Fire Detection System

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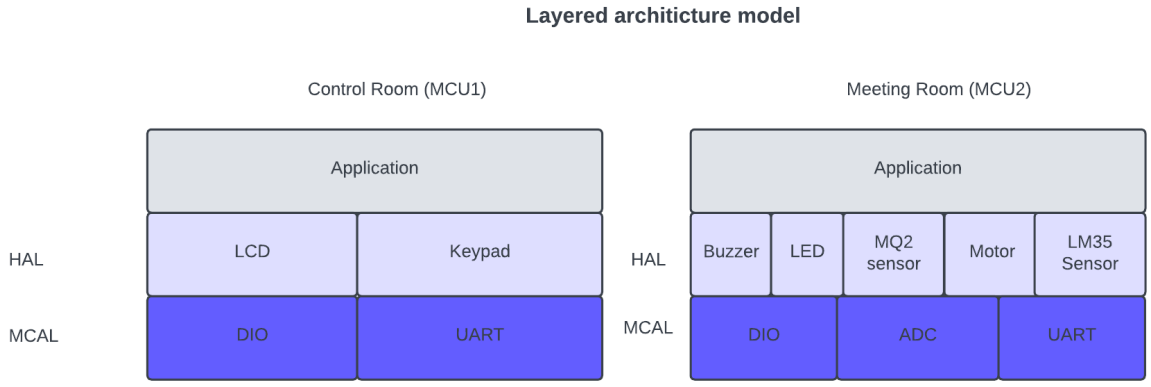
System Description:

An advanced fire detection system utilizes room temperature sensors to detect the presence of a fire. When the temperature surpasses the safety threshold, it activates a dual-level alert system. Initially, it activates both an audible buzzer and an LED indicator to notify occupants. If the temperature continues to rise and smoke is detected, indicating the presence of a fire, it further triggers the LED and buzzer while simultaneously initiating an evacuation plan. As the temperature continues to increase, the system prompts the control system to initiate essential safety protocols.

System design:



The system is designed based on the layered architecture model, Application, HAL, and MCAL.

Microcontroller: ATmega32.

We are using two microcontrollers first in the control room, and second in the meeting room.

First Microcontroller:

MCAL: Layer contains:

- DIO Driver: Based on ATmega32, DIO Driver supports 4 Ports.
- UART Driver: The UART (Universal Asynchronous Receiver/Transmitter) driver is responsible for enabling communication via serial communication in a microcontroller or similar embedded system. This driver facilitates both sending and receiving individual characters and strings of characters (text). It manages the configuration, transmission, and reception of data over a serial connection.

HAL: Layer contains:

- LCD Driver: Driver that Initializes the LCD module, Sends a command to the LCD module, Sends data (character) to be displayed on the LCD, Sends a string of characters to be displayed on the LCD, Sends numerical value whether it is integer or float, Sets the cursor position on the LCD, Clears the LCD display, Defines and sends a custom special character to be displayed on the LCD.
- Keypad Driver: Driver that initializes the keypad and enters the pressed key from its buttons.

Second Microcontroller:

MCAL: Layer contains:

- DIO Driver: Based on ATmega32, DIO Driver supports 4 Ports.
- ADC Driver: Responsible for initializing and controlling the ADC module's functionality. This driver facilitates the conversion of analog signal to digital values, that is read by heat sensor.
- UART Driver: The UART (Universal Asynchronous Receiver/Transmitter) driver is responsible for enabling communication via serial communication in a microcontroller or similar embedded system. This driver facilitates both sending and receiving individual characters and strings of characters (text). It manages the configuration, transmission, and reception of data over a serial connection.

HAL: Layer contains:

- LED Driver: Driver for interfacing with a LED component, it initializes the LED, and turns it on or off.
- Buzzer Driver: Driver for interfacing with a buzzer component, it initializes the buzzer, and turns it on or off.
- Stepper Motor Driver: Driver to control motor, it Initializes the motor control system, Stops the motor, or makes it rotate by 90-degree angle to open or close the automated door.
- DC Motor Driver: Driver to control motor, it Initializes the motor control system, Stops the motor, or makes it rotate clockwise or anti clockwise.
- MQ2 Driver: indicates if there is a smoke by getting pin value as it works as digital output.

System flowchart: