

REMOTE MONITORING AND DISTRIBUTED REAL-TIME CONTROL VIA ETHERNET

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Ethernet is the most widely used information carrier and the service provider for many important day-to-day applications such as e-mail, voice-image data and web based information. It is also emerging strongly in the area of industrial communication. This paper presents research and development being carried out to enhance the possibilities for using standard TCP/IP Ethernet for real-time condition monitoring and distributed real-time control.

Condition monitoring from a location remote to the site of an industrial process is becoming increasingly common. Control loops that are closed over a communication network are also becoming more common, because, hardware devices for network and network nodes have become cheaper due to advanced cost effective silicon technology and less wiring in installation.

In distributed real-time control systems, the network nodes that are of specific interest for distributed control are sensor nodes, actuator nodes, and control nodes. Sensor nodes measure process output values and transmit that information over the communication network. Actuators receive the new values for the process inputs. Controller nodes read process values from sensor nodes. Using control algorithm, control signals are calculated and sent to the actuator nodes. The system setup with a common communication network reduces cost of cabling and offers modularity and flexibility in system design.

The objective of this paper is to present the work done so far on designing and implementing sensor and actuator nodes that can easily be connected to Ethernet. Most of the outputs of physical sensors can be obtained in the form of an analogue voltage (tacho generator) or a digital word (an incremental encoder). Similarly, inputs of many actuators can be provided in the form of an analogue voltage (linear power amplifier) or a digital word (PWM inverter). Thus the whole system design problem boils down to implementing the hardware needed to interface, an Analogue to Digital Converter (ADC), Digital to Analogue Converter (DAC) and Digital Input/Output to the Ethernet.

As the first prototype, a microcontroller based unit capable of completing one A/D conversion and a D/A conversion needed for a single actuation cycle within 1 ms is designed.

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