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Elect/Elect

EE 471

Signal processing is an electrical engineering subject that focuses on analyzing, modifying and synthesizing signals such as images, sound, and scientific measurements.

Signal processing techniques can be used to improve transmission, storage efficiency and subjective quality and to also emphasize or detect components of interest in a measured signal.

Signal processing and interfacing work together to produce more precise and accurate results and improve the quality of outputs.

\* Statistical signal processing: This is an approach which treats signals as stochastic processes, utilizing their statistical properties to perform signal processing tasks.

Statistical techniques are widely used in signal processing applications. For example one can model the probability distribution of noise incurred when photographing an image, and construct techniques based on this model to reduce the noise in the resulting image.

\* Digital signal processing: This is the processing of digital or discrete-time sampled signals. Processing is done by general-purpose computers or by digital circuits such as ASICs, field programmable gate arrays or specialized digital signal processors (DSP chips). Example of algorithms are the fast Fourier transform (FFT),

finite impulse response (FIR) filter, infinite impulse response (IIR) filter and adaptive filters such as the Wiener and Kalman filters.

\* Non-Linear Signal Processing: This involves the analysis and processing of signals produced from non-linear systems and can be in the time, frequency, or spatio-temporal domains. Non linear systems can produce highly complex behaviors including bifurcations, chaos, harmonics and sub-harmonics which cannot be produced or analyzed using linear methods.

\* **Discrete-time signal processing:** This is for ~~st~~ sampled signals, defined only at discrete parts in time, and as such are quantized in time, but not in magnitude. Analog discrete-time signal processing is a technology based on electronic devices such as sample and hold circuits, analog time-division multiplexers, analog delay lines and analog feedback shift registers. This technology was a predecessor of digital signal processing and is still used in advanced processing of gigahertz signals.

\* **Continuous-time signal processing:** This is for signals that vary with the change of continuous domain (without considering some individual interrupted parts). The methods of signal processing include time domain, frequency domain and complex frequency domain.

### EXPERT SYSTEM INSTRUMENTATION:

This is the term that refers to systems capable of mimicking human like decision making thus leading to the term AI (Artificial intelligence). The architecture of an expert system is an example of a Knowledge based system. Expert systems were the first commercial systems to use a Knowledge based architecture.

A Knowledge-based system is essentially composed of two sub-systems:

- The Knowledge base; and
- The Inference Engine.

In the field of artificial intelligence, ~~infer~~ inference engine is a component of the system that applies logical rules to the Knowledge base to deduce new information while Knowledge Base (KB) is a technology used to store complex structured and unstructured information used by a computer system.