Institution of Electronics and Telecommunication Engineers

KOLKATA, CENTRE, Plot No J1-7, EP-Block, Sector V, Salt Lake, Electronics Complex, Kolkata 700091

A Quarterly News Letter

SIGNAL

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CHAIRMAN'S MESSAGE

Mr. P. S. Biswas

The newsletter "SIGNAL" was out of circulation since 2005 and it has been revived by the EC since 2019 in its web version. This issue contains an advanced technology article on fake news detection written by one of the esteem fellow of IETE Dr. Pradosh K. Roy. Current activities of IETE has also been reflected in this issue.

Apart from being published in our website, this will be e-mailed to our IETE Kolkata members.

A special thanks to our Editor, Prof. J.K. Mandal, our Hon. Secretary, for taking initiative on this project.

We invite contributions/articles for this newsletter from our members. Your contribution may please be sent to secretaryietekolkata@gmail.com. If accepted, it shall be published in future edition.

With Greetings and Best Wishes

Partha S. Biswas

EVENTS

SEMINAR ON HAZARDS OF E.M. WAVE NARULA INSTITUTE OF TECHNOLOGY ON 8TH NOVEMBER, 2019

IETE Student Forum , Electronics and Communication Department of Narula Institute of Technology organized a seminar on "Hazards of E.M Wave " in collaboration with IETE Kolkata Centre. The inaugural speech was delivered by Prof. (Dr.) S Panda, Head, ECE, Narula Institute of Technology. Prof. (Dr.) M Mitra, ECE Department, IIEST Shibpur delivered the keynote speech, he Enlighted on the details of different hazards of E. M Wave and its effects in our life .

UPCOMING EVENTS

- IETE Kolkata Centre organizing 25th Sir J C Bose Memorial Lecture on Saturday, 30th November at 2 pm. The topic of the lecture is "Data, Analytics, Visualization: Uses and abuses ", to be delivered by the Former Chairman and Professor Dr. H. S. Jamadagni, in the Department of Electronic Systems Engineering (DESE, formerly Centre for Electronics Design and Technology, CEDT), Indian Institute of Science (IISc), Bangalore.

- The IETE Students chapter of Adamas University, Barasat going to organise a guest lecture on: Introduction to Dielectric Resonator Antennas on 27-11-2019 (Wednesday) sponsored by IETE Kolkata Centre. This guest lecture is scheduled from 2:00 PM onwards at our seminar Hall. The guest speaker for the lecture will be Dr. Koushik Dutta, *Assistant Professor, ECE, NSEC, Garia, Kolkata and Student Activity Chair, IEEE Kolkata Section.*.

Members

- ⇒ Mr. P. S. Biswas, Hon. Chairman
- ⇒ Dr. Jyotsna Kumar Mandal, Secretary
- ⇒ Prof. P. R. Bandopadhyay, Treasurer
- ⇒ Mr. S. C. Rudra, Immediate Past Chairman, IETE Kolkata Centre
- ⇒ Mr. Anirban Guha, Vice Chairman
- ⇒ Sri Tapan Jyoti Sen, Committee Member
- ⇒ Mr. S. D Tiwary, Committee Member
- ⇒ Dr. A. K. Mukhopadhyay, Committee Member
- ⇒ Smt. Sangita Roy, Committee Member
- ⇒ Mr. Dibyandu Majumder, Committee Member
- ⇒ Prof. Dr. Sujit Biswas, Ex. Professor, Jadavpur University Co-opted Member
- ⇒ Mr. Soumya Roy, Ex. CGM Calcutta Telecom, Co-opted Member
- ⇒ Mr. Aniruddha Nag, Co-opted Member

" You have to grow from the inside out. None can teach you, none can make you spiritual. There is no other teacher but your own soul. "

EDITOR'S COLUMN

Dr. Jyotsna Kumar Mandal

The Managing committee took charge during third week of July 2018. Since then regular activities are being organized on behalf of IETE Kolkata Centre. Initiatives has already been taken for motivating technical institutes to open ISF Centre. Initiatives are also taken to induct more new members. It has been decided to provide grant in aid to organize ISF activity.

IETE Kolkata Centre organizing 25th Sir J C Bose Memorial Lecture on Saturday, 30th November at 2 pm. The topic of the lecture is "Data, Analytics, Visualization: Uses and abuses ", to be delivered by by the Former Chairman and Professor Dr. H. S. Jamadagni, in the Department of Electronic Systems Engineering (DESE, formerly Centre for Electronics Design and Technology, CEDT), Indian Institute of Science (IISc), Bangalore.

IETE Student Forum, Electronics and Communication Department of Narula Institute of Technology organised a seminar on "Hadars of E.M Wave " for ECE 1st year, 2nd year, 3rd year and 4th year in collaboration with IETE Kolkata Centre on 8th November 2019 at the Narula Institute of Technology, Sodepur, North 24 Parganas. The keynote speaker of the day was Prof. (Dr.)M Mitra, ECE Department, IIEST Shibpur

The IETE Students chapter of Adamas University, Barasat going to organise a guest lecture on: Introduction to Dielectric Resonator Antennas on 27-11-2019 (Wednesday) sponsored by IETE Kolkata Centre.

On behalf of the members of EC, I would like to thanks to all members and my scholars for taking positive role to reactivate the newsletter. Hope this will be a useful information and technical brochure for the esteem members. I would like to request our esteem members to participate in writing technical articles into this newsletter.

Best wishes

Jyotsna Kumar Mandal

Secretary, IETE Kolkata Centre

Editor, SIGNAL

"Forget not that the grossest crime is to compromise with injustice and wrong. Remember the eternal law: you must give, if you want to get."

– Subhash Chandra Bose

The Quantum Computing Paradigm

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A digital computer operates on strings of binary digits or bits [0 ,1] to represent the values it is operating on. A bit can be represented and stored by any physical system that exists in either of two distinct states e.g. flip-flop stable states , two positions of an electrical switch ; distinct voltage levels in a circuit etc. The complexity of a problem is defined as the time required to solve it and measured in the number of elementary steps required by the algorithm . The complexity T(n) is a function of the size of the problem n. The kind of problems that computers can solve in a reasonable amount of time, even for large values of n, are those for which an algorithm exists that uses a number of steps governed by a polynomial e.g. an3 + bn2 +c . Leaving the low order terms such as bn2 and the constants in the above example , we say that the complexity of the algorithm is O(n3). "Computer scientists call such an algorithm efficient, and problems that can be solved by an efficient algorithm are said to be in the complexity class P, which stands for polynomial time" [3]. However , there are problems for which the complexity increases exponentially with the problem size n . This class known as Nondeterministic Polynomial (NP) contains a huge number of problems of practical interest. It may be noted that P problems are contained in NP Class, . Hardest of the NP problems are known as NP Complete Class. In 1994 Peter Shor, found the first ex-ample of a quantum algorithm that could factor an n-digit num-ber in polynomial time , classically belonging to NP complete class ; heralding thereby the era of quantum computing. This article intends to review the emerging paradigm, including its technical challenges and limitations.

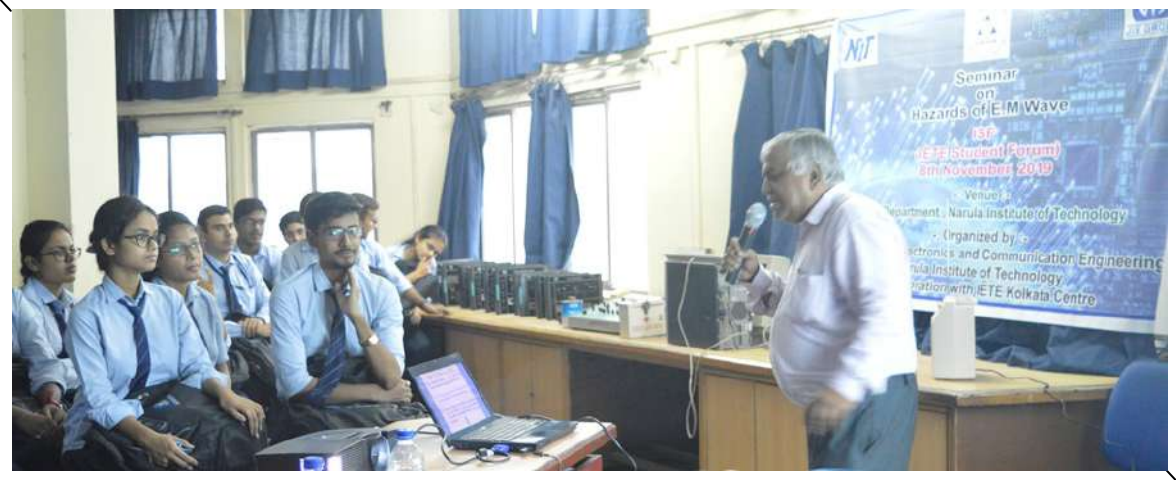
A quantum computer uses quantum bits, or qubits which are basically quantum mechanical two state systems , represented by basis states . Ground and an excited state of Hydrogen atom , Spin 1/2 particle in a Magnetic Field etc. are common examples of such systems . Qubits can exist in Superposition state, which simultaneously involve both the states . Thus a 1-qubit is represented by . The wave function for such a state is Linear Superposition of the individual states . The amplitudes are in general complex numbers , and the square of the amplitudes represent the individual probability of finding the system in the state and respectively post measurement . Born Normalizing Condition , ensures that the sum of the probabilities is 1. Thus , a 2-qubit system is the superposition of four basis states : Generalizing the scheme , we can define an n-qubit system as the superposition of basis states ; mathematically , subject to , summed over all binary representations of n-qubit states (from). However , the qubits are neither digital nor purely binary. The state of an n -qubit system is encoded in the amplitudes , which are a set of analog signals , not robust to noise. To make use of this 2n space it is essential that all of the qubits be Entangled , 'well isolated from the outside environment, and intrinsically inter connected'[2]. This is known as Entanglement. Superposition and Entanglement are unique to quantum systems only.

Digital computer circuits are constructed using sets of logic gates e.g. OR , NOT , AND, NAND. Similarly , quantum logic gates compute the output states from the input states , where the inputs in general are n-qubit systems. Quantum gates are fundamentally Unitary Operators, and their applications are accomplished through multiplication of the respective matrix by the state vector . It is now mathematically established that a couple of 'single-qubit gates and one two-qubit gate are sufficient to implement an arbitrary quantum algorithm'[2]. From the applications point of view Peter Shor's algorithm for factoring large numbers , computing discrete logarithms and Lov Grover's database search algorithms are the most well known. Shor's algorithm is implemented using Quantum Fourier Transform [QFT] , an earlier work by Don Coppersmith . Shor's algorithm was a significant discovery because a number of algorithms for public-key cryptography, including the commonly used RSA algorithm to factor integers into prime numbers are classically NP complete problems. Grover's algorithm is a database search algorithm - also a NP complete problem ; using {\displaystyle O({\sqrt {N}})} function evaluations , where {\displaystyle N}N is the size of the function's domain ; whereas the classical complexity is evaluations. 'Researchers have found only a few other quantum algorithms that appear to provide a speedup from exponential to polynomial time for a problem'[3]. Currently the class of problems that a quantum computer could solve efficiently are known as 'Bounded-error Quantum, Polynomial time [BQP] algorithms' that include Class P problems and also a few other NP problems ' [3]. A number of other interesting problems in Physics , Chemistry , Computational Biology and Drug Design etc. for which efficient algorithms are yet to be designed , may be successfully solved with a quantum computer. Examples include (i) Superconductor Design , (ii) Quantum Chemistry Calculations and (iii) Molecular Dynamics Simulations [2].

Physical realization of such systems poses a major technical challenge [1] . A quantum system lose their inherent properties (Quantum Coherence) 'mainly due to the interaction with the environment that tends to annihilate superposition and entanglement'[2] . Two leading technologies viz. trapped ions at University of Maryland and superconducting qubits at MIT Lincoln Laboratory using very 'different techniques for embodying and operating on qubits'[2] are being developed at present. Research at Intel Labs has led recently to the development of a 49 qubit Tangle Lake , a superconducting quantum processor manufactured at Intel's 300-millimeter fabrication facility in Hillsboro, Oregon. IBM Q Experience and Microsoft Quantum Development Kit (QDK) are open access platforms for researchers for experimenting with quantum algorithms. As on 23 October, 2019 Google, in partnership with NASA Ames Research Centre and ORNL , has claimed in achieving a milestone known as quantum supremacy with a 53 qubit Sycamore Chipp [4]. Though it is not possible to set ' a time frame for a scalable, fully error-corrected machine capable of a larger number of operations' [1] , quantum computing offers new technical challenges and opportunities for the creative minds to explore.

GLIMPSES OF THE SEMINAR ON HAZARDS OF E.M. WAVE
NARULA INSTITUTE OF TECHNOLOGY

8th November, 2019



The keynote speaker of the day was Prof. (Dr.)M Mitra, ECE Department, IIEST

Dr. S Panda delivering plaque to Mr. P S Biswas, Chairman IETE Kolkata.

" Life is like riding a bicycle. To keep your balance you must keep moving. "

— Albert Einstein

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