Dryer Alarm System

Overview

This Dryer Alarm System is designed to monitor a clothes dryer using a BeagleBone Black (BBB). It detects whether the dryer is running based on vibration readings and monitors ambient light levels. The system uses this data to control LEDs, activate a buzzer under specific conditions, and send an email notification if the dryer remains in a "done" state for more than 30 seconds.

Hardware Requirements

- **BeagleBone Black (BBB)**
- **Vibration Sensor** (e.g., Piezo electric sensor)
- **Light Sensor** (e.g., Photocell)
- **Buzzer**
- **Red LED**
- **Green LED**
- **Resistors** (for LEDs and sensors as needed)
- **Connecting wires**
- **Breadboard**

Hardware Setup

Sensor and Output Connections

1. **Vibration Sensor:**
    - **Positive** pin to **P9_39** (AIN0) for analog input.
    - **Negative** pin to **ground** on the BBB.
2. **Light Sensor:**
    - **Positive** pin to **P9_40** (AIN1) for analog input.
    - **Negative** pin to **ground** on the BBB.
3. **Red LED:**
    - **Anode** (longer leg) to **GPIO 66**.
    - **Cathode** (shorter leg) through a **330Ω resistor** to **ground**.
4. **Green LED:**
    - **Anode** to **GPIO 67**.
    - **Cathode** through a **330Ω resistor** to **ground**.

5. **Buzzer:**
    - One pin to **GPIO 68**.
    - Other pin to **ground**.

General Connections

- Connect all ground connections to one of the GND pins on the BBB.
- Ensure that each component is securely connected on the breadboard and that the BBB pins are correctly mapped.

Software Setup

1. **Environment Setup:**
    - Ensure that the BBB is running a compatible version of Debian or another Linux distribution.
    - Update the system: **sudo apt-get update && sudo apt-get upgrade**
    - Install required packages: **sudo apt-get install postfix mailutils**
2. **Email Configuration:**
    - Configure **postfix** to send emails as previously detailed in the email setup instructions.
      sudo nano /etc/postfix/main.cf
    - Add or modify the following lines at the end of the file:
      relayhost = [smtp.gmail.com]:587
      smtp_use_tls = yes
      smtp_sasl_auth_enable = yes
      smtp_sasl_security_options = noanonymous
      smtp_sasl_password_maps = hash:/etc/postfix/sasl_passwd
      smtp_tls_CAfile = /etc/ssl/certs/ca-certificates.crt
    - Create the password file:Create /etc/postfix/sasl_passwd to store your SMTP credentials:
      sudo nano /etc/postfix/sasl_passwd
    - Add the following line:
      [smtp.gmail.com]:587 your-email@gmail.com:your-password
    - Restart Postfix Restart the Postfix service to apply the changes:
      sudo systemctl restart postfix
3. **Compiling the Program:**
    - Navigate to the directory containing the source code.
    - Compile the code using: **gcc -o dryer_alarm dryer_alarm.c -lpthread**
    - Run the program: **sudo ./dryer_alarm**

Operation

- The system continuously reads the vibration and light sensor values.
- The **Red LED** lights up when the dryer is running (based on vibration threshold).
- The **Green LED** lights up when the dryer is considered done.
- The **buzzer** activates if the light value is below a set threshold when the dryer is done.
- If the dryer remains in the "done" state for more than 30 seconds, an email notification is sent.

Troubleshooting

- Check connections on the breadboard if LEDs or the buzzer are not responding.
- Ensure the email system is correctly configured if notifications are not being received.
- Review system logs (**/var/log/syslog** and **/var/log/mail.log**) for potential errors related to GPIO or email sending.
- If error writing GPIO pins continue, manually configure the pins to resolve the issue:

```
echo "66" > /sys/class/gpio/unexport
echo "67" > /sys/class/gpio/unexport
echo "68" > /sys/class/gpio/unexport
echo "66" > /sys/class/gpio/export
echo "67" > /sys/class/gpio/export
echo "68" > /sys/class/gpio/export
echo "out" > /sys/class/gpio/gpio66/direction
echo "out" > /sys/class/gpio/gpio67/direction
echo "out" > /sys/class/gpio/gpio68/direction
```