

Adaptive Smart Sensor Networks for Distributed Measurement and Control in Process Industries

Kishor Uttamrao Dawane

Lecturer

Department of Instrumentation Engineering
Government Polytechnic, Mumbai

Abstract: *Adaptive smart sensor networks provide an intelligent framework for distributed measurement and control in modern process industries. Conventional fixed-rate sensing systems continuously acquire and transmit measurements which can increase communication traffic and computational requirements even during stable process conditions. Proposed approach integrates smart sensors, adaptive sampling, edge computing, sensor fusion, industrial communication, fault diagnosis and distributed control. Sensor nodes dynamically modify their sampling and transmission rates according to process dynamics, measurement reliability and control requirements. Edge-based processing enables local data validation and rapid identification of abnormal sensor behavior while reducing unnecessary transmission of raw measurements. Performance can be assessed using measurement error, communication load, data reduction, response time, sensor reliability and control performance. These support flexible, scalable and responsive industrial instrumentation and provides a practical foundation for intelligent process monitoring and Industry 4.0-oriented distributed control.*

Keywords: Adaptive Smart Sensors, Distributed Measurement, Edge Computing, Process Control & Industrial IoT