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Real Time Face Recognition Technique for Institutional Healthcare's Security System

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Abstract Security is very critical in daily lifestyles, especially inside the healthcare field. The facial recognition machine changed into utilized, which is one of the biometric information processes. Its utility is less complicated than that of different biometric information processes which includes fingerprints, iris scans, signatures, etc... In both research and industry, accurate and effective person recognition has always been a fascinating topic. Face recognition has received a growing amount of attention in security applications in recent years due to the rapid advancement of artificial intelligence. Face recognition has numerous advantages, including humanization, high simultaneity, and limited to non-contact. Two parts of the system suggest a combination of technologies: The Biometric Pattern Recognition Algorithms are a facial recognition system based on the simplest stay obtained Haar-like feature detection algorithm (LBP) for face detection. Three persons test the system with a database developed in the OpenCV library. This system presents appropriate overall performance for figuring out faces in the desired bounds and establishing the door to an identified person is known or unknown of the system.

Keywords:. Biometric, Facial Recognition System, Haar-Like Feature, (LBP), OpenCV library.

1 Introduction

Nowadays, safety and security are becoming increasingly popular, getting better over time and being used to improve our lives. Given the difficulties of recognizing facial images with a variety of expressions, occlusions, camouflages, and illuminations, face recognition is one of the hottest fields in computer vision and biometrics. Along with fingerprints and retinas, they provide a novel biometrics method. [1]

Face recognition was first suggested in the Sixties. Woody Bledsoe, Helen Chan Kurt, and Charles Bisson developed the primary semi-automatic facial recognition system. However, the human face contains a few pieces of information that are already utilized in several systems, such as facial recognition, digital customer experience management, audience recording, and safety digital camera surveillance. Surveillance, forensic and clinical programs, security systems, personal identity in international travel facilities, clinical programs, and access to control are all examples of facial recognition programs. Face recognition technology is used a lot at the gift, especially in special places that need to be very secure (like airports, police stations, banks, sports fields, and access manipulation tracking of employer organizations).[2,sec,2]

Computer security tool is taken into consideration to be vital in these days now. Computer imaginative and prescient sciences continue to face a significant obstacle in face recognition. This is because the modern systems work well under strict control, but they appear to fail when problems with facial images, make-up, and noise- and blur-delivered photo damage occur. Presently the field has extended past to utilize two or three particular arrangements that had been attempted to adapt to the difficulty of changing circumstances of the environmental factors. Consequently, frontal images formalize a significant awareness of the length of the image. Because of this length, common reputation strategy examples are nearly impossible to comprehend successfully with a high degree of success.

1.1 Biometric Security System and Its Applications in Healthcare:

A. *How current healthcare systems operate has been altered by the most recent trends in bio-, nano-, and*

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virtual generation. Medical professionals and patients are constantly interacting with a variety of digital devices due to the remote availability of healthcare services and the utilization of tracking and assistive technology in both interior and exterior medical facilities. Additionally, it facilitates the storage and transmission of sensitive character data among those devices. In today's healthcare equipment, appropriate encryption and debugging infrastructure must be protected to prevent criminals from gaining access to information and to ensure the smooth and stable use of scientific equipment. [3]

B. 1.2 Facial Recognition Techniques:

Each facial recognition technology has its effective features. However, recent research has proved that the best results are achieved with combinations of different algorithms and methods. These combinations aim to solve the facial recognition process's many routine problems differences in facial expressions, posing, lighting conditions, and image noise, etc. The latest experiments combine the LBP algorithm with advanced image processing techniques: bilateral filter, histogram equalization, contrast adjustment, and image blending. Such a technique shows impressive improvement to the LBP code and looks very promising for further research.[4]

1.3 Features of face recognition Technology:

• **Non-mandatory:** Optional features are very necessary to the revelation path, lest the detection process become awkward and not smooth enough to attract people's attention, prevent and be hacked.

• **Concurrency:** Digital cameras and other image or video capture devices can quickly and simultaneously capture and identify multiple faces in a individual image or video subject, offering unparalleled advantages over fingerprints, palm prints, and other recognition techniques.

• **Non-contact:** Face recognition technology also has a non-touch feature. For gifts, the wide utilization of fingerprint identification is to attach auto electronic strain sensors to collect fingerprints for recognition and comparison. For sensory fitness environments such as hospitals, contact recognition systems are not useful in preventing disease communication.

1.4 The Face recognition system problems:

- **Technical errors**: This case isn't caused by natural face duplication. The error of the nonpublic information collected in the database, the wrong operation of the accounts of the system, and the evaluation and matching substantially predicated on an unarguable adventure can also create the system matching error.
- **Functional Latent Alternative Practical**: The latent alternative type of phenomenon selected for the selected technology. Face recognition technology has excessive flexibility, so its scope of application can be expanded from the unique characteristics of terrain detection and surveillance to various aspects very easily, and changing the functionality of face recognition technology is also very easy to achieve. The expansion of the identification data database, the expansion of the function software and the replacement of the clients of the face recognition system will lead to the phenomenon that the possibility of its function's existence will be shared**.**
- **Disclosure of Confidentiality:** By monitoring the population in popular places without consultation and information collection, it is difficult to prevent the confidentiality of the monitored person from being leaked. Facial recognition systems can receive, verify and disclose mandatory facts such as personal occupation, age, employment, property reputation, etc., as well as real-time facts that do not require individual self-determination rights, such as movement tracking and incoming documents.[5]

2 Methodology:

An image is acquired using a digital camera and motion detection is performed by a PIR sensor. Human faces are then detected and recognized using a computer vision module. Once that has been done, an unknown photo will be emailed to an address that has been entered. An ease of travel at a healthcare facility may be made possible by this technology. The program will not detect and recognize faces if there is no motion detected. Figure (1) illustrates a flow chart of the proposed system. PIR sensors are used in (Fig.1) to detect movement. Afterward, the algorithm will look for human faces after which identification may be processed. An attempt to classify a face, whether it is recognized or unknown, by comparing a face with a database and separating the names from unidentified people. This could be done by evaluating the invariant capabilities obtained from the strategies that trap the delegate variability of the faces or the shape. Face detection and localization are performed using a Haar-like algorithm. Through the use of a weighted LBP algorithm, face features might be extracted. The face recognition system is classified into three steps: face detection, feature extraction and face recognition.

2.1 Flow Chart Diagram:

Figure (1) shows a block diagram describing the system. Because facial recognition approaches are made up into static turn, this creates system inefficiencies as the systems can only identify the person in front of them.

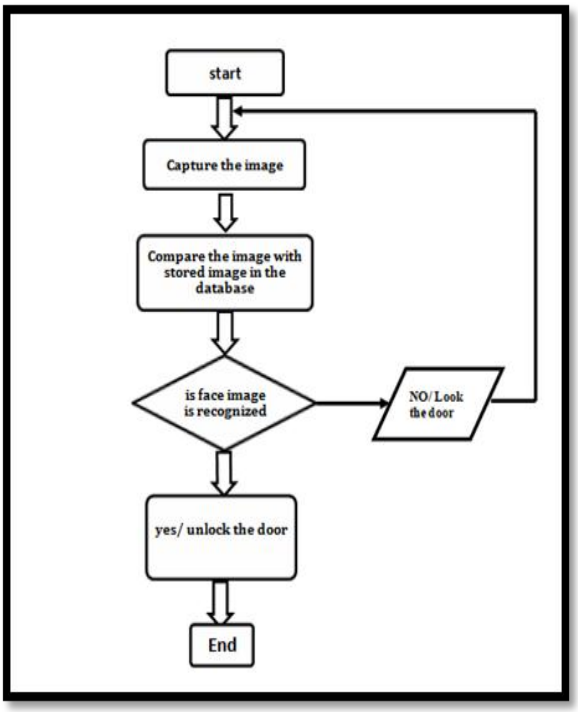

Fig.1. Flowchart for Face Recognition System

2.2 The Face Detection System Steps:

Pre-Processing of images: Before they are fed the image into the network to be reducing the variability in the faces, after that the images are processed. All taking features that is the face images are obtained by cropping Images with frontal faces to include only the front view. All the cropped images are then corrected for lighting through standard algorithms.

Classification of images: Implemented by neural networks to classify the images as faces or no faces by training on these images. We use both our implementation of the neural network and the python libraries for this application.

Localization of images: A neural network is trained to use it to find image features in files and, if found, place it in a folder. Different Feature of Face on which the work has done on Position Scale Orientation Illumination. [6]

2.3 OpenCV Library:

Is a terrific device for image processing and performing computer imaginative and prescient obligations. Its miles an open-source library that can be used to carry out responsibilities like face detection, objection monitoring, landmark detection, and much greater. It supports a couple of languages including python, java C++. Although, for this article, we are able to be proscribing to python only.

The library is ready with masses of beneficial capabilities and algorithms, which might be all freely available to us. Some of those functions are really common and are used in nearly every computer vision mission. While most of the capabilities are nevertheless unexplored and haven't received plenty attention but. [7]

2.4 Haar-like features:

In the past, using the simplest image intensities (that is, RGB pixel values for each pixel in the image) formed feature computation very expensive. We converse the use of a adjusted set of modulation features based on Haar wavelets alternately of usual image intensities. Paul Viola and (Michael Jones) replaced the concept of using Haar wavelets and enhanced the so-called Haar. A scan-like operation looks at contiguous rectangular regions in a detection window, sums their pixel intensities, and computes the difference of the sums (used to classify image segments), such as familiar expressions of faces. On all faces, the eye area is darker than the cheek area. Thus, a not unfamiliar structural hair feature for face detection is the hard fast space of adjacent rectangles above the eyes and cheeks. This function of the rectangle is supposed related to the revelation window, which acts as a bounding container for the target object (the face in this case).

Within the detection region of the Viola-Jones Item Detection Framework, a window of intent length is moved done the input image (captured image) and a Haar-like function is computed for each subsection of the image. This difference is then correlated to the edge found to separate non-objects from objects. Since the Haar-like behavior type is the best learner or classifier (detection over prediction), a lot of Haar approximations are necessary to account for everything. In Viola Jones' object recognizance method, Haar-like procedures are prepared in so-called cascades of classifiers to form robust learners or classifiers.

2.5 Local Binary Pattern (LBP):

Local Binary sample is a way for describing an image; its miles used as characteristic extraction approach in face recognition structures. It's far taken into consideration as a quick algorithm in a manner that can be followed in actual-time structures; also, this approach is robust in opposition to facial expressions modifications and distinctive light conditions. LBP operator is delivered by means of Ojala and it could be implemented best to a grayscale image of 8-bit/pixel. This operator is determined by using comparing all pixels' values across the center pixel together with the middle pixel cost. If a sure pixel value is under the middle pixel value, 0 value is assigned to this pixel inside the pattern; otherwise, it will have a value of 1. [8]

A histogram with each viable label is built for every phase. Which means each bin in a histogram characterizes a pattern and holds the quantity of its appearance within the phase. The characteristic vector is finally constructed via concatenating the local histograms to one large histogram.

$$LBPH(i) = \sum_{x,y} I(i, LBP(x,y)), i = 0, \dots, n-1$$

n is the number of various labels created via the LBP operator.

2.6 Circuit diagram of system:

The circuit implemented in the proteus program associated with the Python shell consists of several different components:

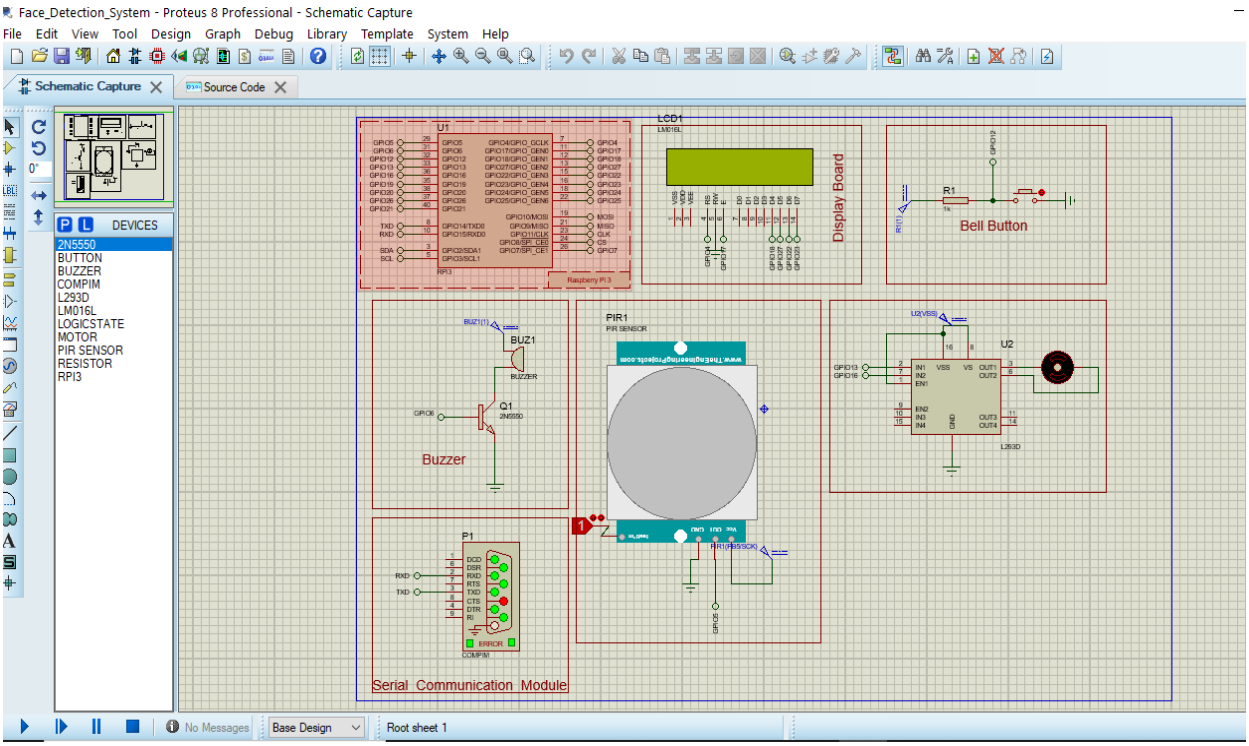

Fig.2: The circuit Diagram of Face Recognition for Security Door

2.6.1 Raspberry Pi: Is a microcontroller that includes a display port (HDMI) and a USB port for connecting a mouse and keyboard. The microprocessor is from the ARM family, so it looks like an everyday phone. You can run a great Linux bistro, Home Windows 10, or IoT Middle on your Raspberry Pi. Unlike an Arduino computer, it is not efficient to use a Raspberry Pi to operate several devices (using GPIO pins); however, it is also very effective to advance the corresponding software yourself. It has many tiny faces and movement popular specifications; it uses the modern model Raspberry Pi 3 Logo B from 2016. It's the first 64-bit Raspberry Pi with built-in wireless and Bluetooth software.

2.6.2 PIR Sensor: PIR sensors (passive infrared or pyroelectric) enable near-continuous motion detection to determine if people have moved into or out of the area. They are small, inexpensive, low power, easy to use, and non-intrusive. They may be called PIR, "Passive Infrared", "Pyroelectric", or "IR Motion" sensors. It can be installed on the door to absorb human movement.

2.6.3 Serial Communication Module: After comparing the captured images to the saved images, it is used to send a message to the government (security personnel) with mostly positive or negative results. The module will no longer function on this system if the output is acceptable. The module grants access to the unidentified individual in the event that they attempt to open the door; If not, the "unknown person" attempts to unlock the ship's door.

2.6.4 Motors: Utilize direct current to generate electricity, transform this energy into mechanical rotation, and then open and close the door.

2.6.5 Buzzer: It is a device for audio that can turn audio into electrical signals. It is generally controlled by DC voltage. Used as warnings.

2.6.7 Display Bored: is used to show the status of the system.

3 Results and Discussion:

This includes the results we get from using this system Completed results From the beginning to the end of the development of this system, the following results have been achieved They may be as follows:

- The system is marketplace ready for business/

commercial use.

- The system has the ability to carry as much as 1000 faces to understand.
- The system can serve as much people as they want within an organization.

In figure below the face recognition system can be recognized of some faces at real time, when faces are saved in dataset images, the door is opened.

In figure (4) is critical case, when the camera opened and taken image has some faces, the one faces is unknown means in saved in dataset of security system the door is never opened and sent the photo in E-mail address immediately by SCM module.

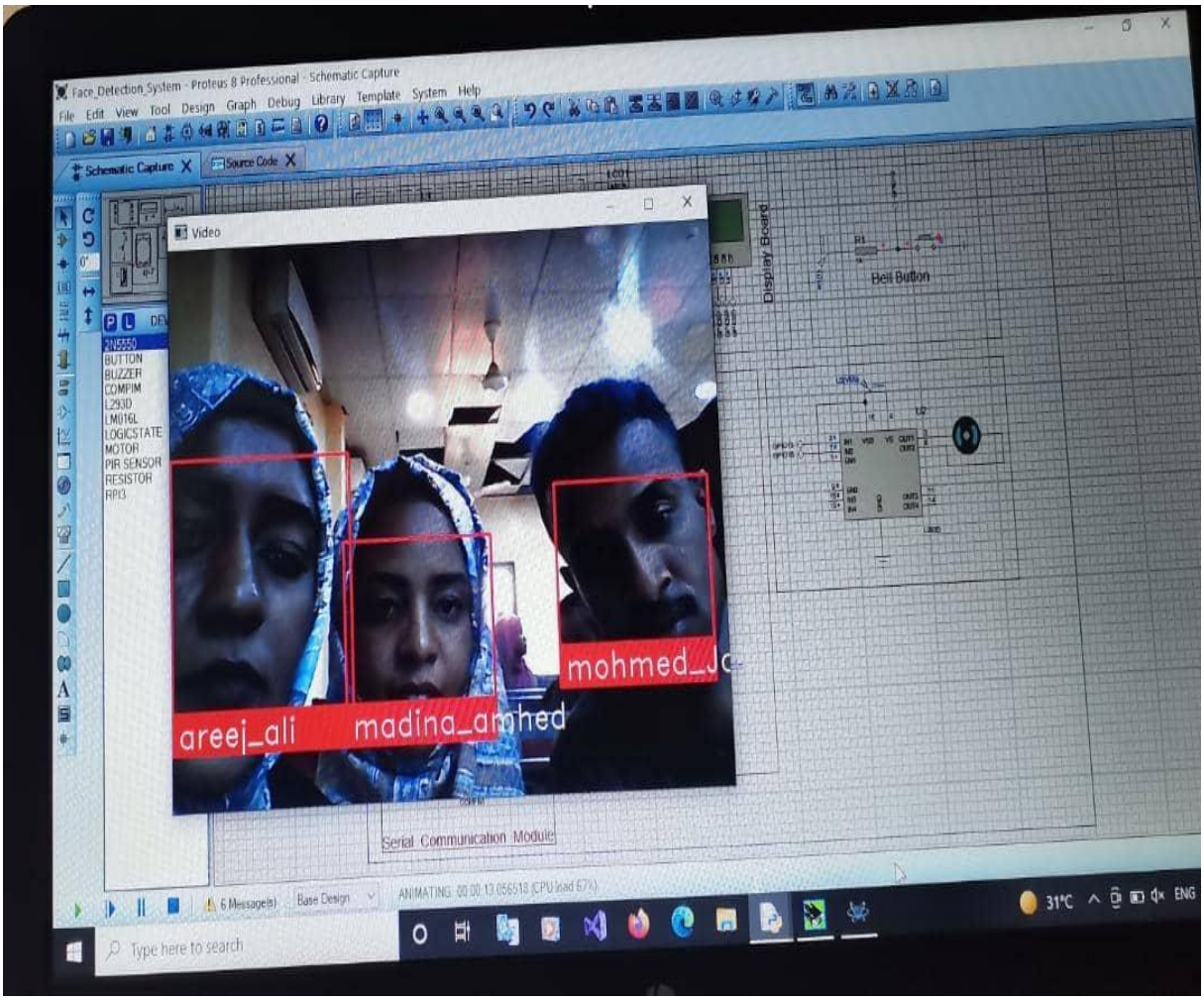

Fig.3: Known Persons /Open the Door

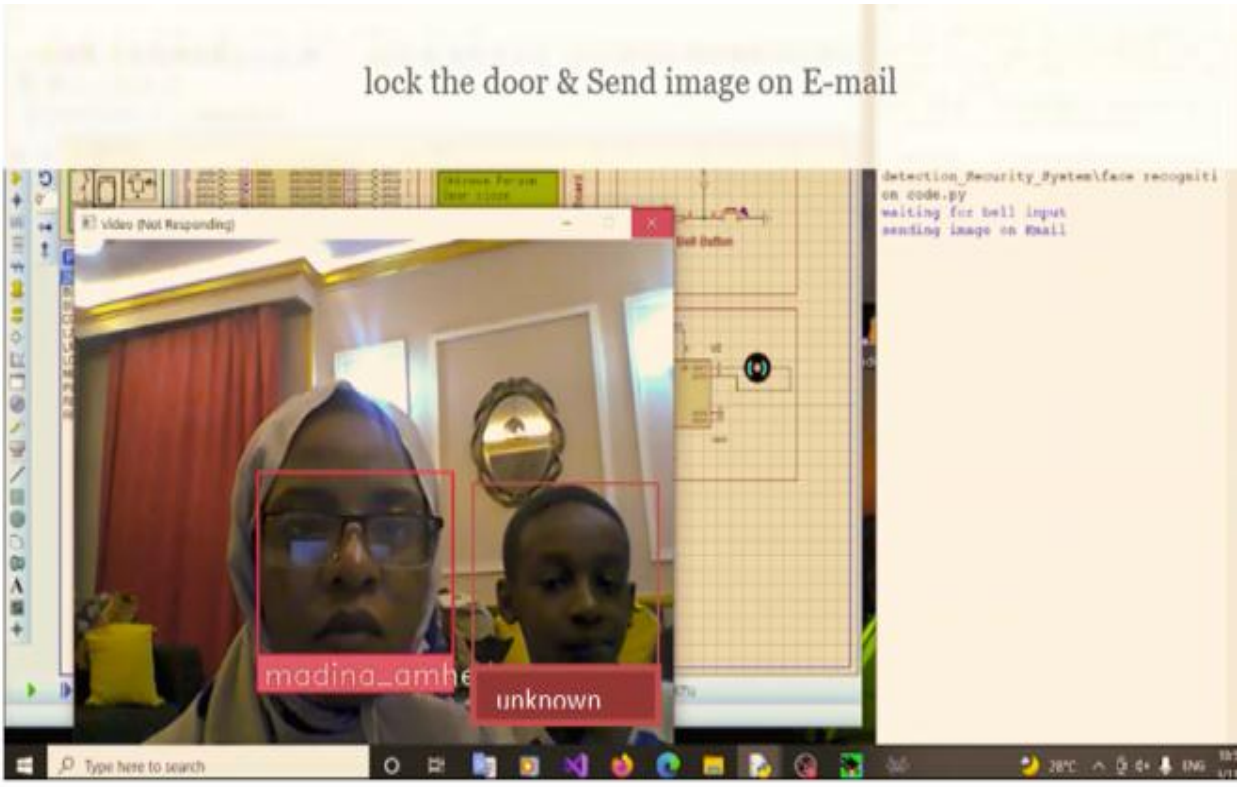

Fig .4: Unknown Persons /Close the Door

Table.1. Experiment Result

Test data	Expected Results	Observed Results	Executed (true/false)
Cv2.VideoCapture (0)	Connects with the hooked up digital is began	Camera started	**True**
Cv2.cascade Classifier	Loads the haar cascade Classifier	Gets ready for extracted	**True**
Extract Face()	Loads the LBPH face extracting framework	Face extracted	**True**
Learn()	Starts the LBPH Algorithm	Updates the trainer.xml file	**True**
Recognize()	It compares the taken face with the saved images in xml file	Recognizes	**True**

4 Conclusion

A face recognition-based door lock system utilizing a Raspberry Pi and PIR sensor is proposed for this project. We have developed a product that provides users with door security locks, comfort, pleasant security, and power efficiency. Banking, health care security, native land security, and other government facilities are all possible applications for this method. An internet camera, a Raspberry Pi, a PIR sensor, a buzzer, a show board, a door lock motor, and a serial conversation module are all available from us. Furthermore, we use the Haar Fountain class technique for face discovery and the nearby local Binary Pattern Histogram (LBPH) for face identification. I believe exclusive sports are better studied and documented.

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