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EEE 471

1. Explain briefly the signal Processing and Interfacing Techniques in measuring instruments.
2. Explain briefly the Expert system Instrumentation.

Signal Processing

Signal Processing involves analysing, modifying and synthesizing Signals such as sound, images 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.

Categories of Signal Processing

- Analog signal Processing
- Continous-time signal Processing
- Discrete time signal Processing
- Digital Signal Processing
- Non-linear Signal Processing

Interfacing Techniques.

Signal interfacing, is the method of connecting or linking together devices, allowing us to design or adapt the output & input Configurations of two electronic devices so they can work together.

Signal Interfacing techniques are used to improve transmission storage efficiency and Subjective quality, emphasize or detect components of interest in measured Signal.

Techniques are; as stated above

- ~~Analog~~ Analog
- ~~Continuous~~ Continous time
- Non-linear
- Discrete time

Discrete time. Signal Processing

This is for sampled signals defined only at discrete points in time and as such as quantized in time but not in magnitude

The concept for this also refers to a theoretical discipline that establishes a mathematical basis for DSP [Digital signal Processing]

Continous time. Signal Processing

Continous time signal processing is for signal that vary with the change of continous domain.

The methods of signal processing include time domain, frequency domain and complex frequency domain.

Digital Signal Processing

Digital signal Processing is the processing of digitized discrete-time sampled signals. Processing is done by general purpose computers or by digital circuit such as ASICs, field-Programmable gate arrays.

This technique used in the processing make use of typical arithmetical operations include fixed-point and floating point

Analog Signal Processing

This is for signals that have not been digitized. This involves linear electronic circuit as well as non-linear ones. The methods of signal processing for instance passive filters, additions mixers integrators and delay lines.

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 system can produce highly complex behaviours including harmonics & sub harmonics which cannot be produced or analyzed by using linear methods.

Statistical Signal Processing

This technique which treats signals as stochastic processes, utilizing their statistical properties to perform signal processing tasks.

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

APPLICATIONS

- ✓ Process Control
- ✓ Control systems.

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Expert System Instrumentation

Expert system is a computer system emulating the decision making ability of human expert. Expert systems are designed to solve complex by reasoning through bodies of knowledge represented mainly as "if-then" rules rather through conventional procedural code.

An expert system is divided into two subsystems

- ✓ The interface engine
- ✓ Knowledge base

The Expert System Instrumentation is the act of using or adapting an AI or a series or combination of AIs developed to solve complex problems in a particular domain.

Components / Architecture of Es.

1. Knowledge Base
2. Interference Engine
3. Knowledge Acquistion & learning module
4. User Interface
5. Explanation module

Advantages of Expert System

- Ease of maintenance
- Rapid development

Disadvantages of Expert system

- Knowledge acquistion problem.