

Netra AI

1. Project Overview

Netra AI is a Raspberry Pi-based smart assistance system that integrates **face recognition**, **image/video description**, and an **emergency SOS alert system**. It is designed to assist **visually impaired individuals** and provide real-time insights through AI-powered image processing and immediate emergency communication.

Key Functionalities:

1. Face Registration & Training

- Users can capture and label new face samples for personalized face recognition.

2. Real-Time Face Recognition

- Identifies known individuals when triggered via a tactile button.

3. AI-Powered Image & Video Description

- Uses **Gemini API** to describe captured images and short video clips.

4. SOS Emergency Alert System (New Feature)

- When a long button press is detected, the system **automatically sends an emergency SMS** via Twilio, alerting a predefined contact.

2. Hardware & Environment

- **Raspberry Pi** (e.g., Pi 4)
- **USB Camera** for image/video capture
- **Tactile Buttons** for user interaction
- **Bluetooth/Wired Headphones** for audio feedback
- **Internet Connectivity** for API communication
- **Python Virtual Environment** for dependency management

GPIO Pin Assignments:

- **Pin 17** → Face Registration & Training
- **Pin 18** → Toggle Face Recognition
- **Pin 22** → AI Image Description (Gemini)
- **Pin 23** → AI Video Description (Gemini)
- **Pin 24 (New)** → **SOS Emergency Alert System** (Long Press Detection)

3. Software & Libraries Used

- **OpenCV** → Face detection & recognition
 - **Google TTS** → Text-to-speech conversion
 - **RPi.GPIO** → Tactile button control
 - **Twilio API** → Sends emergency SMS when SOS is triggered
 - **Flask & REST API Integration** → AI-based Image & Video description with **Gemini API**
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4. Implementation Details

4.1 Face Recognition

- **Face Capture & Training:** A dedicated button initiates face sample collection and model training.
- **Real-Time Recognition:** Users can toggle facial recognition **on/off** using a tactile button.

4.2 AI Image & Video Description

- **Image Description:** Captures an image, sends it to **Gemini API**, and returns a textual description.
- **Video Description:** Records a **5-second clip**, analyzes it using Gemini, and provides a summary.

4.3 SOS Emergency Alert System (New Addition)

- A long press on the **SOS button (GPIO 24)** triggers an **HTTP POST request** to the emergency backend:

http

CopyEdit

POST https://emergency-alert-system.onrender.com/data

- The backend, built with **Node.js & Twilio**, sends an **emergency SMS alert** to the configured contact.
- The message content:
"URGENT: I need help immediately. I am in a dangerous situation and unable to secure my own safety. Please send emergency assistance to my location as soon as possible."
- **Enhancement:** This can be extended to **send GPS location** in the future.

5. Status & Future Enhancements

 **Current Status:**

- Face Recognition, AI Image & Video description, and SOS System are **fully functional**.
- Uses **TTS for verbal feedback** and **buttons for hands-free control**.

 **Future Enhancements:**

- **GPS Integration** for SOS alerts
- **Offline AI Processing** for better performance
- **Voice Command Integration** for hands-free activation

6. Conclusion

Netra AI now includes a **real-time emergency SOS feature**, making it even more useful for individuals needing **immediate assistance**. It remains a **powerful tool for visual assistance, real-time AI image analysis, and security monitoring**.