**Introduction:**

This system is designed to control the temperature in a room. It includes a temperature sensor, a display, a keypad, and a buzzer (LED in Simulation). The user can set a target temperature using the keypad, and the system will turn on the buzzer if the temperature goes above the target.

**System Architecture:**

1. The system is implemented using a microcontroller. The following components are included in the system:
2. LM35 Temperature Sensor: This is a temperature sensor that measures the temperature of the room and outputs an analog voltage proportional to the temperature.
3. LCD Display: This is a 2x16 character LCD display that is used to show the current temperature, target temperature, and system status.
4. Keypad: This is a 3x3 keypad that is used to set the target temperature.
5. Buzzer (LED in the Simulation): This is a buzzer that is used to indicate when the temperature is above the target temperature.
6. Microcontroller: The system is implemented using a microcontroller that reads the temperature from the LM35, displays the temperature on the LCD, and controls the buzzer based on the temperature.

**use cases for the system:**

* Adjusting the target temperature: The user can use the keypad to adjust the target temperature. By pressing the "4" button, the user can enter the set mode, which allows them to adjust the temperature using the "1" and "2" buttons to increase or decrease the temperature, respectively. The "3" button is used to confirm the desired temperature and return to the main screen.
* Resetting the temperature: If the user wants to reset the temperature to the default value, they can press the "5" button, which triggers the reset mode. The system will display a message indicating that the temperature has been reset, and the default temperature will be set as the target temperature.
* Temperature monitoring: The system continuously monitors the temperature using the LM35 temperature sensor. If the current temperature is lower than the target temperature, the system turns off the buzzer. If the temperature exceeds the target temperature, the system turns on the buzzer to alert the user.
* Displaying the current and target temperature: The system displays the current temperature and the target temperature on the LCD screen. The user can easily check the temperature status at any time.
* Start-up message: When the system is started, it displays a welcome message on the LCD screen. The message indicates that the system is ready to use and displays the default target temperature.
* Error handling: The system handles errors caused by incorrect user inputs. If the user presses an invalid button, the system will display an error message on the LCD screen and return to the main screen.

**System Functions:**

AppInit(): This function initializes the system by initializing the LCD display, ADC (analog-to-digital converter), and the buzzer. It also displays the welcome message, the default temperature, and the current temperature on the LCD.

AppStart(): This function is called repeatedly in a loop. It reads the temperature from the LM35, updates the LCD display with the current temperature, target temperature, and system status (whether the buzzer is on or off), and checks for keypad inputs to set or reset the target temperature.

setMode(): This function is called when the user wants to set the target temperature. It displays the minimum, maximum, and current target temperature on the LCD and waits for the user to input a new target temperature using the keypad. If the user inputs a new target temperature, the function returns and the new target temperature is set.

resetMode(): This function resets the target temperature to the default temperature and displays a message on the LCD indicating that the temperature has been reset.

buzzer\_digitalwrite(): This function is used to turn on or off the buzzer (LED in the original description) based on the current temperature and target temperature. If the current temperature is above the target temperature, the buzzer is turned on. Otherwise, the buzzer is turned off.

**Global Variables:**

* current\_temp: This variable holds the current temperature read from the LM35.
* target\_temp: This variable holds the target temperature set by the user.
* buffer: This variable is used to temporarily store the new target temperature input by the user through the keypad.
* is\_working: This variable is used to indicate whether the buzzer (LED in the original description) should be turned on or off based on the current temperature and target temperature.

