CAPSTONE PROJECT 2024

USER MANUAL

DEVELOPMENT OF ZERO WASTE KITCHEN MODEL

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1. Overview of System Components

Hardware:

- **ESP32 Microcontroller:** Manages the logic and communicates with the central database.
- **R307 Fingerprint Scanner:** Captures and verifies fingerprints.
- **Red and Green LEDs:** Provide visual feedback for entry status.
- **Buzzer:** Sounds alerts based on access status.
- **USB cables:** Used for hardware connections.

Software:

- **Web Application:** Allows students to update meal preferences.
- **Firebase:** Real-time database for storing meal preferences and Students data. Also acts as middleman between website and ESP32 for communication.
- **Arduino IDE:** Used to program the ESP32.

2. Hardware Setup Instructions

1. **Assemble the Components:**
   - Connect the **R307 fingerprint scanner** to the **ESP32** using UART communication (6 PIN Connector).
2. **Power the System:**
   - Plug the ESP32 into a computer or any power source using a **USB cable**.
3. **Wi-Fi:**
   - Make Sure Biometric is in range of Appropriate Wi-Fi connection. (EACCESS by default, to connect to another network change the credentials in "ESP32" code).

3. Software Setup Instructions

1. Extract Folder from provided Zip file.
2. Open this Folder into any development environment (recommended VS Code).
3. Pass this folder path in terminal using command "cd Plate-it".
4. Run command "npm start" to launch this website on localhost. This opens Login Page.
5. This Login Page is designed to handle both Admin login and Student login.

   Admin Login:

   i. Use this credential for Admin Login. "Email: ksingh10@thapar.edu, Password: IamAdmin"

   ii. This Page Shows name of Hostel admin is of and number of students active for current meal.

   iii. This Page is also designed for registering new student. Admin can enter all details of student in required fields then click on get fingerprint button.

   iv. Once get fingerprint button is clicked, Student need to put his finger on Fingerprint sensor. On successful template generation unique fingerprint id will be shown on website in form of alert.

   v. Now admin can click on Sign Up button to register student.

Student Login:

i. Use Email provided during registration of student and Password “Hellouser” for student login.
ii. Student can choose to skip meals by toggling off provided buttons, they can again toggle on button to attend the meal.
iii. Toggling of any button can be done till 2 hours prior of meal time only. (Breakfast 5am, Lunch 10am, Dinner 5 pm). After this toggle button will be disabled.
iv. Students can choose to skip meals of multiple days by selecting two dates on calendar and click on confirm button.
v. Student can also change password, write to admin or sign out using appropriate button in hamburger button.

4. Using the Biometric Entry System

1. **Register Fingerprints:**
   - Each student scans their fingerprint at the **R307 scanner** for initial registration.
2. **Set Meal Preferences:**
   - Students log into the **web application** and opt in or out of meals 2 hours before the scheduled meal time.
3. **Mess Entry Process:**
   - Upon arrival at the mess, students scan their fingerprint.
     - **Green LED** + **short beep:** Access granted (student has opted in).
     - **Red LED** + **continuous beep:** Access denied (student opted out or unregistered).
4. **Reward System:**
   - Students earn **Super Coins** for each meal they skip, redeemable at Sodexo outlets on campus.

5. Troubleshooting

1. **Fingerprint Not Recognized:**
   - Ensure that the fingerprint scanner is clean.
   - Re-register the student's fingerprint if recognition issues persist.
2. **LEDs Not Working:**
   - Check GPIO connections on the ESP32.
   - Verify the code in the Arduino IDE for any logical errors.
3. **Web Application Not Updating:**
   - Ensure Firebase is correctly integrated and the network connection is stable.
   - Check for any missing API keys in the code configuration.

6. Maintenance and Future Use

1. **Regular Maintenance:**
   - Clean the fingerprint scanner regularly to maintain accuracy.
   - Inspect connections to avoid loose wiring.
2. **Future Upgrades:**
   - Consider integrating **facial recognition** for a multi-modal biometric system.
   - Use predictive analytics to further reduce food waste based on historical data