A.V.C COLLEGE OF ENGINEERING, MANNAMPANDAL, MAYILADUTHURAI

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Department of Electronics and Communication Engineering

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"LEMON NEWSLETTER"

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Message from Head of the Department

I express my wishes to the students for participating in the various paper presentation events.

I look forward from the faculties our department to engage themselves in upbringing the department.

I expect from students to study well and score high marks in upcoming exams.

Dr. CHITRAVALAVAN

HOD/ECE

"MOTIVATIONAL QUOTES"

"Keep your face always toward the sunshine, and shadows will fall behind you."

"Be courageous. Challenge orthodoxy. Stand up for what you believe in. When you are in your rocking chair talking to your grandchildren many years from now, be sure you have a good story to tell."

"Success is not final, failure is not fatal: it is the courage to continue that counts."

"You can be everything. You can be the infinite amount of things that people are."

Faculty Corner:

Overview of 6G Networks & Technology

- ***Dr.K.R.Vinothini, AP/ECE***

What is 6G?

6G (sixth-generation wireless) is the successor to 5G cellular technology. 6G networks will be able to use higher frequencies than 5G networks and provide substantially higher capacity and much lower latency. One of the goals of the 6G internet is to support one microsecond latency communications. This is 1,000 times faster -- or 1/1000th the latency -- than one millisecond throughput.

The 6G technology market is expected to facilitate large improvements in the areas of imaging, presence technology and location awareness. Working in conjunction with artificial intelligence (AI), the 6G computational infrastructure will be able to identify the best place for computing to occur; this includes decisions about data storage, processing and sharing.

It is important to note that 6G is not yet a functioning technology. While some vendors are investing in the next-generation wireless standard, industry specifications for 6G-enabled network products remain years away.

What are the advantages of 6G vs. 5G?

6G networks will operate by using signals at the higher end of the radio spectrum. It is too early to approximate 6G data rates, but Dr. Mahyar Shirvanimoghaddam, senior lecturer at the University of Sydney, suggested a theoretical peak data rate of 1 terabyte per second for wireless data may be possible. That estimate applies to data transmitted in short bursts across limited distances. LG, a South Korean company, unveiled this type of technology based on adaptive beamforming in 2021.

This level of capacity and latency will extend the performance of 5G applications. It will also expand the scope of capabilities to support new and innovative applications in wireless.

6G's higher frequencies will enable much faster sampling rates than with 5G. They will also provide significantly better throughput and higher data rates. The use of sub-mm waves -- wavelengths less than 1 millimeter -- and frequency selectivity to determine relative electromagnetic absorption rates is expected to advance the development of wireless sensing technology.

Mobile edge computing will be built into all 6G networks, whereas it must be added to existing 5G networks. Edge and core computing will be more integrated as part of a combined communications and computation infrastructure framework by the time 6G networks are deployed. This approach will provide many potential advantages as 6G technology becomes operational. These benefits include improved access to AI capabilities and support for sophisticated mobile devices and systems.

When will 6G internet be available?

6G internet is expected to launch commercially in 2030. The technology makes greater use of the distributed radio access network (RAN) and the terahertz (THz) spectrum

to increase capacity, lower latency and improve spectrum sharing.

While some early discussions have taken place to define the technology, 6G research and development (R&D) activities started in earnest in 2020. 6G will require development of advanced mobile communications technologies, such as cognitive and highly secure data networks. It will also require the expansion of spectral bandwidth that is orders of magnitude faster than 5G.

China has launched a 6G test satellite equipped with a terahertz system. Technology giants Huawei Technologies and China Global reportedly plan similar 6G satellite launches in 2021. Many of the problems associated with deploying millimeter wave radio for 5G must be resolved in time for network designers to address the challenges of 6G.

How will 6G work?

It's expected that 6G wireless sensing solutions will selectively use different frequencies to measure absorption and adjust frequencies accordingly. This method is possible because atoms and molecules emit and absorb electromagnetic radiation at characteristic frequencies, and the emission and absorption frequencies are the same for any given substance.

6G will have big implications for many government and industry approaches to public safety and critical asset protection, such as the following:

- threat detection;
- health monitoring;
- feature and facial recognition;
- decision-making in areas like law enforcement and social credit systems;
- air quality measurements;
- gas and toxicity sensing; and
- sensory interfaces that feel like real life.

Improvements in these areas will also benefit smartphone and other mobile network technology, as well as emerging technologies such as smart cities, autonomous vehicles, virtual reality and augmented reality.

Do we even need 6G?

There are a number of reasons we need 6G technology. They include the following:

- **Technology convergence.** The sixth generation of cellular networks will integrate previously disparate technologies, such as deep learning and big data analytics. The introduction of 5G has paved the way for much of this convergence.
- **Edge computing.** The need to deploy edge computing to ensure overall throughput and low latency for ultrareliable, low-latency communications solutions is an important driver of 6G.
- **Internet of things (IoT).** Another driving force is the need to support machine-to-machine communication in IoT.
- **High-performance computing (HPC).** A strong relationship has been identified between 6G and HPC. While edge computing resources will handle some of the IoT and mobile technology data, much of it will require more centralized HPC resources to do the processing.

Student Corner:

Network Security And Cryptography

- ***V. Priyanka ,IVECE***

Network security and cryptography is a subject too wide ranging to coverage about how to protect information in digital form and to provide security services. However, a general overview of network security and cryptography is provided and various algorithms are discussed. A detailed review of the subject of **network security and cryptography** in **digital signatures** is then presented. The purpose of a **digital signature** is to provide a means for an entity to bind its identity to a piece of information.

The proliferation of computers and communications systems in the 1960s brought with it a demand from the private sector for means to protect information in digital form and to provide security services. DES, the Data Encryption Standard, is the most well-known cryptographic mechanism. It remains the standard means for securing electronic commerce for many financial institutions around the world. The most striking development in the history of cryptography came in 1976 when Diffie and Hellman published *New Directions in Cryptograph*y.

A digital signature of a message is a number dependent on some secret known only to the signer, and, additionally, on the content of the message being signed. Signatures must be verifiable; if a dispute arises as to whether a party signed a document (caused by either a lying signer trying to *repudiate* a signature it did create, or a fraudulent claimant), an unbiased third party should be able to resolve the matter equitably, without requiring access to the signer's secret information (private key).

The first method discovered was the RSA signature scheme,Which remains today one of the most practical and versatile techniques available. Sub-sequent research has resulted in many alternative digital signature techniques. The Feige-Fiat-Shamir signature scheme requires a one-way hash function.

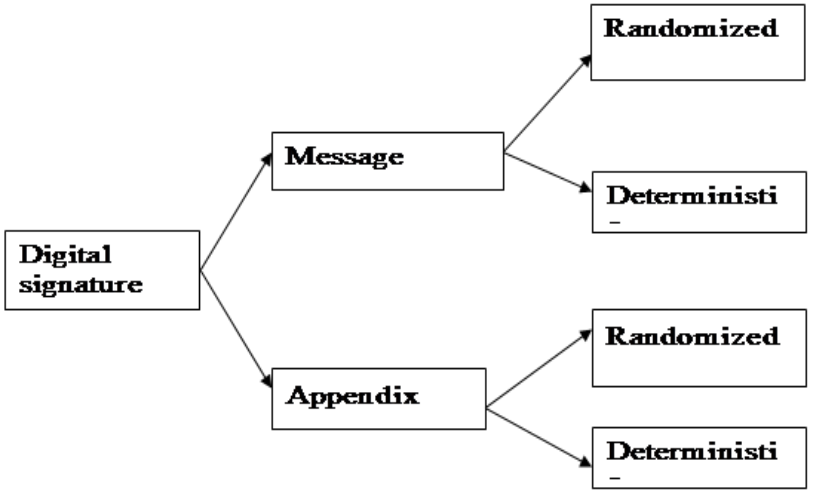

Figure: Taxonomy of signature schemes

Information Security and Cryptography

Cryptography, an understanding of issues related to information security in general is necessary. Information security manifests itself in many ways according to the situation and requirement. Over the centuries, an elaborate set of protocols and mechanisms has been created to deal with information security issues when the information is conveyed by physical documents. Often the objectives of information security cannot solely be achieved through mathematical algorithms and protocols alone, but require procedural techniques and abidance of laws to achieve.The concept of *information* will be taken to be an understood quantity. For example, privacy of letters is provided by sealed envelopes delivered by an accepted mail service.

ATTACKS ON DIGITAL SIGNATURES

1. ***Key-only attacks***. In these attacks, an adversary knows only the signer's public key.
2. ***Message attacks***. Here an adversary is able to examine signatures corresponding either to known or chosen messages.

Message attacks can be further subdivided into three classes:
(a) ***Known-message attack***. An adversary has signatures for a set of messages which are known to the adversary but not chosen by him.
(b) ***Chosen-message attack***. An adversary obtains valid signatures from a chosen list of messages before attempting to break the signature scheme. This attack is *non-adaptive* in the sense that messages are chosen before any signatures are seen. Chosen-message attacks against signature schemes are analogous to chosen cipher text attacks against public-key encryption schemes .
(c) ***Adaptive chosen-message attack***. An adversary is allowed to use the signer as an oracle; the adversary may request signatures of messages which depend on the signer's public key and he may request signatures of messages which depend on previously obtained signatures or messages.

Signing procedure
Entity A (the *signe*r) creates a signature for a message m € M by doing the following:
1. Compute s = S A (m).
2. Transmit the pair (m, s). s is called the *signature* for message m.

Verification procedure
To verify that a signature s on a message m was created by A, an entity B performs the following steps:
1. Obtain the verification function VA of A.
2. Compute u = VA (m, s).
3. Accept the signature as having been created by A if u = *tru*e, and reject the signature if u = *fals*e.

The RSA signature scheme
The message space and cipher text space for the RSA public-key encryption scheme are both Z n = {0, 1, 2… n-1} where n = pq is the product of two randomly chosen distinct prime numbers. Since the encryption transformation is a bijection,

digital signatures can be created by reversing the roles of encryption and decryption. The RSA signature scheme is a deterministic digital signature scheme which provides message recovery. The signing space MS and signature space S are both Z n. A redundancy function R: M à Z n is chosen and is public Knowledge.

Algorithm: *Key generation for the RSA signature scheme*

SUMMARY: each entity creates an RSA public key and a corresponding private key.

Each entity A should do the following:

1. Generate two large distinct random primes p and q, each roughly the same size.
2. Compute n = pq and Φ = (p -1)(q - 1).
3. Select a random integer e, 1 < e < Φ, such that gcd (e, Φ) =1.
4. Use the extended Euclidean algorithm (Algorithm 2.107) to compute the unique integer d, 1 < d<Φ, such that ed Ξ 1 (mod Φ).
5. A's public key is (n, e); A's private key is d.

Algorithm: *RSA signature generation and verification*

SUMMARY: entity A signs a message m € M. Any entity B can verify A's signature and recover the message m from the signature.

1. *Signature generation.* Entity A should do the following:

(a) Compute m = R (m), an integer in the range [0, n-1].
(b) Compute s = m d mod n.
(c) A's signature for m is s.

2. *Verification.* To verify A's signature s and recover the message m, B should:

(a) Obtain A's authentic public key (n; e).
(b) Compute m = se mod n.
(c) Verify that m € MR; if not, reject the signature.
(d) Recover m = R ¯1 (m).

Objective type questions on 5G Networks

- Venkatesh.S, IV ECE

1 .5G was introduced in which year?
A)July 2015
B)July 2016
C)July 2017
D)July 2018

2 .Which country launched the world's first fully-fledged 5G mobile networks in April 2019?
A)China
B)Japan
C)South Korea
D)Singapore

3 .The G in 5G stands for?
A)Gigabit
B)Gigahertz
C)Good to Go
D)Generation

4 .5G is the fifth generation technology standard for_____
A)Laptops
B)Televisions
C)Broadband cellular networks
D)None of the Above

5 .In 5G NR, the NR stands for?
A)New Radio
B)Not Right
C)New Reach
D)Never Ready

Answers:

1. B)July 2016
2. C)South Korea
3. D)Generation
4. C)Broadband cellular networks
5. A)New Radio

Mathematics Fun

- Harine.K, III ECE

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Once a clever mathematician borrowed Rs.5,000 from a rich man. After a few months, he borrowed Rs.2000 from the same man.

Days rolled. But the mathematician did not return the money to the rich man. The rich man went to the mathematician and asked him to return the money. But the mathematician replied that he had repaid the money. He said "the sum of 5000 and 2000 is equal to zero. So I do not have any balance to pay".

This matter was taken to the court. The mathematician was asked to prove this. The clever mathematician said, Let x=5,000, y=2000 and z=7000

x+y=z

Now, multiply both sides by (x+y)

(x+y)(x+y) = z(x+y)

(x*x)+xy+yx+(y*y) = zx+zy

(x*x)+xy-zx = zy-yx-(y*y)

x(x+y-z) = -y(x+y-z)

x = -y

x+y = 0

Hence by putting the values of x and y as 5,000 and 2,000 respectively, their sum is zero. Thus the clever mathematician proved that he need not pay any money.

PUZZLES

- Viswaja.S, IV ECE

1.A male and a female person are sitting on the bench."I'm a male," says the person with brown hair."I'm a female," says the person with black hair.If at least one of them is lying, who is male and who is female?

Answer: A simple analysis shows that the persons either have to be both lying or both telling the truth. Since we are told that at least one of them is lying, the person with brown hair is the female person and the person with black hair is the male person.(Atleast one means one or more than one)

2. Leo, Dolly, and Tommy are related to each other.

i. Among the three are Leo's legal spouse, Dolly's sibling, and Tommy's sister-in-law.

ii. Leo's legal spouse and Dolly's sibling are of the same sex.Who do you know is a married man?

Answer: If Leo's spouse is Dolly, then Dolly's sibling cannot be Leo and must be Tommy; then Tommy's sister-in-law cannot be Dolly and must be Leo. If Leo's spouse is Tommy, then Tommy's sister –in-law cannot be Leo and must be Dolly; then Dolly's sibling cannot be Leo and must be Dolly; then Dolly's sibling cannot be Tommy and must be Leo. Then, in any case, all three of Leo, Dolly. And Tommy are accounted for and Tommy's sister-in-law is a female. So, from [2], Leo's spouse and Dolly's sibling are both males.

3. The President decides to give a prisoner, who is about to be sentenced to death, one last chance to live. There are 2 doors, one - the life door and the other - the death door. There is one security person standing by each door, who knows about the doors. However, one of them always tells the truth and the other always tells a lie. There is no way to identify which door is the life door and which is the death door. There is no way to distinguish which security person is telling the truth. The prisoner can only ask only one question from any of the security person. After this he needs to choose a door. If he walks in the death door, then he will be executed. If he walks in the life door, he will get a life. He did choose the life door and lived. What was the question he asked? How did he choose the door after he got the answer from one of the security person?

Answer:

Assume the security person X is by door X and the other person is by door Y. Let the prisoner go to person X and asks this question "If I ask person Y what door is door Y, then what will be answer given by him: life door or death door?"

If the answer is life door (door X), he can walk in the door Y. If the answer is death door (door Y), he can choose the door Y and walk in. This is because the question goes through 2 levels of questions from 2 people. The overall answer will be always a lie because there is always one person lying and the other telling the truth.

4. While travelling to Tungnath Vicky reached a fork on the way. He could have gone to any of the two ways. But only one of them leads to the town. But fortunately two men were standing nearby, however one of them always lies and other always speak the truth and its not known who is who. Since the men do not really like to help, one is allowed to ask one of them only one question. Which question should he ask?

Answer:

Ask one of the men, "if I would ask the man standing next to you: which is the way to the town? ,
what would he answer?"
If he asks this to the liar, he will point him in the wrong way.
If he asks this to the one who speaks the truth, he will also point him in the wrong way. So after asking the question, take the other way. This will bring you in the town.

Editor's Desk:

- ***If you're unsure about starting a morning workout routine, consider the following ten benefits.***

1. Fewer Distractions
2. You'll Be In a Better Mood Throughout the Day
3. It Aids Weight Loss
4. It Controls Your Appetite
5. Improves Your Focus
6. Controls Your Blood Glucose
7. Improves Your Sleep Patterns
8. It Helps You Avoid Summer Heat
9. Working Out Helps You Eat Healthier
10. It Increases Your Body's Alertness

Send your suggestions to:

Dr.K.R.Vinothini, AP/ECE –Editor / ***LEMON NEWSLETTER***
lemonece2013@gmail.com

Student Editors :

1. M.Yogeshwaran, IV ECE
2. S.Ashika, IV ECE
3. B.Arooran, III ECE
4. S.Abirami, III ECE

Department Vision

To create globally competent engineers in Electronics and Communication Engineering to meet the industrial progress for betterment of the society

Department Mission

- To create an academic ambience for quality education in the field of Electronics and Communication Engineering
- To make the best use of modern tools and software for teaching and research activities
- To promote industry-institution interaction for skill-based learning of students from rural society
- To inculcate moral and ethical values with a sense of professionalism.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's):

1. To provide the students with a strong foundation in the required sciences in order to pursue studies in Electronics and Communication Engineering.
2. To gain adequate knowledge to become good professional in electronic and communication engineering associated industries, higher education and research.
3. To develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolve
4. To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.

5. To inculcate in the students a professional and ethical attitude and an ability to visualize the engineering issues in a broader social context.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO1: Design, develop and analyze electronic systems through application of relevant electronics, mathematics and engineering principles
- PSO2: Design, develop and analyze communication systems through application of fundamentals from communication principles, signal processing, and RF System Design & Electromagnetics.
- PSO3: Adapt to emerging electronics and communication technologies and develop innovative solutions for existing and newer problems