CSE 321 Project 3

Humidity Alarm

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Project Statement

What the device?

The device is a humidity alarm that can display the current humidity level and warn users when humidity levels become harmful.

Purpose?

The purpose of this device is to detect the humidity levels in a home, and warn users when they become too low or high. Additionally, this alarm system will also be able to display the current humidity levels on an LCD display, as well as include an option to mute the device. The motivation for creating this device is to prevent the harmful effects of low/high humidity before they can occur.

Area of application?

The area of application for this device is safety.

How does it help in that area? Or what purpose does it serve there?

This device helps in safety because it allows for the detection of potentially harmful humidity levels in a home. When humidity levels are allowed to reach dangerous levels, a myriad of problems can arise. High humidity levels in a home can led to the growth of mold and rot. Meanwhile low humidity levels can allow viruses to spread more rapidly, cause dryness of the skin and eyes, damage homes and more. It Is integral to one's home and health then, to carefully monitor the humidity levels in their home. This project will address this need with a device capable of informing the user of their home's humidity level, as well as warning them if levels become unsafe.

Initial Constraints and Specifications

Constraints

1. This device is designed to detect unsafe humidity levels for a home and may not be applicable to different environments such as the outdoors.
2. The storage environment for the DHT11 sensor is recommended to be:
    a. Temperature: 10-40 Celsius

    b. 60% Relative humidity.
3. Due to storage constraints, long-term use of this device in environments with high humidity/temperature may make this device unreliable.
4. Exposure to chemical substances can affect the humidity sensor, and cause drift of the signal. This may limit the devices application in areas where chemicals are used frequently.

Specifications

1. DHT11 will be used to measure the humidity levels.
2. The LCD will display the current humidity levels, and if it is harmful, fair or ideal.
3. The buzzer will output audio to signal when humidity levels get harmful.
4. Humidity levels are:
    a. Harmful at greater than 70% or lower than 25%
    b. Fair between 60 – 70%, and 25-30%.
    c. Ideal at 30-60%
5. On-board button B1 can be used to mute the buzzer.

Asks

Purpose

The purpose of this project is to design and create a humidity alarm. The alarm will require the combination of hardware and software to implement, with the introduction of two new external peripherals. The input peripheral is the DHT11 sensor, which will be used to detect the humidity levels. The output peripheral is the buzzer, which will be used to send audio signals. The buzzer will continue to output sound until it is muted by user input with the B1 user button. In addition, an LCD will be used to display the current humidity level and its safety level.

Inputs

1. Humidity level
2. Internal button will be used to mute buzzer.

Outputs

1. LCD displays “Humidity Level: __%” on row 1 and “Condition: __ (Fair/Harmful/Ideal)”
2. Buzzer outputs sound when levels are harmful.

Constraints

1. Watchdog timer must be configured appropriately.
2. Must use a synchronization technique.
3. Minimum of 1 interrupt must be configured.
4. Must have critical section protection for the entire implementation

5. Minimum of 1 direct bitwise driver configuration.
6. Incorporate a task/thread.

Bill of Materials

DHT11 Sensor:

Description: An external peripheral which can detect humidity levels and temperature.
Price: $10.29
Reference: https://components101.com/sites/default/files/component_datasheet/DHT11-Temperature-Sensor.pdf
Purchase Link: https://www.amazon.com/HiLetgo-Temperature-Humidity-Digital-3-3V-5V/dp/B01DKC2GQ0

16x2 LCD Display
Description: An external peripheral that displays text on a 16x2 display.
Price: $8.99
Purchase Link: *https://www.amazon.com/SunFounder-Serial-Module-Display-Arduino/dp/B019K5X53O/ref=sxin_13_pa_sp_search_thematic_sspa?cv_ct_cx=LCD+1602&dchild=1&keywords=LCD+1602&pd_rd_i=B019K5X53O&pd_rd_r=533f4e19-cd79-4704-9ea7-4a9b76ea3af5&pd_rd_w=zEW74&pd_rd_wg=txPku&pf_rd_p=3b2adfc6-e3ad-467a-9f38-271e811048b0&pf_rd_r=A14V16SMA0DCWZABFJ5P&qid=1629389281&sr=1-1-a73d1c8c-2fd2-4f19-aa41-2df022bcb241-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEyNzM5N1RLMU1XWDBOJmVuY3J5cHRlZElkPUEwNzU0MTk3M0ZKRDJVQTJGOTY4SiZlbmNyeXB0ZWRBZElkPUEwNjg1NDY1M0hTTDVSTVhZQlNUQyZ3aWRnZXROYW1lPXNwX3NlYXJjaF90aGVtYXRpYyZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=&pldnSite=1*

Buzzer
Description: An external peripheral which outputs audio signals.
Price: $7.80
Reference: *http://tinkbox.ph/sites/tinkbox.ph/file/downloads/5V_BUZZER_MODULE.pdf*
Purchase Link: *https://www.amazon.com/HiLetgo-Temperature-Humidity-Digital-3-3V-5V/do/B01DKC2GQ0*
Nucleo-L4R5ZI
Description: The microcontroller which will control the logic of the system.
Price: $28.14
Purchase Link: *https://www.mouser.com/ProductDetail/511-NUCLEO-L4R5ZI*
Wires
Description: Wires allow for the flow of electricity between components.
Price: $3.90
Purchase Link: https://www.mouser.com/ProductDetail/713-110990044

Breadboard

Description: A device upon which electric components are held, and connected.
Reference: $15.40
Purchase Link: https://www.mouser.com/ProductDetail/854-BB1460

Resistors
Description: Resistors regulate voltage between components.
Price: $0.95
Purchase Link: https://www.mouser.com/ProductDetail/474-PRT-14492

USB a to Micro USB B cable
Description: Cable which will connect the Nucleo-L4R5ZI to a computer.
Price: $7.99
Purchase Link: https://www.bestbuy.com/site/best-buy-essentials-3-micro-usb-to- usb-charge-and-sync-cable-black/6456436.p?skuId=6456436