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Part A: Project statement

In this project, a temperature alarm will be designed. The purpose of the temperature alarm is to notify people that the temperature of the environment is now lower or higher than the set temperature range. The area of application of the project is safety. The user can input a range of temperature that is suitable for the environment, if the temperature is higher or lower than the range, the buzzer will output sound to notify people around it. For example, the temperature alarm can be placed in a bedroom, the user can set a range of room temperature between 10 ℃ and 27 ℃, if the room temperature is not in that range, the buzzer outputs sound to notify the user. It can be also placed in a green house, if a certain plant can live in a range between 20 ℃ and 35 ℃, the user can set that range in the temperature alarm, and if the temperature is not in that range, the buzzer alerts to notify people around.

Part B: Initial constraints and Specification

Constraints:

- The temperature range can only be between 0 ℃ and 50 ℃ because the DHT11 can only measure temperatures in that range.
- The buzzer sound can only be heard within 10 meters.
- It can only be used to measure the air temperature.
- Temperature measurement error is ±2 ℃.
- It takes time to measure the temperature.

Specification:

- User can use matrix keypad to input the temperature range.
- Current temperature will be displayed on the LCD screen.
- The default temperature range is 10 ℃ to 35 ℃.
- If the temperature is not in the set range for at least 10 seconds, the buzzer outputs sounds. This is because the sensor takes some time to measure the correct temperature.
- If the buzzer alarms, user can press D on the matrix keypad to stop the buzzer.

Part C: Ask

Purpose:

- Design a temperature alarm that user can input a temperature range. If the measured temperature is not in the range, the buzzer alerts.

Inputs:

- 4x4 Matrix Keypad
- DHT11 temperature-humidity sensor

Outputs:

- Buzzer

- LCD screen

Constraints:

- Temperature range is 0 – 50 ℃
- Temperature measurement error is ±2 ℃.
- The sensor takes some time to measure the temperature.

Part D: Preliminary Bill of Materials

- DHT11 temperature humidity sensor
- 4x4 membrane matrix keypad
- 1602 LCD screen
- Buzzer
- Nucleo L4R5ZI
- 100 Ohm resistors.
- Jumper wires.
- Breadboard.