Smart Home Control System

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Problem Statement

This project solves the need for a smart home system offering real-time control and security with enhanced privacy by integrating edge-computing, offering a one-stop solution.

Deliverables

Hardware

- A Raspberry Pi-based unit integrated with sensors and connectivity modules.

Software

- An application for controlling the devices and monitoring the security features, that also uses a locally deployed LLM for processing user commands

Data and Simulation

- SystemC simulation results that will demonstrate the performance of the hardware-software integration

Requirements

Functions

- **Home automation:** Real-time control of home devices based on predefined rules.
- **Surveillance:** Secure management using live camera monitoring, real-time theft detection system
- **Energy Tracking:** Models energy consumption trends based on historical usage and makes predictions/suggestions.
- **Air Quality Detection:** Relays real-time AQI to the application and warns user if AQI > 100.

Objectives

- Ensure local processing with a response time of less than 200ms.
- > 95% accuracy in detecting movement and security breaches.
- < 500ms per command processed for LLM model inference.
- Maintain data privacy through edge computing
- Ensure compatibility with existing home automation standards like Wi-Fi, Bluetooth, and Zigbee.

Requirements

Constraints

- The system must operate on a Raspberry Pi with additional processing power provided by Coral AI boards.
- Local LLM should consume less than 500MB RAM to run efficiently on edge devices.
- The system should handle up to 30 connected devices simultaneously.
- Must comply with local data privacy regulations, restricting external data storage and transmission.

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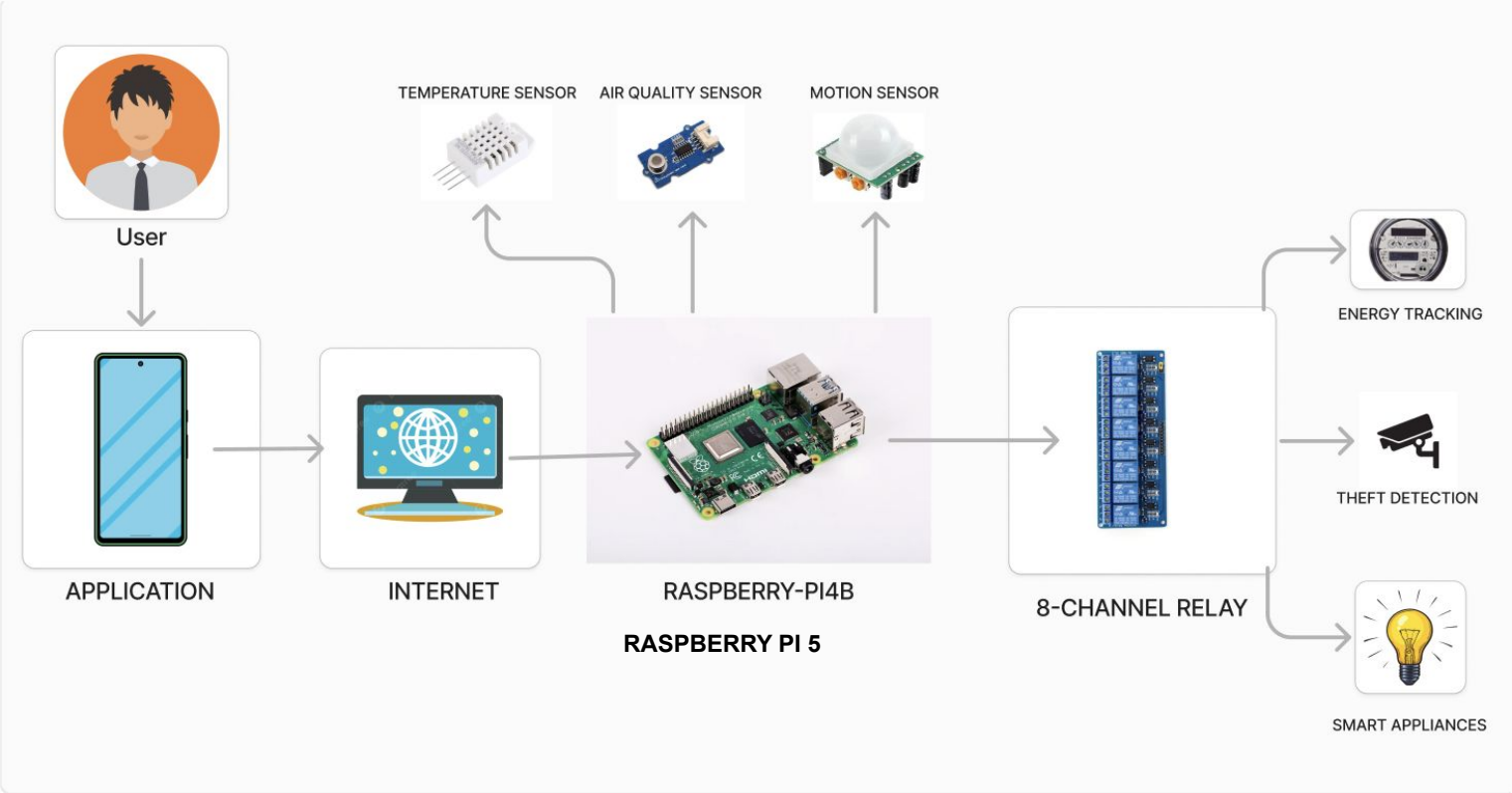
Visualization



Popular competing Technologies/Other Products

Google Nest

Used for: Smart home automation hub with security features.

Amazon Alexa & Ring

Used for: Voice-controlled automation with theft detection.

Apple HomeKit

Used for: Privacy-focused home automation system.

Comments/Questions?