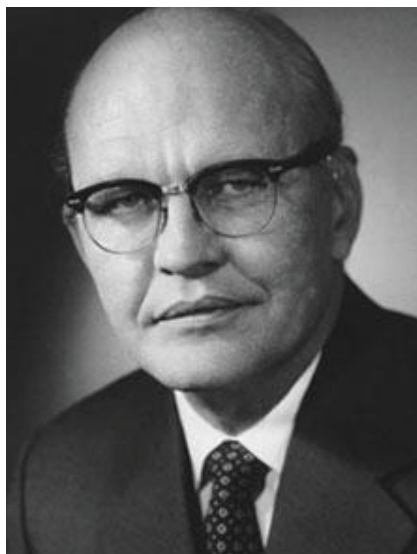
Ferraris like many in his era believed in this idea that the scientific and intellectual values of new developments far outstripped material values, and he deliberately did not patent his invention. He demonstrated it freely in his own laboratory to all comers. Meanwhile, others came independently to the same principle—among them was Nikola Tesla, who applied and patented his invention. Ferraris is also considered as an early advocate of alternating-current



distribution systems for electrical power.

Galileo Ferraris did not confine his research interests to electricity. He also researched on the fundamental properties of dioptric instruments and made an elementary representation of the theory and its applications. His work contains a detailed description of the geometric dioptrics for uncentered systems. He provided a greater generality as previously found in the telescopic system treatments, with less emphasis on applications.

We owe a great deal to him. Induction motors are now said to be the workhorse of all industries and yet none knows Galileo Ferraris. As Electrical Engineers, let us express our gratitude to this unsung legend for his contributions.



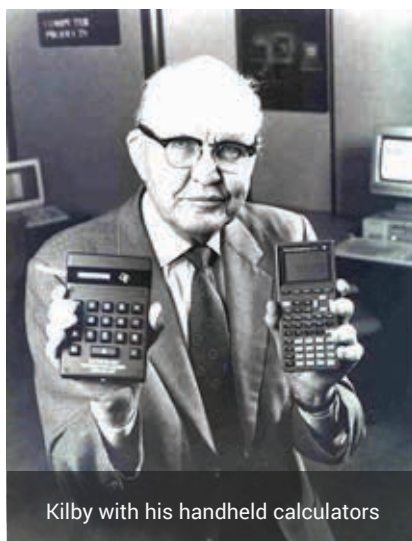
One of the greatest inventors of the modern era, Jack Kilby is considered a Mozart, in the eyes of Electrical Engineers. The winner of Nobel Prize for Physics for his undeniable contributions in the invention of integrated circuits, Kilby received applause from the American president Bill Clinton where he wrote: *You can take pride in the knowledge that your work will help to improve lives for generations to come.*

Jack St. Claire Kilby was born on 8 November 1923, in Jefferson City, Missouri to Hubert and Vina Freitag Kilby. He earned a degree in Electrical and Electronics Engineering and joined the Texas Instruments (TI) in 1958, which was a turning point in life to him. He had to deal with a common problem in circuit design which was popularly known as 'tyranny of numbers', for which he found a solution by incorporating a considerable number of circuit components into a single piece of semiconductor. U.S. Patent 3,138,743 for 'miniature electronic circuit' was filed on February 6th, 1959 for the first integrated circuit by him. He is also the co-inventor

of the hand-held calculator and thermal printer.

Kilby was recognized by Institute of Electrical and Electronics Engineers (IEEE), as he was elected to be an IEEE fellow in 1966 and was handed the David Sarnoff award in 1966. He was also a co-recipient of the first IEEE Cleo Brunetti Award in 1978, the IEEE Centennial Medal in 1984, the IEEE Medal of Honor in 1986 and Franklin Institute's Stuart Ballantine Medal in 1966. Over the course of his career, Kilby filed dozens of patents and founded the Jack Kilby International Awards Foundation, honouring peers and colleagues doing innovative, progressive work in science and medicine.

You may be thinking what is there to celebrate so much about Jack Kilby. The impact of his invention was ever-lasting. The modern world is pulsating around Integrated Circuits, where almost



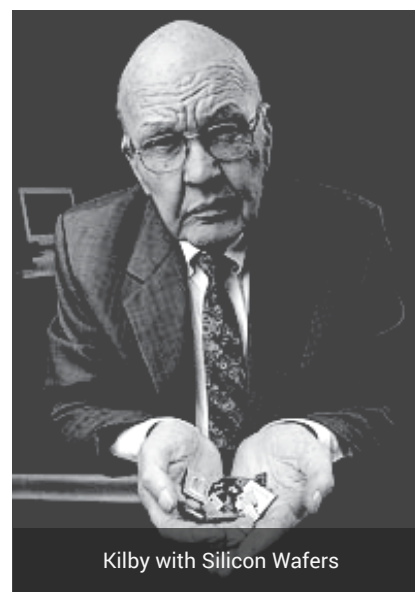
Kilby with his handheld calculators

Jack Kilby



By Vaishak Rajeev

all electronic devices are built in the conscience of minimalistic design with tremendous capabilities. Since 1961, the worldwide electronics market has grown from \$29 billion to nearly



Kilby with Silicon Wafers

\$1,500 billion. The form factor of electronic devices is rapidly decreasing and once a huge room-sized device is now smaller than our palms.

Kilby retired from Texas Instruments in 1983 and at the age of 81, the great man bid goodbye to the world due to cancer in June 2005. Provided much of the entertainment at major technical meetings over the next few years, the words which Kilby wrote about his ride with integrated circuits has literally turned to gold as IC's set the pace for modern computing

A Lalitha



By Srichitra S

The mighty and beautiful Bhakra-Nangal Dam of Himachal Pradesh boasts of one woman engineer who had made history with her contribution. Yes, she was India's first woman engineer; Mrs Lalitha. Seven decades ago, the norms of Indian society was quite queer. It was unimaginable for a woman to even dream of being a full-fledged engineer in her life. Lalitha, married at 15, was 18 when she had her daughter. A few months later, in 1937, her husband passed away. Determined not to stay at home and mourn or to remarry, she decided to take up a professional course. Lalitha applied to CEG in 1939, an all-male institution at the time.

Thanks to her father's support, she completed her degree meritoriously and continued in the field of Electrical Engineering by helping her father in his research works. They together patented Jelectromonium (an electrical musical instrument), smokeless ovens and an electric flame producer. The circumstances though were not favourable for a research life and hence she joined Associated Electrical Industries, a British firm. She then began designing transmission lines, doing substation layouts and executing contracts.

The Society of Women

Engineers (SWE) held the first International Conference of Women Engineers and Scientists (ICWES) from June 15-21, 1964, to coincide with the SWE National Convention and the 1964 World's Fair in New York City, New York. Although ICWES planners originally estimated 300 participants, the conference brought together over 500 people from more than 35 countries to discuss the role of women engineers and the future of engineering. She was the only woman engineer from India to attend this International conference. Thereafter, she was active in women's engineering organisations internationally until she passed away in 1979.

She once said: *Electrical Engineering runs in my blood. My father, four brothers, nephew and son-in-law are all electrical engineers.*



Today, many girls get a STEM (Science, Technology, Engineering and Mathematics) education - both in India and elsewhere. For any number of reasons, many of them decide to drop out of their fields. It takes grit and interest in the field to stay close to this subject, and Lalitha's life is a beacon of light, not for all the women who came after her in the 1950s, but also today.



Attendees gather at the 1964 New York World's Fair during the first International Conference of Women Engineers and Scientists, hosted by The Society of Women Engineers in June 1964. Left to right: A. Lalitha (Indian delegate), Unknown, Joan Shubert, Unknown Canadian delegate, N. Sainani (Canadian delegate of Indian origin), and Dee Halladay. Image Courtesy: [HTTP ALLTOGETHER.SWE.ORG](http://ALLTOGETHER.SWE.ORG)

Raspberry Pi



By Abhinav A



Raspberry Pi is a series of single board computers developed by the Raspberry Pi foundation for basic computer science in schools for developing countries. Originally intended for teaching computer science in schools in developing countries, it gained popularity due to its usage in robotics. The credit card sized form factor added to the Broadcom BCM2835 SoC in the first generation was only the beginning. Since then it has only gained in popularity among the developer community.

Raspberry Pi over the years

All models feature a Broadcom SoC consisting of ARM-compatible CPU with on-chip GPU, the Video Core IV. CPU speed ranges from

700 MHz to 1.4 GHz for the Pi 3 and onboard memory range from 256 MB to 1 GB RAM. SD cards are used to store the operating systems. Most boards have between one and four USB slots, HDMI composite video output and a 3.5 mm audio jack. A lower level output is provided by several GPIO pins which support common protocols like I²C. The recent B-models have an 8P8C Ethernet port and the Pi 3 and Pi Zero W have Wi-Fi 802.11n and Bluetooth on board.

The first generation of the board had 256 MB RAM, split equally between the CPU and the GPU. The next generation doubled the RAM whereas the third generation doubled it further. Raspberry Pi 3 Model B released

in February 2016, consists of onboard Wi-Fi, Bluetooth and USB boot capabilities. As of 28 February 2017, the Raspberry Pi Zero W was launched, which is identical to Pi Zero but has the Wi-Fi and Bluetooth functionality of the Raspberry Pi 3. On 14 March 2018, Raspberry Pi 3 model B+ was launched, which has a 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support.

Additional components

- Power supply 5V ,2A micro USB power supply
- USB keyboard
- USB mouse
- Micro SD card-the micro SD



must have at least 8GB of storage

- A monitor or TV that supports HDMI or composite video

Supported OS

The micro SD card must be loaded with any of the recommended operating systems. Some commonly used operating systems are

- RASPBIAN
- NOOBS
- WINDOWS 10 IOT CORE
- UBUNTU MATE
- SNAPPY UBUNTU CORE
- OSMC
- RISC OS
- KALI LINUX
- CENT OS

Accessories

- Camera

Camera module V2 (8 MP): It supports 1080p30, 720p60 and VGA90 video modes, as well as still capture.

Camera module V1 (5MP): It supports 1080p30, 720p60 and VGA90 video modes.

Infrared Camera Module v2 (Pi NoIR) 8MP: The Pi NoIR gives everything the regular camera module offers, with one difference; it does not employ an infrared filter.

- Raspberry Pi Touch Display
- HAT(Hardware Attached on Top) expansion boards

Software development tools

- **Arduino IDE** - for programming an Arduino.

- **Processing** - an IDE built for the electronic arts, new media art, and visual design communities with the purpose of teaching the fundamentals of computer programming in a visual context.

- **Algoid** - for learning programming for kids and beginners.

- **Python IDE** - for programming python.

- **Scratch** - a cross platform teaching IDE using visual blocks.

- **SqueakSmalltalk** - a full scale open Smalltalk.

- **Node-RED** - Wiring for the IoT.

- **Geany** - an IDE for almost any language.

ADVANCED PROJECTS WITH PI

Raspberry Pi – MATLAB integration

With MATLAB® Support Package for Raspberry Pi™ Hardware, we can remotely communicate with a Raspberry Pi computer and use it to control peripheral devices. This support allows us to acquire data from sensors and imaging devices connected to the Raspberry Pi. (Note that we cannot install MATLAB as a standalone application or execute MATLAB code locally on a Raspberry Pi).

Processing IDE for Pi

With Processing we can make projects based on mapping, Physics simulation, Forward and Inverse kinematics, Fluid simulation, Image processing and many more. For more details go to

<https://processing.org/>

OpenCV - Python

OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. In simple language it is library used for Image Processing. It is mainly used to do all the operation related to Images. What it can do:

1. Read and Write Images.
2. Detection of faces and its features.
3. Detection of shapes like Circle, rectangle, etc. in an image. E.g. Detection of coin in images
4. Text recognition in images. E.g. Reading Number Plates
5. Modifying image quality and colors.
6. Developing Augmented reality apps, and many more.

For more go to http://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_tutorials.html and <https://www.pyimage-search.com/category/raspberry-pi/>

For more go to http://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_tutorials.html and <https://www.pyimage-search.com/category/raspberry-pi/>

Deep learning on the Raspberry Pi with OpenCV

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. We can make object recognition projects with Pi. For more go to <https://www.pyimage-search.com/2017/10/02/deep-learning-on-the-raspberry-pi-with-opencv/>

A Glance On Multisim



By Rizwin Mohammed Yosuf

Simulation has greater importance in the modern age for the design of an electrical system. It really gives us the complete laboratory experience for synthesising, debugging and testing the desirable circuit. It has become advisable to use such simulation software prior to implementation of the actual hardware. The advantage of using such simulation software is that it helps to prevent dangerous situations that could happen due to design errors. It also helps us

to foresee the expected result in any condition.

One such software is NI-Multisim. NI Multisim is an electronic schematic capture and simulation program which is part of a suite of circuit design programs, along with NI Ultiboard. Multisim is one of the few circuit design programs to employ the original Berkeley SPICE based software simulation. It supports all circuitry setup that comes under subjects such as analog electronics, digital circuits and power circuit renewable

energy. The Multisim has categorised users into education, research and design based on the performance and functionality required by each class of users.

It provides GUI that supports a workspace surrounded by tools, components and equipment that simplifies the work in developing circuits with ease. Other features that are available in Multisim are Active Analysis mode, Multisim live, projects design on Ultiboard, advanced power design etc.

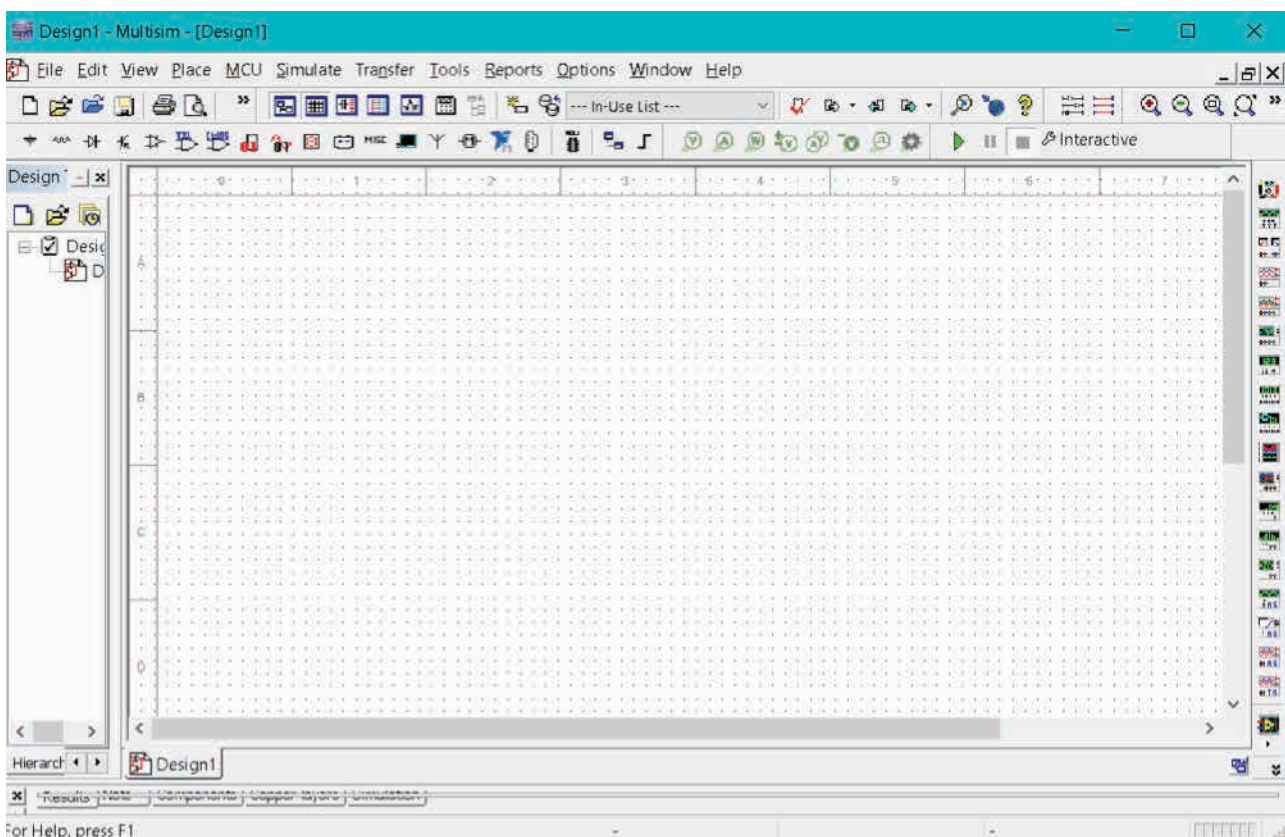


Fig.1: Main window of NI Multisim

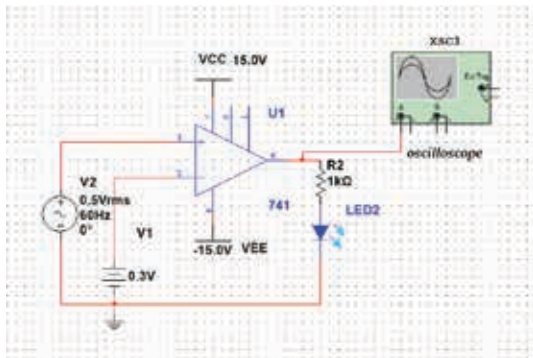


Fig.2: Comparator circuit

Let's understand how we can use Multisim with an example of comparator circuit. The above shown is a comparator circuit with an opamp, it's biasing circuit, reference and input voltages at its input nodes and output across an LED. The oscilloscope gives the waveform of the output voltage of opamp. Components in Multisim are available along the quick access toolbar below the ribbon as in fig 1. Clicking on the desired component will take it to a collection of related components as shown below. Components are classified into different categories under the 'Group' column as shown in fig 3. The user has the chance to

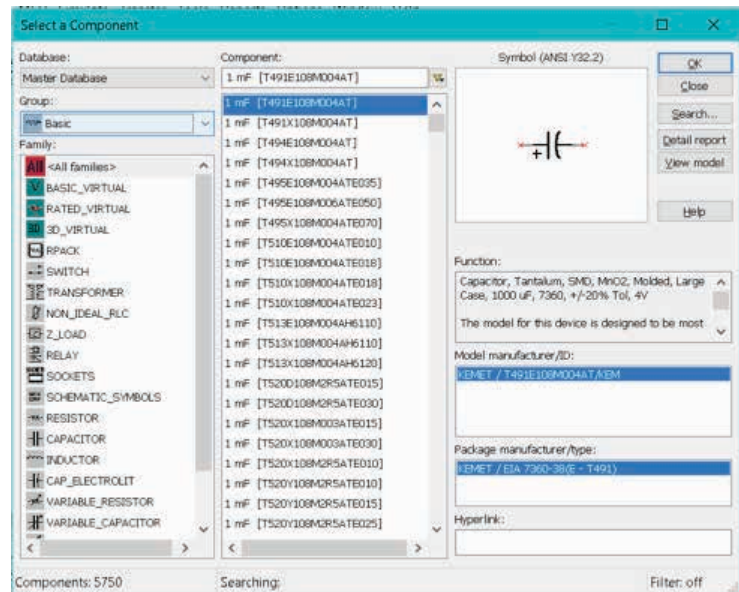


Fig.3: Components table

select the required component out of this collection and manually join all legs of different components to complete the circuit. The user will run the software by clicking the Run symbol on the toolbar. The equipment required for observing and generating waveform is available at the right edge of the software as on fig 1.

The output of the waveform can be observed on double tapping the oscilloscope. The output is as shown in fig 4.

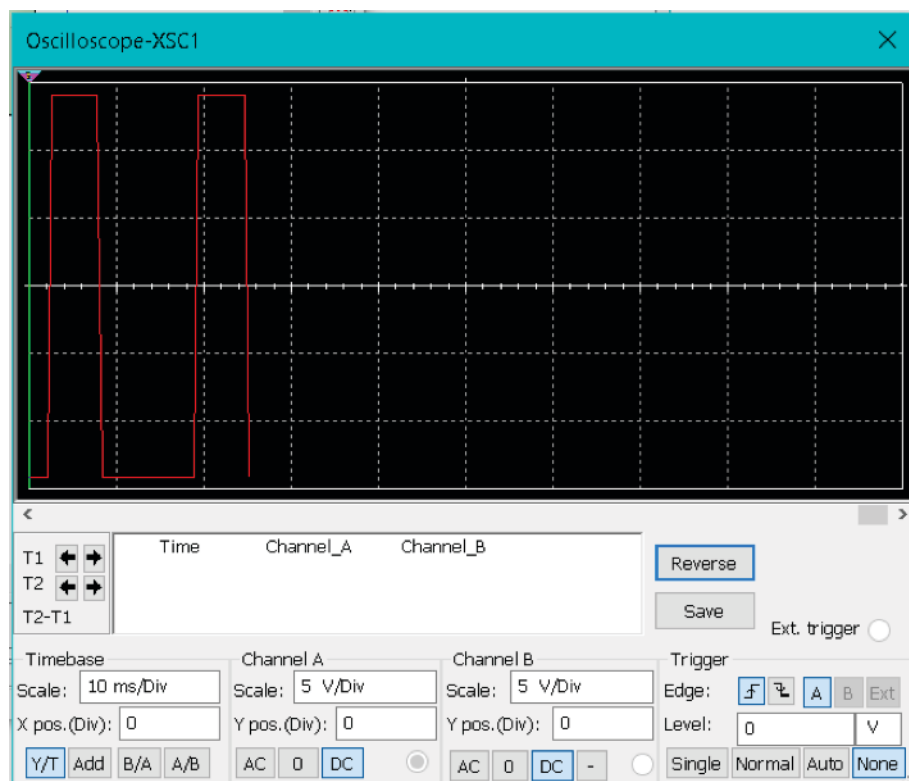


Fig.4: Oscilloscope in Multisim

MATLAB



By Yadunath R

MATLAB, which stands for MATrixLABoratory, is a state-of-the-art mathematical software package, which is used extensively in both academia and industry. It is an interactive program for numerical computation and datavisualization, which along with its programming capabilities provides a very useful tool for almost all areas of science and engineering. Unlike other mathematical packages, such as MAPLE or MATHEMATICA, MATLAB cannot perform symbolic manipulations without the use of additional Toolboxes. It remains, however, one of the leading software packages for numerical computation. As you might guess from its name, MATLAB deals mainly with matrices. A scalar is a 1-by-1 matrix and a row vector of length say 5, is a 1-by-5 matrix. We will elaborate more on these and other features of MATLAB in the sections that follow. One of the many advantages of MATLAB is the natural notation used. It looks a lot like the notation that you encounter in a linear algebra course. This makes the use of the program especially easy and it is what makes MATLAB a natural choice for numerical computations.'

Basics

The main window includes these panels:

- Current Folder - Access your files.
- Command Window - Enter commands at the command line, indicated by the prompt (`>>`).
- Workspace - Explore data that you create or import from files.
- Editor Window - Enter the programs and it provides the feature of editing the code.

Let us start with something simple, like defining a row vector with components the numbers 1, 2, 3, 4, 5 and assigning it a variable name, say `x`.

```
>> x = [1 2 3 4 5]
      x = 1 2 3 4 5
```

Note that we used the equal sign for assigning the variable name `x` to the vector, brackets to enclose its entries and spaces to separate them. (Just like you

would do while using the linear algebra notation). We could have used commas (,) instead of spaces to separate the entries, or even a combination of the two. The use of either spaces or commas is essential! To create a column vector (MATLAB distinguishes between row and column vectors, as it should) we can either use semicolons (;) to separate the entries, or first define a row vector and take its transpose to obtain a column vector. Let us demonstrate this by defining a column vector `y` with entries 6, 7, 8, 9, 10 using both techniques.

Defining a Matrix using MATLAB

Defining a matrix is similar to defining a vector. To define a matrix `A`, you can treat it like a column of row vectors. That is, you enter each row of the matrix as a row vector (remember to separate the entries either by commas or spaces) and you separate the rows by semicolons (;).

```
>> A = [1 2 3 ; 3 4 5 ; 6 7 8]
```

```
A =
     1     2     3
     3     4     5
     6     7     8
```

Built-in functions

There are numerous built-in functions (i.e. commands) in MATLAB. We will mention a few of them in this section by separating them into categories.

Scalar Functions

Certain MATLAB functions are essentially used on scalars, but operate element-wise when applied to a matrix (or vector). They are summarized in the table below.

<code>sin</code>	trigonometric sine
<code>cos</code>	trigonometric cosine
<code>tan</code>	trigonometric tangent
<code>asin</code>	trigonometric inverse sine (arcsine)

acos	trigonometric inverse cosine (arccosine)
atan	trigonometric inverse tangent (arctangent)
exp	exponential
log	natural logarithm
abs	absolute value
sqrt	square root
rem	remainder
round	round towards nearest integer
floor	round towards negative infinity
ceil	round towards positive infinity

Vector Functions

Other MATLAB functions operate essentially on vectors returning a scalar value. Some of these functions are given in the table below.

max	largest component
min	smallest component
length	length of a vector
sort	sort in ascending order
sum	sum of elements
prod	product of elements
median	median value
mean	mean value
std	standard deviation

Matrix Functions

Much of MATLAB's power comes from its matrix functions. These can be further separated into two sub-categories. The first one consists of convenient matrix building functions, some of which are given in the table below.

eye	identity matrix
zeros	matrix of zeros
ones	matrix of ones
diag	extract diagonal of a matrix or create diagonal matrices
triu	upper triangular part of a matrix
tril	lower triangular part of a matrix
rand	randomly generated matrix

Plotting

We end our discussion on the basic features of MATLAB by introducing the commands for data visualization (i.e. plotting). By typing `help plot` you can see the various capabilities of this main command for two-dimensional plotting, some of which will be illustrated below.

If x and y are two vectors of the same length then `plot(x,y)` plots x versus y . It is good practice to label the axis on a graph and if applicable indicate what each axis represents. This can be done with the

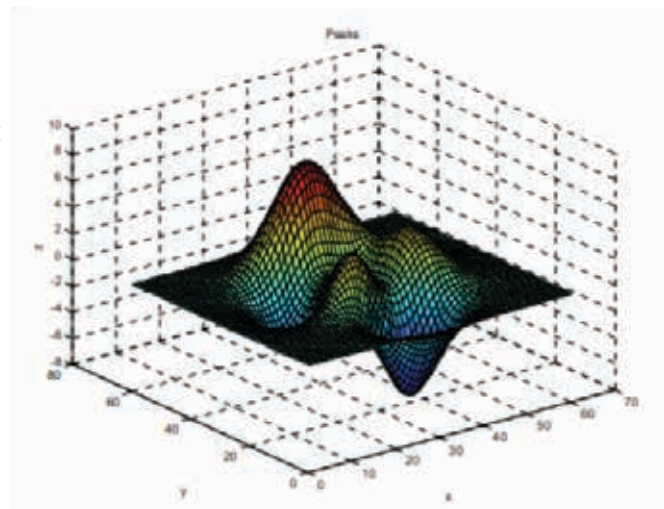
`xlabel` and `ylabel` commands.

Other commands for data visualization that exist in MATLAB include

subplot	create an array of (tiled) plots in the same window
loglog	plot using log-log scales
semilogx	plot using log scale on x-axis
semilogy	plot using log scale on y-axis
surf	3-D shaded surface graph
surfl	3-D shaded surface graph with lighting
mesh	3-D mesh surface

For example,

```
» [x,y] = meshgrid (-3:.1:3,-3:.1:3);
» z =
3*(1-x).^2.*exp(-(x.^2)-(y+1).^2)...
-10*(x/5-x.^3-y.^5).*exp(-x.^2-y.^2)...
-1/3*exp(-(x+1).^2-y.^2);
» surf(z)
» xlabel('x')
» ylabel('y')
» zlabel('z')
» title('Peaks')
```



Conclusion

MATLAB is a high performance language for technical computing. It integrates computation, visualisation, and programming in an easy to use environment where problems and solutions are expressed in familiar mathematical notation. Typical application includes application development, graphical user interface building etc. MATLAB acts as a key to the modern application development and practical simulation of all type projects and inventions.





The Electrical and Electronics Engineering Association was officially inaugurated this year by Prof. V K Damodaran - a veteran in the field of Power and Energy, during the grand ceremony organised on 28th February 2018, at the Central Auditorium of TKM College of Engineering. The function was presided by Dr. S Ayoob, Principal, TKMCE, in the presence of Prof. V Gayathri, HOD, Department of EEE, Dr. K Bijuna Kunju, Senior Advisor to the batch of 2018, and Mr. R Rohith Gopal, the newly elected Secretary of the Association. In the Welcome Address, Dr. K Bijuna Kunju urged the students to be an integral part of the association activities and pitched in certain initiatives that could be taken up in order to improve the cognizance of its members in the field of Electrical Engineering.

The Presidential Address by Dr. S Ayoob was a major highlight of the function. As a person with immense knowledge and experience in various sectors of society, he shed light on the present status of engineering education in the country. He focused on elaborating the moral responsibilities that every student of TKMCE should uphold as socially committed professionals of the future. Also, he focused on how these values help the

Electrical and Electronics Engineering Association Annual Report 2018



ASSOCIATION INAUGURATION

— ELECTRICAL & ELECTRONICS ENGINEERING —

28.02.2018

04.00 PM

College Auditorium



institution, even today, in finding its name amidst the elite engineering institutions of the country.

Prof. V K Damodaran inaugurated the activities of the association for the year 2018 by lighting the lamp. He is the Founding Director of the Energy Management Centre (EMC), Trivandrum, International Consultant of UNIDO and holds many other pivotal roles in various paramount organisations. In the inaugural address, he dilated the importance of focusing on the energy sector and how small steps can lead to monumental changes in achieving advancements without compromising the environmental concerns. This was an eye-opener towards a greener future.

The ceremony also witnessed the launch of the 12th Edition of POTENTIA, the yearly magazine of the Department of Electrical &



Electronics Engineering. Dr. S.Ayoob gave the first copy to Prof. V K Damodaran in the presence of Mr. G Anantha Krishnan, the Student editor of the magazine. The 12th edition put forward 'DISRUPT' as the theme - implying the latest technological innovations and trends that are on its plight at a rapid pace in today's world. The Students of the Department of Electrical & Electronics Engineering always focused on aligning themselves as frontrunners in academic and socio-technical proficiency. Such students who had brought laurels to the department, making the institution proud at various instances were awarded certificates of Excellence. The department also congratulated



the students who have made remarkable contributions to the institution as active volunteers of the College Union, IEEE, NSS and STEPS.

Felicitating the gathering, Prof. Gayathri V shared her teaching experience of the past three decades as faculty and HOD of the department of EEE and blessed the students for having a bright future. Senior teaching faculty, Dr. Imthias Ahmed T P and Dr. C Ushadevi Amma, teaching and non-teaching staff and students were present at the occasion. Expressing the gratitude, Mr. R Rohith Gopal discussed the heaviness of responsibilities bestowed on him, hoping for an active year ahead and closed the ceremony.

Technical Talk

Challenges in Power Sector: Energy Transition Rewrites the Shape and Fate of Powering the World

Embarking the activities of the association, a technical talk by Prof. V K Damodaran was organised on 28th February at the College Auditorium soon after the official inauguration of the Electrical & Electronics Engineering Association activities.

The interactive session discussed the challenges in the Power Sector, as it is the focal point of the advancing world. So, it is of prime importance that the next generation engineers be aware of the challenges and the latest technological advancements in this field. The trend in Power Generation is rapidly toppling as environmental concerns are unavoidable in comparison with the by-gone era. Prof. V K Damodaran, being a pioneer in the promotion of the use of non-conventional energy sources in the Power sector of the state of Kerala, was the primal



resource to ignite such a discussion. He presented a comparison of the current distribution of energy sources in India and the world and how we could utilise them for faster growth in the power scenario. The major focus of the session was on the challenges faced by the power sector and the initiatives taken by governmental and non-governmental agencies in overcoming those. Discussions also revolved around the latest technologies available for the generation of a cleaner and reliable power, and also over the contributions of the power sector in redefining the future of the world. He concluded the session by answering the queries raised by the attendees.

Earning a career

Imparting behavioural knowledge is an art, only the experienced is capable of performing. In the view

of giving a kick start to the students of sixth-semester batch who were heading to begin a new career or in simple terms to those who were about to attend the placement drives, an interactive session was organised under the Electrical & Electronics Engineering Association, at the Electrical Seminar Hall on March 24, 2018.

The session was handled by two final year students, Mr. Asif Noushad Sharafudeen and Mr. Jithin Thulasi, who have finesse in this field. The former has been an integral part of the working committee of many versions of the Kerala IEEE Job fairs and the later has served as the placement coordinator of the eight-semester batch, and were the best-fit for hosting such a session. Mr. Asif, having a major experience in placements both attending and conducting, gave a thorough insight on what the companies

expect of a candidate and what all preparations are to be done by a candidate in order to fulfil those requirements. Mr. Jithin shed light on the activities of the placement cell and the probable range of companies visiting the college in the next season. The session was concluded by addressing the queries of the students and also performing mock interviews with the students.

Technical workshop

Computer-aided Design Of Electrical System Of High Rise Residential Buildings

A two-day workshop on Computer Aided Design of Electrical System of High Rise Residential Buildings was conducted under the Electrical & Electronics Engineering Association, by Mr. A G Hareendralal on 10th April and 11th April 2018 at the Microprocessor Lab of the Department of EEE. Mr.



Hareendralal is the Former Design Head at Mouchel International, UAE and is presently the Director of Anantha Gangah Institute of Engineers dedicated to Electrical System Design.

The workshop was conducted exclusively for the students of eighth-semester to train them on designing a complete electrical system for high rise buildings with the help of computer software. The workshop was a stepping stone for students who wish to have a career in the core electrical sector. Printed reference materials essential for the designing were provided beforehand to the

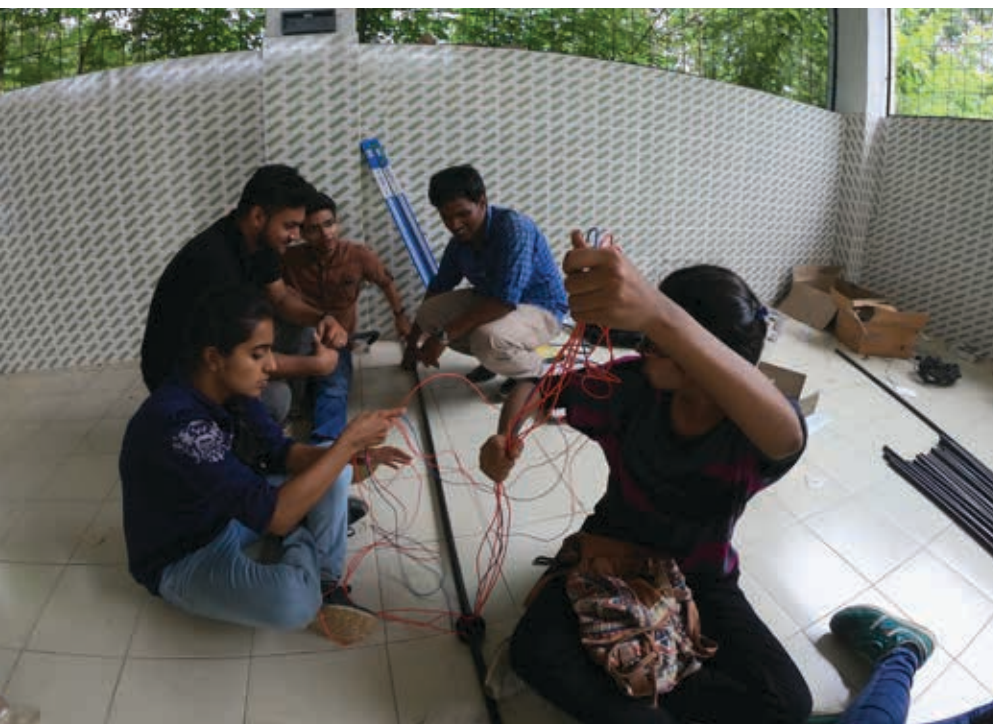
students. The first day of the workshop covered the estimation of the electrical equipment, design and selection of Transformers and Generators required for the system along with the basic usage of Microsoft Excel to tally these estimations in its technical aspect. The second day of the workshop covered advanced hands-on designing processes similar to that done in major Electrical System Design companies. The students received individual attention and were quite happy with the content and intent of the workshop.

Humanitarian activity

Rosemala Community Hall Electrification

The Electrical & Electronics Engineering Association along with IEEE SB TKMCE and KSEB undertook the mission to electrify a community hall at Rosemala, Aryankavu Grama Panchayat, Kollam. The electrification was done in two days time starting from May 16th, 2018. The prelude to the electrification was done in the month of April with a team consisting of five students and a professor visiting the site, completing the estimation and ordering the required equipment for completing the task.

Rosemala, a known paradise of explorers, is a small village- 15km into the dense Shenduruny Forests from Aryankavu Junction with poor health, education and electricity facilities. It takes almost an hour to reach Rosemala from Aryankavu. Only off-road vehicles reach Rosemala, leaving it a village of people with limited connectivity to the well off areas. Thus the estimation of the minimum requirements had to be pitch-perfect since a





miscalculation couldn't be afforded.

All the required materials were purchased and transported to Rosemala in a jeep, which included screws, nails, saddles, PVC pipes, distribution boxes, MCBs, ELCBs, ceiling fans, LEDs and tube lights. It was made sure that all the expendable items were bought in excess such that if not

used can be returned as buying spares after reaching Rosemala was impossible. Some tools were also taken from the Department Laboratory.

On May 16th, a team of 10 volunteers constituting of eighth and sixth-semester students along with KSEB personnel visited the community hall. The building was poorly constructed and

hence extra care had to be given while drilling, screwing and hammering. The local residents were highly welcoming and offered any kind of assistance. The happiness and gratitude that the people showed were overwhelming, giving back the volunteers immense experience of caring for a lifetime.





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Prof. Sunitha Beevi K

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360°

Awards and Recognition

Alumnus of TKMCE gets selected for Indian Administrative Services

Arjun Pandian, alumnus of 2008-2012 batch secured 248th rank in UPSC Civil Services Examination 2016 and got selected for Indian Administrative Services in the Kerala Cadre.

Electrical students take home two prestigious awards at NSS National Integration Camp

Visakh V, student of 6th semester was awarded the title of State Level Best Volunteer in the Directorate Level Awards of NSS, Technical Cell Kerala 2018. He also represented the Kerala contingent at the National Integration Camp held in Gujarat in August 2017.

Adwaita Pradeep, student of 2nd semester won the prestigious National Talent Award at the 7-day NSS National Integration Camp 2018 held in Telengana.



EEE student bags prizes at the Kerala University Youth Festival 2017

Ajmi Basheer, student of 8th semester won first prize for Bharatanatyam and Kuchipudi along with a second prize for Mohiniyattam in the Kerala University Youth Festival 2017.



College Chess Team wins the Kerala University Inter-Collegiate Chess Championship 2017

Adarsh TR, Hiran Raj and Binshad Ahmed KT, students of 8th semester played key role in the College Chess Team that won the Kerala University Inter-Collegiate Chess Championship 2017. Adarsh TR was also selected as part of the Kerala University Chess team for the All India Inter-University Chess Championships at Chennai.





Final year students come up with energy efficient dream home ideas at the Energy Efficient Dream Home Contest 2018

Asif Noushad Sharafudeen and R Rohith Gopal, students of 8th semester were the Runner up in the State Level 'Energy Efficient Dream Home Contest' jointly conducted by IEEE Power and Energy Society along with the Energy Management Centre, Trivandrum in 2018. They were also the Travancore Hub Level winners of the same.

Alen V Luke, Jithin T, A Varun and Dyuthi S, students of 8th semester won the second prize in the Hub Level 'Energy Efficient Dream Home Contest' jointly organized by IEEE PES Kerala Section and Energy Management Centre.

Final year student gets selected in the Kerala University Women's Football team

Anagha Pradeep, student of 8th semester was selected as a member of the Kerala University Women's Football team in 2017.

Sixth semester student participates in Gramya Manthan

Anjitha Nandan, student of 6th semester attended 'Gramya Manthan', a rigorous 10-day rural immersion journey which brings together 30 passionate young minds from across the country.

Technical paper of sixth semester students gets selected at I2CT 2018

Sameer Pradeep, Nandana Suresh and Akshay Guruvayoorappan, students of 6th semester got selected for Paper Presentation of 'IoT based Public Bus Boarding Aid for The Visually Impaired' at The International Conference on Convergence in Technology 2018.

Sameer Pradeep, student of 6th semester won the first prize for the Paper Presentation competition held at NIT Calicut in 2017.

Student wins gold medal for NPTEL online course

Caroline Maria John, student of 4th semester won the Gold Medal for the NPTEL online course 'Biology for Engineers and Other Non-Biologist'.

Team AWAKE gets awarded at multiple events

Team AWAKE (Automatic Waking Alert System to Keep down road Emergencies) consisting of five members Anagha Pradeep, Liyana C, Hariprasad M, Niyas Najeem, Mrudula C K and their guide Prof. Sunitha Beevi K proposed a driver drowsiness detection system that helps to reduce road accidents by an appreciable amount.

The team won the first prize for Ideathon conducted by Indian Institute of Management, Kozhikode in February 2018 which included Spaces at various incubation centres under the Kerala Start-Up Mission was provided for practicalising the device along with Fundings. The team Participated in the Start-Up Mentorship Program conducted by AICTE at New Delhi. They also won the first prize at the Zero Accident Expo conducted by Kollam District Traffic Police and The TCS Best Project Award 2018.



Paper presentation on Smart Grid for Power Distribution in Smart Cities - A team of three bags second prize

Jithin T, A Varun and Dyuthi S, students of 8th semester were the State Level Runner up in the Paper Presentation Competition on 'Smart Grid for Power Distribution in Smart Cities' jointly organized by IEEE PES Kerala Section & Energy Management Centre in 2017.

IEEE honoured Senior Volunteer with Global Award

Prof. Sunitha Beevi K received IEEE Women in Engineering 'Outstanding Professional Volunteer Award 2017' in the Asia-Pacific Region and IEEE Kerala Section Best Project Award 2017 for 'Shastra Vismaya' Project, a science workshop for socially backward girls which was coordinated by her.

IEEE SB TKMCE's Vibrant Volunteer gets selected as the Student Representative of IEEE Kerala Section

Asif Noushad Sharafudeen, student of 8th semester held the position of Student Representative of IEEE Kerala Section in 2017-18. It is the topmost position that can be held by a student IEEE member within a Section. The Student Community conducted various exemplary programs that benefitted a wide range of diaspora during his tenure.

28 houses in Edamulackal Panchayat is now electrified with the efforts of Electrical department

The Department in collaboration with IEEE SB TKMCE and KSEB Ayoor Sub-division was appreciated by Hon. Minister for Electricity M M Mani for the efforts in electrifying 28 houses in Edamulackal Panchayat, Valakom, Kollam as part of the Complete Electrification Project of Kerala taken up by the Government of Kerala. The Project received special mention in IEEE SIGHT Blog and IEEE IAS AGM held in USA.



Second edition of IEEE SPICES held at TKM College of Engineering

The Department in association with Department of Computer Science Engineering hosted the 2nd edition of the International Conference of IEEE on Signal Processing, Informatics, Communication and Energy Systems (SPICES-2017). Over 200 Delegates from 5 Countries Participated in the Tutorials and Plenary sessions. 95 Papers were presented in 5 Tracks.

Around The World

Students of TKMCE participate in IEEE Industry Applications Society Annual General Meeting in USA

Harikrishnan R, Swetha Harikumar and Adarsh G of 8th semester attended the IEEE Industry Applications Society Annual General Meeting 2017 at Cincinnati, Ohio, USA. The trio were among the 20 member Indian Contingent that attended the function along with representatives from all parts of the globe.





Final year students represent TKM at the Japan Geoscience Union & American Geophysical Union Joint Meeting in Japan

Sebin Sabu, Srichitra S and Rizwin Muhammed Yosuf of 8th Semester co-authored a number of research papers that were presented at JpGU and AGU Joint meeting held at Japan.

The research paper titled 'Review of Characteristics of Atmospheric Electric Field Prior To Lightning Strike' by Srichitra S, Sebin Sabu, Nora Elizabeth Joby (NIT Calicut) and Prof. Premlet B (MES Kollam) is a study on the atmospheric electric fields prior to lightning strike. This paper helps in identifying the characteristic change in atmospheric electric field prior to lightning strike and can create a great advantage in lightning prediction.

The research paper titled 'An Analysis of Lightning Related Parameters using NASA GHRC Datasets' by Srichitra S, Sebin Sabu, Abraham Mulamootil, Nora Elizabeth Joby (NIT Calicut) and Prof. Premlet B (MES Kollam) collects data from LDAR (Lightning Detection and Ranging) datasets from GHRC and KSC and CGSLSS (Cloud-to-Ground Lightning Surveillance System) from KSC. Static electric field measurements are obtained with Electric Field Mills (EFM) from the AGBFM (Advanced Ground Based Field Mills) datasets. Dynamic Electric field measurements are also made using dipole and capacitive antennas, and data made available in the form of K-changes. This data, which is available along with timestamps and co-ordinates, are analysed for interrelationships and coincident occurrences. Changes in other weather parameters associated with lightning are also observed. Finally, the feasibility of using these parameters for lightning prediction and detection is examined.

The research paper titled 'Varactor based Electric Field Sensor for Lightning Early Warning System and Response Study' by Rizwin Muhammed, Sebin Sabu, Nora Elizabeth Joby (NIT Calicut) and Prof. Premlet B (MES Kollam) proposes a voltage controlled variable capacitance as a method for non-contacting measurement of electric fields. A varactor based mini electric field measurement system is developed, to detect any change in the atmospheric electric field and to issue lightning early warning system. A network of these devices can help in forming a spatial map of electric field variations over a region, and this can be used for more improved atmospheric electricity studies in developing countries.



Research paper of Electrical students gets selected in International Conference On Intelligent Autonomous Systems in Singapore

The paper titled 'Automated Power Factor Improvement Based on Artificial Networks' by V R Ananthapadmanabhan, Irene Tenison and Prof. Shanavas T N was selected for presentation and publication at ICoIAS 2018, Singapore. The paper was also a part of the Grace Hopper International Conference, Bengaluru. The paper addresses the basic issues related to voltage instability considering the characteristics of transmission systems and thereby introducing a power factor improvement tool based on artificial neural networks focusing on the compensation of reactive power, consequently improving the voltage stability.

Research paper of final year student gets selected in American Geophysical Union Meeting in USA

Rizwin Muhammed Yosuf, student of 8th semester got selected for presenting the Poster of his Research Paper 'Electric Field Sensor for Lightning Early Warning System' at the American Geophysical Union Meeting 2017 at New Orleans, USA.

Semester Toppers

First Semester



Sany Shaji
SGPA: 9.67

Second Semester



Amina Shajahan
SGPA: 10



Saranya S
SGPA: 10



Pooja Rejikumar
SGPA: 10



Induja S
SGPA: 10



Sandra S
SGPA: 10



Bharath Krishna K
SGPA: 10



Krishnendhu Murali
SGPA: 10



Muhammed Shanil N P
SGPA: 10

Third Semester



Reenu M Aby
SGPA: 10

Fourth Semester



Caroline Maria John
SGPA: 10

Fifth Semester



Deepika Krishna
SGPA: 10



Athira T
SGPA: 10

Sixth Semester



Archa S
SGPA: 9.7

Seventh Semester



Nair Dhanya Dinesh
SGPA: 9.69

Kerala University Rank Holders



Noufal C S
Rank: 2
CGPA: 9.49



Nair Dhanya Dinesh
Rank: 3
CGPA: 9.42



Yadunath R
Rank: 6
CGPA: 9.34



Rizwin Mohammed Yosuf
Rank: 9
CGPA: 9.25



Srichitra S
Rank: 11
CGPA: 9.20



Arunima B
Rank: 14
CGPA: 9.13

To Contributors

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