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Emerging Trends in Electrical Engineering Communications

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ABOUT THE STUDY

Electrical Engineering Communications refers to the branch of Electrical Engineering that deals with the design and implementation of communication systems that transmit and receive information using electrical signals. This field encompasses a wide range of technologies, from simple telegraph systems to complex wireless networks.

Key concepts in electrical engineering communications

There are several key concepts that are fundamental to Electrical Engineering Communications. These include:

Signals: Signals are electrical or electromagnetic phenomena that carry information. A signal can be in the form of a voltage, current, electromagnetic wave, or any other physical quantity that can be measured. Signals can be either analog or digital. Analog signals are continuous in time and can take any value within a range, while digital signals are discrete and can only take on specific values [1].

Modulation: Modulation is the process of modifying a signal to make it suitable for transmission over a communication channel. There are several types of modulation techniques, including amplitude modulation, frequency modulation, and phase modulation. In amplitude modulation, the amplitude of the signal is varied to carry information [2]. In frequency modulation, the frequency of the signal is varied to carry information, the phase of the signal is varied to carry information, the phase of the signal is varied to carry information.

Demodulation: Demodulation is the process of extracting the original signal from a modulated signal. Demodulation is required at the receiving end of a communication channel to recover the original signal [3].

Transmission medium: A transmission medium is the physical medium through which a signal is transmitted [4]. There are several types of transmission media, including wired and wireless media. Wired media include coaxial cables, twisted pair cables, and fiber optic cables, while wireless media include radio waves, microwaves, and infrared waves.

Bandwidth: Bandwidth is the range of frequencies that a communication channel can support. The bandwidth of a communication channel determines the maximum amount of information that can be transmitted over the channel. The higher the bandwidth, the higher the data rate that can be achieved.

Noise: Noise is unwanted electrical or electromagnetic interference that affects the quality of a signal. Noise can be introduced at various points in a communication system, including during transmission, reception, and processing [5]. Noise can be reduced by using noise-cancelling techniques or by increasing the signal strength.

Error Control: Error control is the process of detecting and correcting errors that may occur during signal transmission. Error control techniques include parity check, cyclic redundancy check, and error-correcting codes.

Multiplexing: Multiplexing is the process of combining multiple signals into a single signal for transmission over a communication channel [6]. Multiplexing is essential in increasing the efficiency of a communication channel by enabling multiple users to share the same channel.

Modulation schemes: Modulation schemes are techniques used to encode digital information into analog signals. Examples of modulation schemes include Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK).

Digital signal processing: Digital signal processing is the use of digital techniques to process signals. Digital signal processing is essential in modern communication systems as it enables the manipulation and processing of signals.

Applications of electrical engineering communications

Electrical Engineering Communications has numerous applications in the modern world, from mobile phones and the internet to satellite communication and medical imaging.

Mobile communication: Mobile phones and other wireless devices rely on Electrical Engineering Communications to transmit voice and data over cellular networks [7]. This technology

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has revolutionized the way people communicate, enabling instant communication across the globe.

Internet: The internet is a vast network of interconnected computers and servers that rely on Electrical Engineering Communications to transmit data. The internet enables people to access information from anywhere in the world, connect with others, and conduct business.

Satellite communication: Satellite communication is used to transmit signals over long distances, such as television broadcasts and GPS signals. This technology is vital for remote sensing, weather forecasting, and other applications [8].

Medical imaging: Medical imaging technologies, such as MRI and CT scans, rely on Electrical Engineering Communications to generate images of the human body [9]. These technologies have revolutionized the diagnosis and treatment of diseases, enabling doctors to see inside the body without invasive procedures.

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