



SMART GLASSES

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ABSTRACT :

This research work erupted generally in our mind pertaining to recent technology. Hence it was decided to work on making a small introduction to the idea and usage of smart glasses. When given more insight we decided to extend this idea to medical and healthcare purposes as smart glasses have proved to be really helpful to the patients and doctors in need. Our basic idea is to implement a database via a database application and display the related information on the smart glass via an OLED screen using facial recognition technology. Our extended implementation includes displaying date and time. On succeeding, we also plan to implement basic navigational facilities in our project. We referred to several research papers pertaining to smart glasses and face recognition technologies. Technologies we used were python for face recognition, android studio for making a database application and MySQL for creating a database. The hardware part includes a pair of spectacles, raspberry pi 3, OLED screen and a camera module. Currently, AR smart glasses have revolutionized in healthcare and medical facilities.

Keywords: Structured Query Language, Organic Light Emitting Diode, Augmented Reality, Universal Serial Bus, High-Definition Multimedia Interface, Liquid-crystal display, Inter-Integrated Circuit.

INTRODUCTION :

The concept of smart glasses can empower patients in the sense of interaction between them and the clinic or other patients, telemedicine, simplifying hospital or outpatient visits among many other functions[11]. There is also possible use for wearable technology in pharmacies for example for drug delivery tracking or checking medications prior to delivering them to the patient which can increase safety and also in education and in medication preparation process[12-13].

Where and by whom will smart glasses be used?

There are generally three types of initial applications for smart glasses:

- 1) specific job-related applications.
- 2) task-related and professional, contextual applications.
- 3) lifestyle applications.

Objectives:

1. To develop a system with database fields about an individual for easier access for memory loss patients.
2. To learn and interface database applications as well as machine learning [16-44] based face recognition systems.
3. To incorporate basic navigational details in the system.

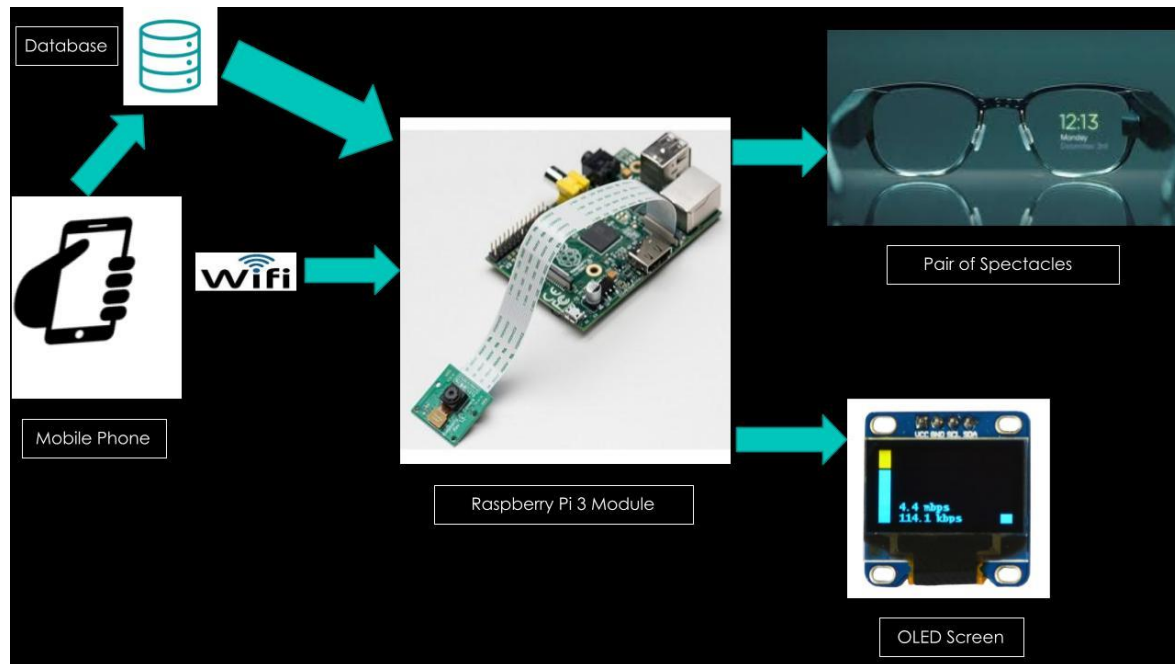


Fig. 1 : Block diagram of Smart Glasses system

The block diagram consists of a mobile phone connected to the database. The mobile phone is connected over WiFi using a Raspberry Pi 3 module along with the database. The OLED screen is also connected with the Raspberry Pi 3 module which displays all the information we get via our mobile application which is in turn displayed on the smart glass screen.

1] LITERATURE SURVEY :

Smart glasses are wearable computing devices that are web-connected and enable to transmit multiple types of data and project it in the field of vision. They offer most functions of a standard computer but in this case, head-mounted displays can react to voice commands, eye movements, gestures or simple tactile commands[1]. The smart glass designed by us simply displays basic information of a person for example name, phone number and address by face recognition. The face recognition code was developed using python whereas the entire database was created using MySQL. The database application was developed using java and it's JDBC library. Displaying of date and time was done by transmitting the data from the computer to the raspberry module and displaying it using the OLED screen on the pair of spectacles[5-9]. The problem we encountered was about the research of the project as it is an exhaustive topic. Creating an android application as well as interfacing it to the face recognition code made it difficult to implement. Coming to the healthcare part of it - Although most

smart glasses were not initially targeted at healthcare, they have been already implemented in multiple different medical applications across different specialties. In general such devices can be utilized whenever a screen or external monitor is already required. Head mounted displays can be implemented for very basic purposes such as education, simulation, live streaming of visualized data (i.e. vital signs, imaging studies, tests results, etc.), to more interactive functions such as video recording and digital photo documentation, for telemedicine, tele-mentoring and many others. Also, role of Machine learning in said research work is increasing day by day[16-44].

2] PROPOSED WORK :

1. Face Recognition-: Python is the most regularly used programming language for advent of actual time algorithms such as face recognition. OpenCV is the most famous library for laptop vision. Originally written in C/C++, it now affords bindings for Python. OpenCV uses computing device studying algorithms to search for faces within a picture. Because faces are so complicated, there isn't one simple look that will tell you if it determines a face or not. Instead, there are lots of small patterns and aspects that should be matched. The algorithms smash the challenge of identifying the face into heaps of smaller, bite-sized tasks, each of which is easy to solve.



Fig. 2 : Face Recognition

The above figure implements the use of face recognition technology using Python.

2.Database Creation using SQLite -: SQLite is a open source SQL database that shops facts to a textual content file on a device. Android comes in with constructed in SQLite database implementation. The essential package deal is android.database.sqlite that includes the training to manage your personal databases. In order to create a database you simply need to call this method openOrCreateDatabase with your database title and mode as a parameter. SQLite is a software library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine. SQLite is the most broadly deployed SQL database engine in the world. The source code for SQLite is in the public domain. Since the Internet performs a very indispensable function in this application, this software is made in away to load all statistics from the external server (MySQL) into the device's native database(SQLite) on every occasion there is a connection to the Internet. This improves users' experience because, when there is no Internet connection users can depend on the already loaded data.

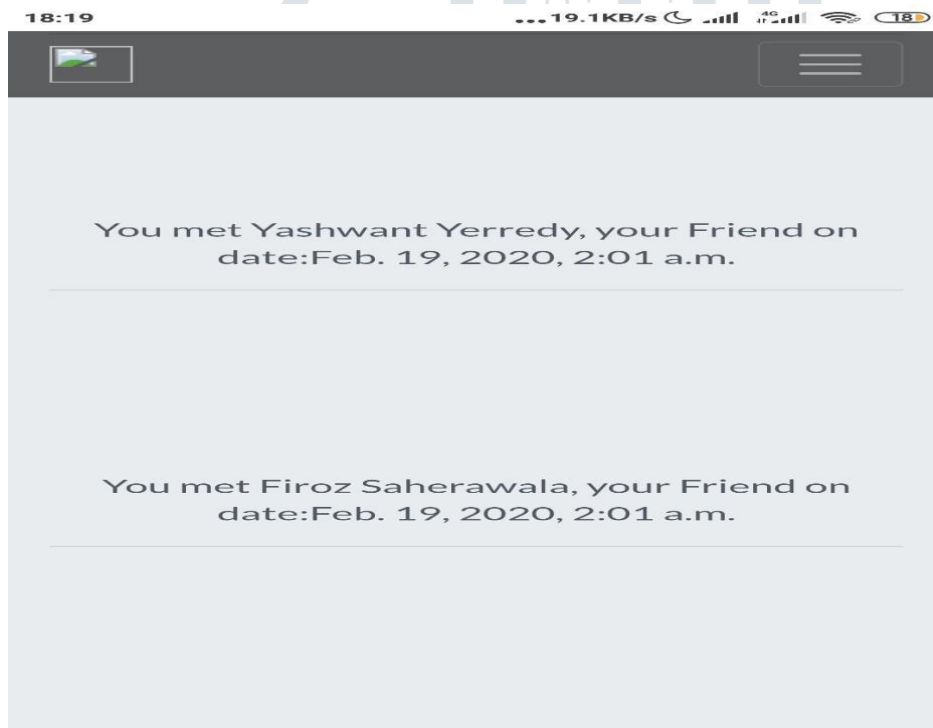


Fig. 3 : Mobile Application

The above figure shows the mobile application displaying data of the person when recognised.

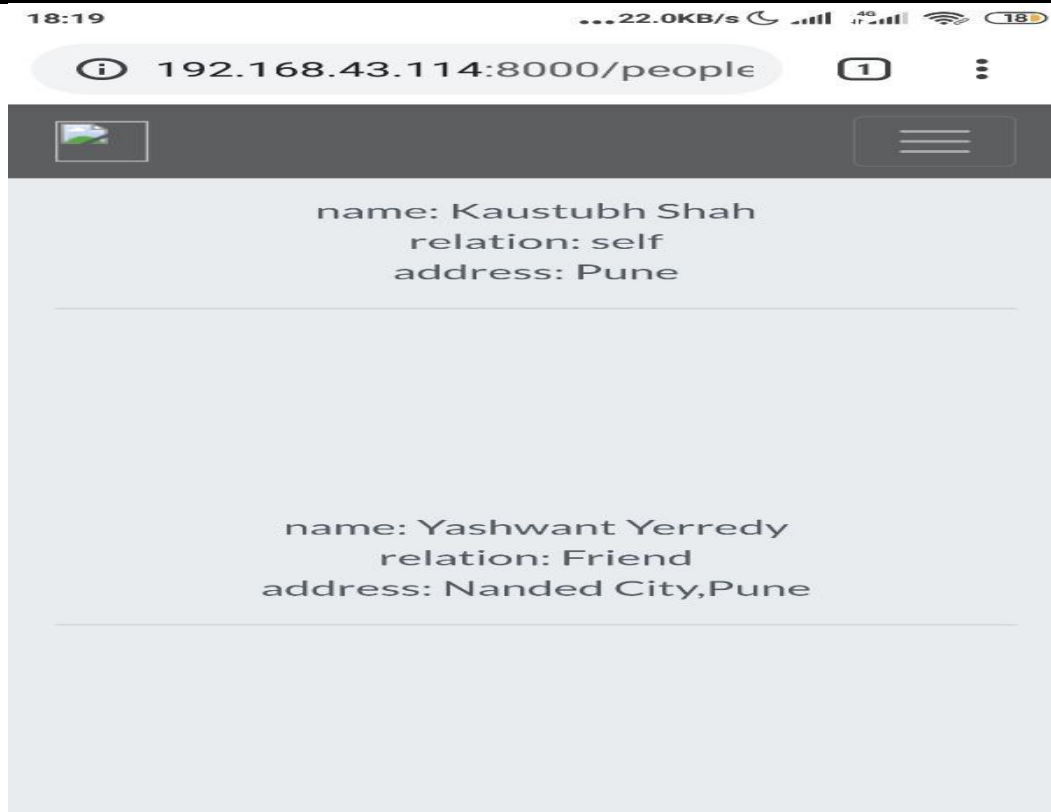


Fig. 4 : Contact Details

The above picture shows the details of the contact such as relation and address

3.Database Application -: The database utility will be created using Android Studio. Android comes in with SQLite database implementation. Since the Internet plays a very necessary role in this application, this utility is made a way to load all records from the external server (MySQL) into the device's native database(SQLite) whenever there is a connection to the Internet. This improves users' experience because, when there is no Internet connection users can count numbers on the already loaded data.

3]Results and Analysis:

1. Statistical Analysis of Face Recognition -

The face recognition was implemented using three algorithms such as Principal Component Analysis (PCA), Kernel-PCA and Bayes algorithm.

Using statistical analysis we can determine the amount of accuracy calculated when recognition of various faces takes place. Currently, our database is relatively small to test on the face recognition library as it will give us 100% accuracy but when tested on a huge database it is found that maximum accuracy is obtained using the Bayes algorithm which is about 95% whereas PCA gives us about 75% which is relatively low. The other algorithms have an intermediate value between 75-95%

2. Probability of error in Face Recognition -: The accuracy and getting an error depends on identifying the correct person and misidentifying the wrong person.
 - A). Database Concurrency -: This depends on the database recorded. For example, if a person has an incorrect name in the database he will be wrongly identified. So, our database should be flawless. Hence to avoid this it should be ensured to have discrete values and no null values.
 - B). Image Quality -: It also depends on image quality. There might exist people with similar facial features so the resolution of the image quality should be permissible to maximum level. Hence this would ensure error free recognition based on image quality.
 - C). Image Exposure -: Face detection issues can occur due to improper exposure of images to the sunlight or the surroundings. Recently these issues can be resolved by using an automatic exposure control mechanism.
 - D). Another error we found was including and using the face recognition command. It is necessary that we upgrade the version of 'pip install' being used as well as downloading other libraries such as 'cmake' and 'Boost'.

4] Conclusion :-

We learned various technologies such as face recognition using python and interfacing database applications and retrieving it for displaying it on a screen. The project has given us an in-depth knowledge of JAVA and developing applications for the same. We have also learnt about creation of databases using SQL and its connectivity with JAVA and Python. Our research work is a start to develop a full-fledged product which can be used by users with weaker memory retention. We can extend this to being used by doctors for evaluating various parameters while operating a patient. A further application can be extended to incorporating a complete navigation system along with voice over technology. We have successfully completed our research work and learned how to integrate python along with web applications using python flask server with an efficiency of recognizing 2 people together at the most with 80% accuracy with exceptions given to face recognition in extreme light and dark environments. Though it would display the information of only 1 person which it would recognize first. We also learnt how to build a web app using HTML and CSS and creating several pages using Django.

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