Face Recognition and Navigation Aid for the Visually Impaired

Cookbook 2024-2025

Submitted by

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1. Introduction

The visually impaired community faces significant challenges in navigation, object recognition, and social interactions, despite the availability of various assistive technologies. Existing solutions often fall short in providing a comprehensive, integrated approach to address these needs effectively. This project proposes an advanced assistive system designed to enhance independence and safety for visually impaired individuals. By integrating real-time navigation, object detection, person recognition, and distance measurement, the system leverages technologies in deep learning and computer vision. Real-time navigation will be supported through live LLM based feedback integration, while object detection algorithms will identify and describe surrounding objects. Facial recognition technology will facilitate the identification of known individuals, improving social interactions and safety. Additionally, depth-sensing techniques will measure distances to nearby objects, aiding in obstacle avoidance. This approach aims to offer a seamless, reliable solution that significantly improves the quality of life for visually impaired individuals, enabling them to navigate their environment with greater confidence and autonomy.

2. Requirements

Server-Side:
- **OS:** Windows or Linux Ubuntu 20.04 LTS or above
- **Python :** Version 3.11.5 for 64-bit
- **Network:** Static IP address within the college network
- **GPU:** NVIDIA GeForce RTX 2080 or above
  (if using laptop GPU, install cuda-cudnn)
- **Processor:** Intel i7 at least
- **Applications:** SoundWire (for audio transfer to mobile)
- **Libraries:**
  - **flask**
  - **opencv-python**
  - **numpy**
  - **scikit-learn**
  - **deepface**
  - **pyttsx3**
  - **ultralytics**
  - **together**
  - **easyocr**
  - **python-dotenv**

Client-Side:
- **Device:** 2 Android mobile
- **Network:** All devices (including laptop) connected via common WiFi network or mobile hotspot
- **Apps:** DroidCam, SoundWire (installed in only 1 mobile)

NOTE:
Please change the necessary paths in the undermentioned files for hassle-free installation.

3. Path Modification

Face Recognition and Navigation Aid for the Visually Impaired (2024-25)

- Face Recognition and Navigation Aid for the Visually Impaired
  - Server.py
  - accesscamera.py
  - cam12.py
  - face-recognition-final.py
  - model.pt
  - .env
    - TOGETHER_API_KEY=
    - CAMERA_1_URL=http://192.168.xx.xx:4747/video
    - CAMERA_2_URL=http://192.168.xx.xx:4747/video
  - Saved_Faces
    - Tejashree Bhangale
      - 10-12 close up face images
    - Austin Paul
      - 10-12 close up face images

4. Files

The Face Recognition and Navigation Aid for the Visually Impaired (2024-25) project can be downloaded from

https://github.com/Suhaani07/Face-Recognition-and-Navigation-Aid-for-the-Visually-Impaired .

- **Connect Laptop sound to 1st Mobile via SoundWire**

- **Open Droid Camera on Both Mobiles**
- **Update the camera URLs in the .env file**
- **Run Server.py**

5. Functionality

The Face Recognition and Navigation Aid for the Visually Impaired

This system proposes an assistive system designed to enhance independence and safety for visually impaired individuals. Real-time navigation is supported through live LLM based feedback integration, while object detection algorithms identify and describe surrounding objects. Facial recognition technology facilitates the identification of known individuals, enhancing social interactions and safety. Additionally, depth-sensing techniques measure distances to nearby objects, aiding in obstacle avoidance. This offers a seamless, reliable solution that significantly improves the quality of life for visually impaired individuals, enabling them to navigate their environment with greater confidence and autonomy.

6. Getting Started

I.   Python

Python can be downloaded and installed using the installer from here.
The installation steps are straightforward and it can be installed by following the steps.

II.   CUDA-cuDNN (if using laptop GPU)

These can be downloaded and installed using the installer from here.
The installation steps are straightforward and it can be installed by following the steps.

III.   Python Libraries

Requirements.txt

```
pip install -r requirements.txt
```

All the required libraries can be installed via requirements.txt

7. Steps to Run the Application

The Face Recognition and Navigation Aid for the Visually Impaired

1. Open a command prompt at The Face Recognition and Navigation Aid for the Visually Impaired directory.

2. Create a virtual environment.

    ```
    python -m venv har_venv
    ```

3. Activate the virtual environment
    ```
    .\har_venv\Scripts\activate
    ```

4. Download the project dependencies using *pip install*

    Following packages needs to be installed :

    - flask
    - opencv-python
    - numpy
    - scikit-learn
    - deepface
    - pyttsx3
    - ultralytics
    - together
    - easyocr
    - python-dotenv

5. Connect the Laptop Audio to 1st Mobile via SoundWire
    (all systems should be connected to same Wi-Fi or hotspot)

6. Open Droid Camera in both Mobile phones

7. Update Camera URLs in .env

8. Add Together Ai API KEY in .env

9. To run the project, in the command prompt, run :

    ```
    python Server.py
    ```

10. On successful execution, both the cameras will start on the phone and depending on the frames, it'll give the audio instructions, which can be heard via the phone connected to laptop audio.

Future Work

I. Add functionalities to track destination via blueprint of the floor.
II. Increase the accuracy of the model or use a high power GPU to run the system on 60-80 fps (currently runs on 4fps).

References

1. **https://www.microsoft.com/en-us/ai/seeing-ai**
2. **https://www.orcam.com/en/myeye/**
3. **https://www.navilens.com/**

Contact Information

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