Advanced Real Time Systems

Real-Time Smart Home Automation System

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Overview: The Smart Home Automation System is a real-time application designed to remotely control all home appliances. It functions by acoustically monitoring and controlling the home appliances and allowing user to have full control over its use. This application is critical in preventing excess use of resources, which can directly save energy and time.

Working Principle: The real-time smart home automation system is powered by the NodeMCU ESP8266 microcontroller, which integrates with various sensors and relays to automate and monitor home appliances. The NodeMCU connects to the home Wi-Fi network, allowing it to communicate with a central cloud server and user devices. Through this setup, the system continuously monitors input from sensors. Based on predefined user settings or real-time conditions, the system autonomously controls appliances—such as lights, fans, and security systems—by toggling connected relays.

Core Components:
1. Device Control & Automation: Allows control over home devices like lights and fans, enabling scheduled or sensor-based automation.
2. Connectivity & Data Transmission: Uses Wi-Fi for seamless communication between Node MCU8266 and a central hub, supporting remote control.
3. User Alerts: Sends immediate alerts to users for events like Light OFF or ON via a mobile app.
4. System Interface: Simple UI for setting preferences and monitoring status.
5. Energy Management: Monitors energy usage and optimizes device operation to save power.

System Requirements
1. A Wi-Fi-enabled NodeMCU ESP8266 capable of real-time data processing and wireless communication.
2. Real-time capable mobile application for live control of inputs and actions.
3. Notification System: Alerts for significant events of ON/OFF of the controlled devices.

Real-Time Significance
The application's real-time processing capability ensures immediate and accurate response to acoustic events, a critical factor for the user's safety and the integrity of electrical appliances. The real-time nature of the system is evident by immediate processing, deterministic response, resilience and reliability.