

PROJECT NAME

SMART GLUCOSE DOOR LOCK

ABSTRACT

A real time implementable project with scalable CGM device fitted with A mobile smart handle and a synchronized user-friendly application set up using IoT.

CATEGORY

Open stream(health ware)

PROBLEM STATEMENT

- Diabetes is the major health concern worldwide** which is due to high blood sugar levels mainly due to increase in obesity and physical inactivity. 20 years down the lane this will be widespread.
- Diabetes (T1D) in young children (age 4-17 years) is rising.**
- It places **high burden on the caretakers** to monitor and **control the child's diet.**
- In the absence of caretakers **children tend to eat sugar items** which will lead to complications.
- To avoid the same, we have come up with a solution - **The Smart Glucose Door Handle**

PROJECT DESCRIPTION

- Our solution is a **smart door handle**.
- It is a **mobile door handle** which can be attached to any storage space where restricted food items are preserved.
- **Locking and unlocking of the door** can be controlled by the caretaker with the help of a **user friendly app**.
- **WORKING:**
- Case 1 :
 - Any non-diabetic person can access the door by ***unlocking it through Facial recognition/passcode.***
- Case 2:
 - If at all the diabetic person wants access to the storage space , ***they need to use the scanner on the handle to test the glucose level*** in their body and the receiver will send a **notification to the app** in their device.
 - ***This message provides the caretaker with information regarding glucose level obtained from the scanner and an option to unlock or deny access.***
 - ***And the scanned glucose values will be stored in Cloud and sent to an app which can be used to analyse and track the health conditions of the child and take necessary precautions.***
 - ***The data stored in Cloud is maintained with utmost confidentiality and can be accessed anytime in the future.***

NOVELTY

- **Integrating recent CGM technology with a smart door lock system.**
- **Combines diet control along with glucose level measuring feature.**
- Alarm systems are present to immediately alert caretakers if abnormal glucose levels are detected.
- Access your **glucose value history** anywhere.
- Since values are stored in cloud there are **no chances of losing the glucose history data.**
- **Plot graphs and analysis** which can be used for medical examination.
- **Parent can see the child's glucose value** from anywhere automatically using the app.
- **Mobile door handle** can be used anywhere.

REAL LIFE SITUATION ADDRESSED BY THE PRODUCT AND THE IMPACT OF THAT CHANGE ON THE COMMUNITY.

- Consider a family with one or more diabetic people in the household .
- **Step1: All non diabetic members of the household are required to store all the restricted food items in a secluded storage space.**
- **Step2:Now all the non diabetic members have to register their faces in the camera of the smart handle during the installation process , and a passcode has to be set to increase security and access and serve as a backup option during failure of face recognition.DO NOT REGISTER THE FACE OF DIABETIC PERSON , and ensure the passcode is kept unknown to them.**
- **Step3:The handle can be unlocked only when the camera recognizes the pre-registered faces and the food can be accessed.**
- Step4: Transmitter is fitted to the diabetic person body under their arm using an applicator.
- Step5: An app named 'freestyle libre' has to be downloaded on their mobile phones or desktop which gets automatically synchronized with the smart handle.
- Step6 : A diabetic person will be provided access by scanning the CGM in their body and message is sent to the caretakers with the application who can choose to unlock or deny access.

POSSIBLE RISKS.

- Technical faults that might lead to failure in face recognition by camera fitted on smart handle
- Diabetic patients with passcode can access the restricted food items, if not kept protected

CHALLENGES INVOLVED IN IMPLEMENTING THE SOLUTION.

CHALLENGE:

- The sensors are expensive and the initial installation cost is high
- The awareness about the usage and benefits of CGM is very sparse

SOLUTION TO OVERCOME THE CHALLENGE:

- The Freestyle Libre is available for **age 4 and older**
- It is **safe and more comfortable than pricking child finger 7 times a day**
- Mainly used during the **initial stage of diabetes** to get an idea about the child's **glucose trend**
- And also useful for **patients with comorbidities** to regularly have an eye on their glucose reading rather than pricking
- **Recommended by doctors**
- **It is accurate**

TECHSTACK USED.

- **Face recognition & keypad access code - ESP32 cam module** for face recognition .
- **keypad** to type in the code
- **CGM** (continuous glucose monitor)-**freestyle Libre**
- **Scanner/receiver** (freestyle Libre) attached to a handset for ease of use .
- **Servo motor**-for locking and unlocking
- **Arduino uno/nano(depending on size requirements) wifi rev 2**- regular arduino microcontroller board with inbuilt wifi and bluetooth.
- **The ESP32 cam** is mounted on to the arduino board and can be controlled using arduino IDE.
- **Freestyle libre link app** .

PROTOTYPE IMAGES.

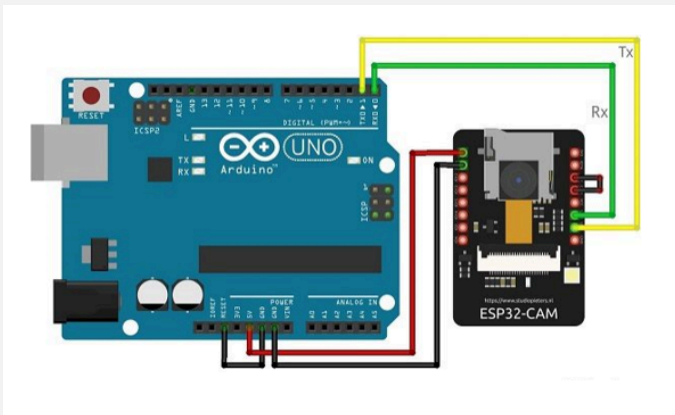
LINK FOR ONLINE SIMULATION OF LOCKING AND UNLOCKING USING SERVO MOTOR AND KEYPAD:

<https://www.tinkercad.com/things/2h6AuEVg28o-locking-and-unlocking-of-the-lock-using-servo-motor/editel>

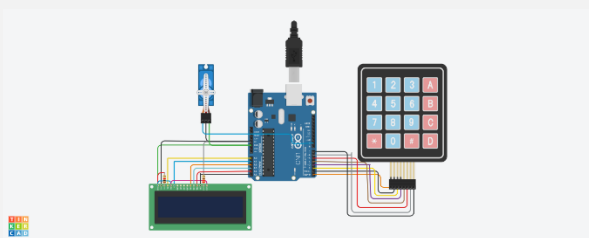
LOCKING AND UNLOCKING VIDEO LINK:

https://drive.google.com/file/d/1vI0G9Z2Vubpj8a8P_9B2e_emIAYOEdYs/view?usp=sharing

ESP32 WITH ARDUINO:



KEYPAD AND SERVO MOTOR WITH ARDUINO CONNECTIONS



CGM – TRANSMITTER:

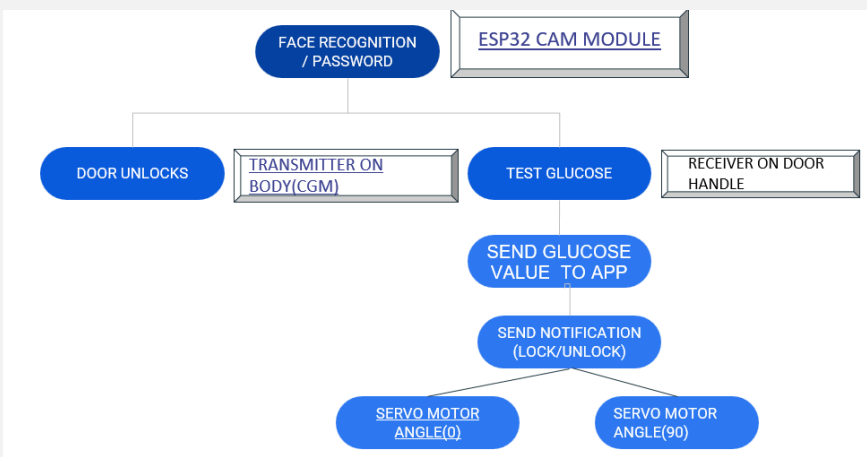


CGM sensor on user body

CGM RECEIVER AND APP:



FLOWCHART FOR WORKFLOW:



DOOR HANDLE DESIGN:

