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Assistive Vision For Visually impaired person

Abstract: Social interaction is the key component for the survival of human beings. In this era of technical advancement visually impaired people are still lacking behind in conveying their emotion to the general population due to the lack of resources. So, in this paper we proposed an assistive vision smart glass system which will help the blind to easily recognize the faces of the one's standing opposite to them. Through this device they can also communicate with the mute people, as they talk in sign language and the blind can't see therefore we have taken the data of sign languages and trained a model which helps them in communicating by observing the patterns through the camera. There is also a feature of object detection as well as the obstruction detection.

Keywords: Face recognition, sign detection, python, OpenCV, numpy, matplotlib, tensorflow, machine learning, sublime, raspberry pi, etc..

Introduction: Visually challenged people face various problems in their day to day life as the modern assistive equipment are often not meeting the consumer's requirement either in terms of prices or the level of assistance provided. This project presents a new design of assistive vision through smart glasses for visually impaired person. The components used in making this project will be of low cost making this device accessible for wider range of people.

Through assistive vision they will be able to identify other person's face standing opposite to them without him introducing himself first. They will also be able to judge the expression of the persons face or identify some objects stored in the database through this assistive device which uses some facial recognition algorithm. It will help them in socializing more with the community around them and living their life with ease.

Limitation of the existing system:

Some of the below mentioned points are the limitation of the existing systems in this domain.

- **ACCESSIBLITY**: The existing facial recognition devices or smart glasses for visually challenged person are not accessible to all, due to their high prices.

- **ILLUMINATION**: It stands for the variation in the intensity of the light. The slight change in the lighting condition can cause a significant challenge for the facial recognition algorithm and can cause a significant impact on its result.
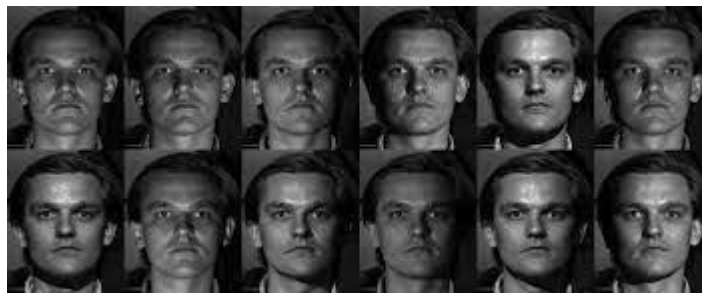
- **POSE**: Facial recognition algorithms are highly responsive to variation in the posture. The pose of the face varies when there is a movement of head or a change in the viewing angle of the face.

- **OCCLUSION**: It means blockage, and it occurs when the whole face or some part of it is not clearly visible in the camera module.

- **EXPRESSIONS**: Different expressions on the same person's face is a significant factor which should be considered in mind which often leads to wrong results in the person identification.


- **LOW RESOLUTION**: The minimum resolution for any standard image should be 16*16. The picture with the resolution less than that is called the low resolution image. So the resolution of the camera must be appropriate for them to be easily recognized by the software.

- **MODEL COMPLEXITY**: Existing state of the art facial recognition methods rely on too-deep Convolutional Neural Network (CNN) architecture which is very complex and unsuitable for real time performance on embedded devices.

Proposed system:

The proposed system includes a camera connected to raspberry pi module which contains a facial recognition algorithm for recognizing different faces, their expressions and various objects through the databases stored in them. The data is collected in large sets and stored in databases for more accurate result.

After collecting the data points from the camera module, if the sets are matching from the datasets inside the database then accordingly text is generated with the output result, which is further carried in the form of sound to the visually challenged person through earphones, which is done via using an API of text to voice assistance like google voice etc.
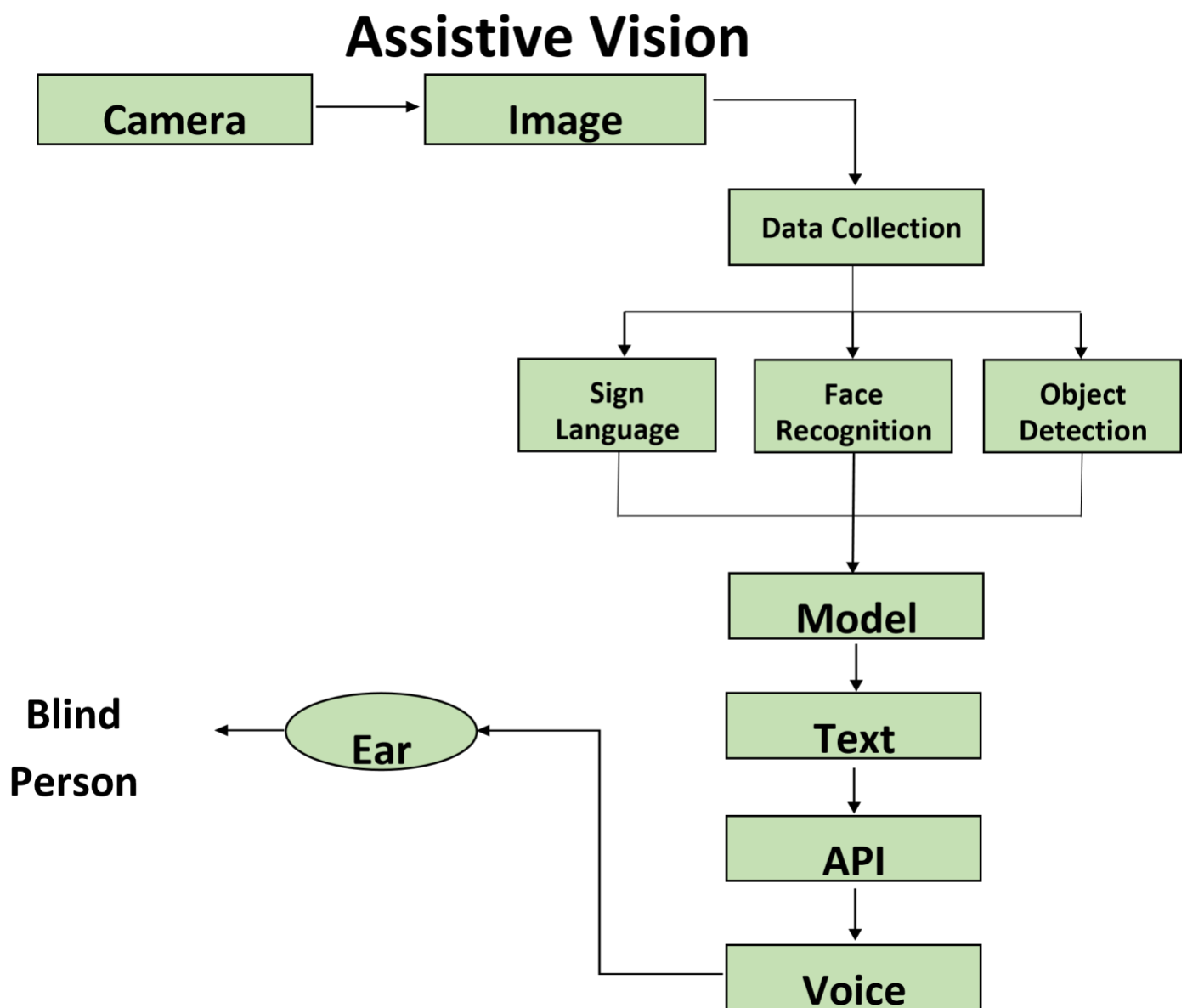
Software Requirement:

- **Python**
- **Numpy**
- **Pandas**
- **Matplotlib**
- **Open CV**
- **Machine Learning**
- **API**
- **Tensorflow**

Hardware Requirement:

- **Glass Frame**
- **Raspberry pi**
- **Camera**
- **USB cable**
- **Wires**
- **Battery 5V/powerbank5V**
- **Headphones**

Disadvantages of previous invention: The previous system which is already present in the society is not available to the large section of people due to their affordability issues and those system only detect the faces of the person and not offer much features, resulting in the wastage of the resources.

Advantages of proposed invention: Through this system we can detect the faces of the person standing in front of the glasses as well as also detect the sign language which will make the communication easier between the physically challenged persons.

Future Improvements:

We can improve our system in the next versions like:

- Adding a GPS system and voice enabled direction feature.
- Night Vision during low lighting conditions.
- We can also enable GPS system in the glasses of the visually impaired for their family members to easily locate them.

Reference and Bibliography:

[1] [Coding Block] Data science master course

[2] Open CV tutorial – Murtaza's Workshop(youtube)

[3] Raspberry pi tutorial (youtube)

[4] https://www.ijrte.org/wp-content/uploads/papers/v8i4/D7676118419.pdf

[5]
https://ijesc.org/upload/696bb294ad388339bb0a50e87a1925f2.Facial%20Recognition%20Smart%20Glasses%20for%20Visually%20Challenged%20Persons.pdf

[7]   www.mygreatlearning.com

[8]   www.w3schools.com

[9]   www.google.com

[10] www.wikipedia.com