

EFFICIENT HUMAN IDENTIFICATION THROUGH FACE DETECTION USING RASPBERRY PI BASED ON PYTHON-OPENCV

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Abstract - Human Identification can be performed through various technique like as fingerprint, palm detection, iris detection as well as face detection. This paper focus on implementation of face detection system for human identification based on open source computer vision library (OpenCV) with python. The model of face recognition has been performed on both laptop and raspberry pi whereas for an implementation of this project on laptop, SQLite studio has been used as a database and for raspberry PI PHPmyadmin has been used. In this paper the concept of detection has been established by writing different code for dataset generator, Trainer and detector. Finally the information that will be displayed along with detected photo has been stored on database. This concept has a higher scope on security and surveillance projects and various automation operation.

Keywords - Face Detection, PHPmyadmin, PI Camera, Raspberry PI, SQLite Studio.

I. INTRODUCTION

The Concept of image processing through python OpenCV platform has been used for human identification through face detection. Human Identification means to recognize a particular people through his unique structure like fingerprint, palm, iris and face detection. This paper is based on the implementation of face detection system with the use of database. The testing of this technique has been proceed through laptop as well as raspberry PI devices.

SQLite studio is used as a database for laptop and similarly PHPmyadmin for Raspberry PI, through this a user data has been stored in a particular sequence and can be manipulated with Detection Window where a current image of user has been displayed. This mechanism is based on three steps, for the first we need to take dataset of each person about 20 samples where an algorithm of face detection face.xml file is used and is based on OpenCV. The second step of human identification is trainer, which means we need to train our system and is converted that dataset into its corresponding .YML file format. This YML file has been used on detector script and is detected the respective face of user in real time when we run this detector file. Through this detector window we can see real time picture along with corresponding user information which has been linked with database and for an unknown person the system said an unauthorized person. This concept is highly applicable on security and surveillance Projects where we can manufactured an embedded system based on face detection and is used on door look mechanism.

II. RELATED WORKS

Patel and shah introduced [1] a survey on facial feature extraction techniques for automatic face annotation. Automatic face annotation is playing vital role in multimedia information. Automatic face annotation is method to identify human faces from image and assign appropriate human name. Face detection and face recognition are essential tasks in face annotation. An author also discuss the phases of the automatic face annotation and surveyed various techniques of facial feature extraction.

Patoliya and Desai developed [2] proposed Face Detection based ATM Security System using Embedded Linux Platform. The system is implemented on the credit card size Raspberry Pi board with extended capability of open source Computer Vision (OpenCV) software which is used for Image processing operation. This technique is also based on OTP (one time password) for establishing a high security for ATM. In an unauthorized condition ATM door has been locked and it's only when the OTP password is entered my watchman.

Heshmat et al. [3] introduced Face Identification System in Video. An author proposed CIE-Luv color space, facial feature extraction and variance estimation. It can be applied in face recognition systems such as video surveillance, human computer interfaces, image database management and smart home applications. The experimental results demonstrate the effectiveness of this system and its ability to recognize a variety of different faces in spite of different pose, expression, zooming and illumination conditions.

Setyadi et al. [4] presented Human Character Recognition Application Based on Facial Feature Using Face Detection. This System can detect the

human fundamental personality for the same input image data with the training data and one way to know the human fundamental personality is based on test, and one kind of test is Grapho test (handwriting test). In this study has been conducted detection of the human fundamental personality using combination of some face features: the eyes, lips, and nose (without test). Those features are obtained from facial image.

Mathur et al. [5] developed a Human Detector and Counter Using Raspberry Pi Microcontroller, This has been developed with an application of histogram of oriented gradients (HOG) feature descriptor using the OpenCV library coded with the High-level programming language Python, booted with the help of Raspberry Pi microcontroller fitted with a RaspiCam to capture moving images of objects passing under it has been demonstrated. PIR motion sensor has been used to detect motion and a pi camera can operated when there is a condition of motion detected.

Cuimei et al. [6] proposed a Human face detection algorithm via Haar cascade classifier combined with three additional classifiers. Author has been used Haar cascade algorithm combined with three additional weak classifiers based on skin hue histogram matching, eyes detection and mouth detection.

Alabbasi and Moldoveanu [7] proposed a system for Human face detection from images, based on skin color. Face detection is necessary in many applications, like those for face recognition, face tracking in video sequences, gender classification, biometric identification, Human Computer Interaction systems, and others.

Sharma et al. [8] developed a system called Iris Movement Based Wheel Chair Control Using Raspberry Pi - A State of Art. This wheel chair is highly applicable to disable person to execute their regular task. This system has been designed using Raspberry Pi and IR Camera Module. OpenCV will be used for image processing and Python is used for programming the Raspberry Pi.

III. TECHNOLOGY USED

1. Raspberry PI 3 Model B

Raspberry PI is a small computer which has been used to develop an embedded system to perform a specific particular task. This electronic module has been operated with the use of raspbian operating system and is based on LINUX platform. This module has SD card slot, Inbuilt WIFI and Bluetooth Connectivity, 40 GPIO pins for Input output operations, PI Camera Port, PI Display port, Audio Port, HDMI cable Port, 4 USB port for connecting pen drive, Mouse, Keyboard, USB Camera etc. It also has Ethernet port for data sharing as well as network sharing between computer and raspberry PI.

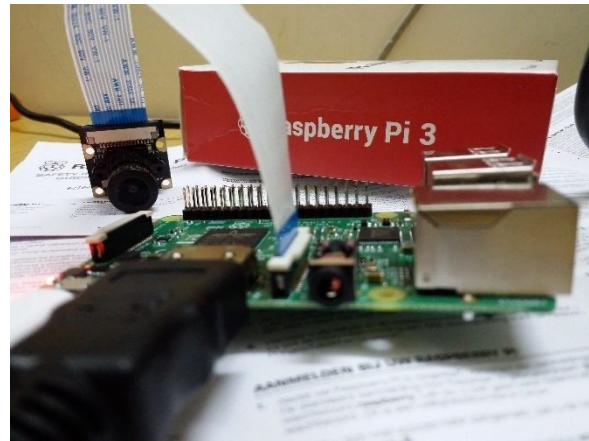


Figure 1. Interfacing Raspberry PI with PI Camera

2. PI Camera

PI Camera is specially designed to interface with raspberry PI and is a standard camera for a raspberry PI. Generally PI Camera has been found of about 5 Mega Pixels. Through this camera we will take a sample picture of user and is stored on the dataset generator folder. After running Detector.PY script then PI Camera opens to take the real time images and it will be displayed on picture window along with the relevant information that will be accessed through Database.

3. OpenCV

OpenCV (Open Source Computer Vision) is a library that can be imported in almost all computer languages like python, C, Java etc. It contains optimized image processing tools. Using OpenCV in python boosts its abilities by incorporating numpy (Numerical Python). In image processing, images are dealt as large 3D arrays and numpy serves as a robust tool for numerical array computations [5]. The commands used for installing OpenCV, Matplot library and numpy in raspberry Pi are “sudo apt-get install python-opencv”, “sudo apt-get install python-matplotlib”, “sudo apt-get install python-numpy”. The concept of using Matplot library in python is to plot a graphical representation as well as drawing steps.

4. SQLite Studio

SQLite studio is a database that is used to store the information in any particular sequence. Here in this project it has been used to store the user identity information and can be displayed during Detection process. For an unauthorized condition simply the detector displays as an unauthorized person. For any new registration of user, it is required to add his/her respective information on this database. This database has been used for implementation of human identification through face detection with laptop.

5. PhpMyAdmin

PhpMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over

the Web [9]. Here in this project, it has been used for an implementation of human identification through face detection with raspberry PI. For installing PhpMyAdmin in raspberry PI, the following process need to be execute [10].

1. Type a command “sudo bash” to change raspberry PI on root user.
2. Type a command “apt-get install phpmyadmin” to install the PhpMyAdmin and choose “Apache2” as a web server.

IV. SYSTEM ARCHITECTURE

System Architecture deals with an overall operation of the purposed system. In this research project real time human faces are analyzed and processed as a result recognized it with other relevant information displayed on the same picture window. This system has been established with writing three different scripts on python as shown in the figure 1. Where Dataset.py, Trainer.py and Detector.py depicts the python code and for the performance first we need to take input data samples of images which is known as Dataset Generator. Furthermore this datasets are analyzed by trainer.py code and as a result this will be converted into its respective file in the format of Trainer.yml. This file has been used during coding for detector and when we run detector.py script, first it will activate the PI Camera and which will takes real time images. When these real-time images parameters are equal to previous stored images that will be in the form of Trainer.yml then the picture window displays a current user images along with corresponding Information that will be stored in database during the process of sample taking on previous. Also we can add the relevant data for respective user on database after detecting. The database that has been used during implementation of this approach on laptop through SQLite Studio and similarly for Raspberry PI through PHPmyadmin. Figure 1 depicts an overall Architecture and Methodology of this research project.

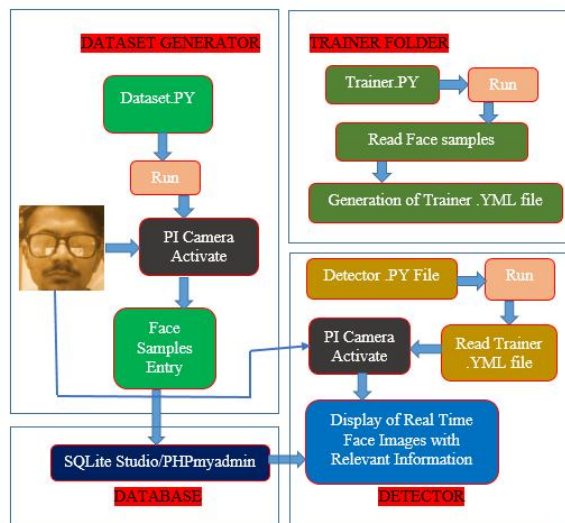


Figure 2. System Architecture

V. TESTING OF SYSTEM



Figure 3. Face detection

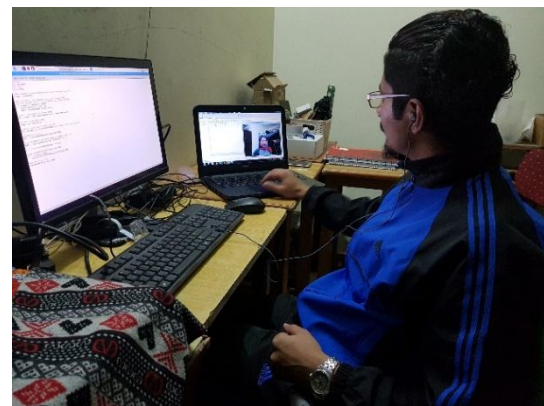


Figure 4. System interfacing with SQLite database



Figure 5. Datasets of face samples

	Name	Data type	Primary Key	Foreign Key	Unique	Check	Not NULL	Collate
1	ID	INTEGER	Yes					NULL
2	Name	TEXT						NULL
3	CRN	INTEGER						NULL
4	URN	INTEGER						NULL
5	Dept	TEXT						NULL

Figure 6. Structure of SQLite Database

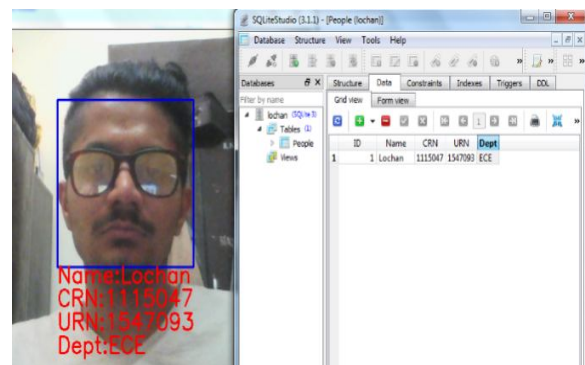


Figure 7. Face detection and recognition

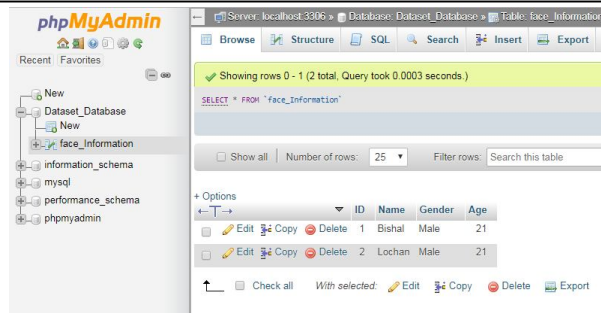


Figure 8. Structure of phpMyAdmin Database

CONCLUSION

Efficient human Identification through face detection has been carried out with the use of PHPmyadmin and SQLite Studio database for storing relevant information. The performance of the system is based on three steps which are datasets, trainer and detector python script. An algorithm that has been used for image processing is OpenCV and especially for face detection “Har cascade frontal face” has been used. As we talk about future modification of this project, It will be used in high security system and face detection based attendance system. Also we can develop projects based on Image Processing, Neural Network and Artificial Intelligence (AI).

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