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ABSTRACT

Facial expression recognition has many potential applications which have attracted the attention of researchers in the last decade. Feature extraction is one important step in expression analysis which contributes toward fast and accurate expression recognition. Happy, surprise, disgust, sad, anger and fear facial expressions Emotion are of facial recognition. Facial expressions are most commonly used for interpretation of human emotion. There is a range of different emotions in two categories: positive emotion and non-positive emotion. There are four types of generally using system: Face detection, extraction, Classification and recognition. In Existing system it is not so much identify exact emotion of a person. In this proposed taking the large scale image, hybrid extraction feature and ANN classification of frame based expression recognition try to detect facial expression detection and emotion detection for positive and non-positive images also design robust. Automatic facial expression recognition system has many applications including, but not limited to, human behaviour understanding and synthetic human expressions. Two popular methods utilized mostly in the literature for the automatic FER systems are based on geometry and appearance. Even though there is lots of research using static images, the research is still going on for the development of new methods which would be quite easy in computation and would have less memory usage as compared to previous methods. A comparative study is also carried out using various feature extraction techniques on data set.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

Facial Gesture Detection systems over the past several decades have attracted much attention from scientific research. FER has proven several benefits and showed great success in computer vision due to their major importance in various areas of our daily life. Facial emotions are important factors in human communication that help us understand the intentions of others. In general, people infer the emotional states of other people, such as joy, sadness, and anger, using facial expressions. The human face is capable of generating thousands of facial expressions. Machine learning approaches to FER all require a set of training image examples, each labelled with a single emotion category. A standard set of six emotions classification is: User with Pressure, User with Tension, User with Low BP, User with High BP. FER is the technology that analyses facial expressions from both static images and videos in order to reveal information on one's emotional state.

Face is one of the most important human's biometric which is used frequently in every day human communication and due to some of its unique characteristics plays a major role in conveying identity and emotion. So far numerous methods have been proposed for face recognition, but it is still remained very challenging in real life applications and up to date; there is no technique which equals human ability to recognize faces despite many variations in appearance that the face can have in a scene and provides a robust solution to all situations. The aim of this report is to present the problems & issues that occur in a face recognition system in detecting & recognizing faces accurately due to light, aging, expressions, similarity in faces and other systematic problems like noise, image-acquisition, video camera distortion etc.

A human can recognize different faces without difficulty. Yet it is a challenging task to design a robust computer system for face identification. The inadequacy of automated face recognition systems is especially apparent when compared to our own innate face recognition ability. Human perform face recognition, an extremely complex visual task, almost instantaneously and our own recognition ability is far more robust than any computer's can hope to be. Human can recognize a familiar individual under very adverse lighting conditions, from varying angles or viewpoints. However, face recognition is still an area of active research since a completely successful approach or model has not been proposed to solve the face recognition

problem. Face Detection: The main function of this step is to determine (1) whether human faces appear in a given image, and (2) where these faces are located at. The expected outputs of this step are patches containing each face in the input image. In order to make further face recognition system more robust and easy to design, face alignment are per-formed to justify the scales and orientations of these patches. Besides serving as the prepossessing for face recognition, face detection could be used for region of interest detection, re-targeting, video and image classification, etc Feature Extraction: After the face detection step, human-face patches are extracted from images. Directly using these patches for face recognition have some disadvantages, first, each patch usually contains over 1000 pixels, which are too large to build a robust recognition system. Second, face patches may be taken from different camera alignments, with different face expressions, illuminations, and may suffer from occlusion and clutter. After this step, a face patch is usually transformed into a vector with fixed dimension or a set of fiducial points and their corresponding locations. Face Detection is a application software to deal with human face. It has the provisions to collect image from the user so that they can detect the eyes, nose, mouth and whole face of human in the image. There are various advantages of developing an software using face detection and recognition in the field of authentication. Face detection is an easy and simple task for humans, but not so for computers. It has been regarded as the most complex and challenging problem in the field of computer vision due to large intra-class variations caused by the changes in facial appearance, lighting and expression. The project titled 'Face Detection and Recognition System', is to manage all the front end back end system of finding or detecting particular region in human face. This software helps the people looking for more advanced way of image processing system. Using this software they can easily find or detect faces in image and also recognize the face after saving that. Face-detection algorithms focus on the detection of frontal human faces. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process. A reliable face-detection approach based on the genetic algorithm and the eigen-face technique. Firstly, the possible human eye regions are detected by testing all the valley regions in the Gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners.

1.1 EXISTING SYSTEM

Nowadays we have system which can only detect driver drowsiness, but system does not have the capability to detect BP and Pressure of a person. In present system camera only detects all about the expression such as happy, sad, angry, fear, surprise etc, which not much helpful. Face recognition algorithms classified as geometry based or template based algorithms. Biometric security systems use facial recognition to uniquely identify individuals during user on boarding or logins as well as strengthen user authentication activity. Mobile and personal devices also commonly use face an analyser technology for device security. Another area where facial recognition is having a profound influence is in law enforcement agencies with policing, prevention and security. Video surveillance systems all around the world are now being installed with face recognition systems and linked to bio metrics data and criminal data bases. The present systems doesn't send the notification to the user and doesn't use the sensor in steering wheel.

1.2 OBJECTIVE

The objective of this project is to develop Automatic Facial Expression Recognition System which can take human facial images containing some expression as input and recognize .

- To monitor the physiological parameters.
- To design and development of facial gesture detection system.
- To notify the emergency messages to users in an emergency.
- The objective of face recognition is, from the incoming image, to find a series of data of the same face in a set of training images in a database.
- To find a series of data of the same face in a set of training images in a database.

CHAPTER 2

LITERATURE SURVEY

The work given in [1] presents mobile-friendly technology that estimates 3D face landmarks in real time. It uses machine learning (ML) to infer the 3D facial surface, which requires only a single camera input and no separate depth sensor. It creates a metric 3D space and estimates a face transform within that space using the facial landmark screen positions. The face transform data is made up of standard 3D primitives, such as a face pose transformation matrix and a triangular face mesh.

The study of face detection with large area occlusion is presented in [2]. The underlying detection algorithm is the Ada boost cascade classifier based on the Haar-like feature. Firstly, the open cv cascade classifier is used to detect the human eye and the mouth. And then the face detection of the occlusion is realized, according to the relationship between the human eye and the human face and the relationship between the mouth and the face, which is the physiological characteristics of the face. Finally, the accuracy of large-area occlusion of various occludes is compared, which proves that the method is reasonable and robust.

The purpose of this paper is to present [3] a Windows based real time application system using face recognition algorithms. Instead of using a bankcard, a camera installed at the Automated Teller Machines would capture pictures of faces of customers, and compare them with the photos of account holders in the database of banks to verify the customer's identity. This new system can be applied in various different fields such as identity verification and other potential commercial applications. Both Eigen and Local Binary Patterns face algorithms were used to reduce the impact of light exposure that will affect the accuracy of the system.

This paper discussed [4] about Android-based SOS platform named SOSerbia for sending emergency messages by citizens in Serbia. The proposed platform solves a lot of safety, security, and emergency problems for people who can be in dangerous situations. After a person presses a correct combination of buttons, a message with his or her location is sent to the operating centre of the Serbian Police. The platform merges several appropriately combined advanced Android technologies into one

complete solution. The proposed solution also uses the Google location API for getting user's location.

Objective of this paper explains about [5], four physiological parameters i.e. Heart Rate (HR), Inter-Beat-Interval (IBI), Heart Rate Variability (HRV) and Oxygen Saturation (SpO2) are extracted from facial video recordings. Methods: Facial videos were recorded for 10 minutes each in 30 test subjects while driving a simulator. Four Regions of Interest (ROIs) are automatically selected in each facial image frame based on 66 facial landmarks. Red-Green-Blue (RGB) color signals are extracted from the ROIs and four physiological parameters are extracted from the color signals. For the evaluation, physiological parameters are also recorded simultaneously using a traditional sensor 'cStress' which is attached to hands and fingers of test subjects.

In his paper, approach for Face Recognition [6] is using PCA (Principal Component Analysis) from digital face image is done. They decompose image into small sets of detailed images. In the face, they use the eyebrow and mouth corners as main "anchor" points. The system, based on a local approach, is able to detect partial blockages.

The work given in [7] " Driver's Facial Expression Recognition in Real Time for Safe Driving ". Here the geometric features are defined using the locations and shapes of facial components extracted from an input image, and the relationship between related facial components.

The purpose of this paper is to present [8] Developed a new theory: "the circumplex model of affect". This new theory explains that emotions appear as a product of two independent systems, one that informs about the valence (how positive or negative is an emotion) and the other that represents the arousal (how intense or soft is an emotion).

Automatic Emotion Recognition for the Calibration of Autonomous Driving Functions, Calibration of manually driven vehicles and autonomous driving cars. Through ML they have analyzed the passengers' emotions while driving. Through the analysis of these emotions, it is possible to obtain an objective metric about the comfort feeling of the passengers. We developed two software tools, called Facial Expressions Databases Classifier and Emotions Detector. The first, designed to generate large facial expressions and other to analyze the testers' emotions.

CHAPTER 3

PROBLEM DEFINITION

Several Projects have already been done in this fields and our goal will not only be to develop an Automatic Facial Expression Recognition System but also improving the accuracy of this system compared to the other available systems. Through facial emotion recognition, we are able to measure the effects that content and services have on the users through an easy and low-cost procedure. Face recognition has many challenges due to illumination variations, large dimensionality, uncontrolled environments, pose variations and aging. In the recent years, Face recognition get remarkable improvement and accuracy to over- come these challenges, but illumination change is still changing. To date, most face recognition systems have had at most a few hundred faces. This could be a problem when the size of database increases. Larger database means longer computational and processing time. Limit the number of entries to be searched in a large database, improving the search speed In other words estimation will be done on the input image and recognition of image is done only in the estimation group. Theoretically this method will cut the processing time almost to half. Facial Recognition systems can be impacted by poor lighting or low image quality. The data may not match up with the person's nodal points because of camera angles being changed, this creates an error when matching face prints cannot be verified in the database.

CHAPTER 4

PROPOSED WORK

The proposed system for the project context based facial gesture detection in vehicular ad hoc network is proposed as now days we are able to see many accidents due to the health issues of the driver, so we have designed our systems to reduce the accidents by developing facial system recognize the under tension, under pressure, high bp and low bp. We have used pulse sensor which can detect the bpm of the driver. We are using Arduino through which we are connected to the computer. We are using gsm through which we can connect the driver phone to the system. Once the driver is detected to have high bp, low bp and tension he is notified, So that he can take precautionary measures as early as possible. We have also made it such that one of his family member can also be notified by the message.

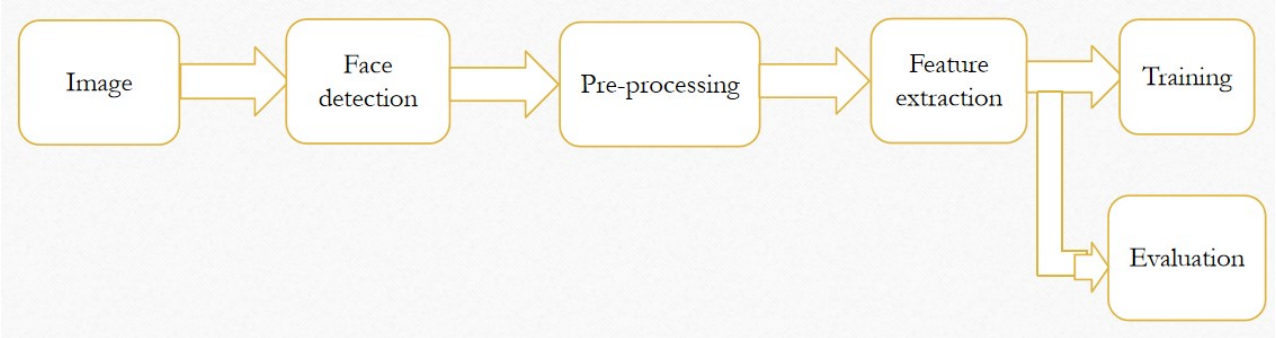

Fig 4.1: Proposed System

4.1 THE PROPOSED ALGORITHM

In order to improve the reliability of facial expression recognition system, and reduce the chance of false positives caused by error, classification strategy is important in recognition process. In the process, the k-nearest neighbor algorithm is improved. KNN is a lazy learning, non-parametric algorithm. It uses data with several classes to predict the classification of the new sample point. KNN is non-parametric since it doesn't make any assumptions on the data being studied, i.e., the model is distributed from the data the k-NN algorithm classifies unknown data points by finding the most common class among the k closest examples. KNN (K nearest neighbors) is a data

science model used to identify the closest approximate neighbors to the input data. The input data can be of any format (in our case it would be images). In pattern recognition, the k-Nearest Neighbors algorithm (or k-NN) is a non-parametric method which is used for classification and regression. The input consists of the k closest training examples in the feature space. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors (k is a positive integer, k<1). If k = 1, then the object is simply assigned to the class of that single nearest neighbor.

In K-NN regression, the output is the property value for the object. This value is the average of the values of its k nearest neighbors. K-NN comes under instance-based learning, or lazy learning, where the function is only approximated locally and all evaluation is deferred until classification. The KNN algorithm is among the simplest of all machine learning algorithms in the terms of classification and regression, it can be useful to weight the contributions of the neighbors, so that the nearer neighbors contribute more to the average than the more distant ones. For example, a common weighing scheme consists in giving each neighbor a weight of 1/d, where d is the distance to the neighbor. The neighbors are taken from a set of objects for which the object property value (for K-NN regression) and class (for K-NN classification) is known. This can be thought of as the training set for the algorithm, though no explicit training step is required

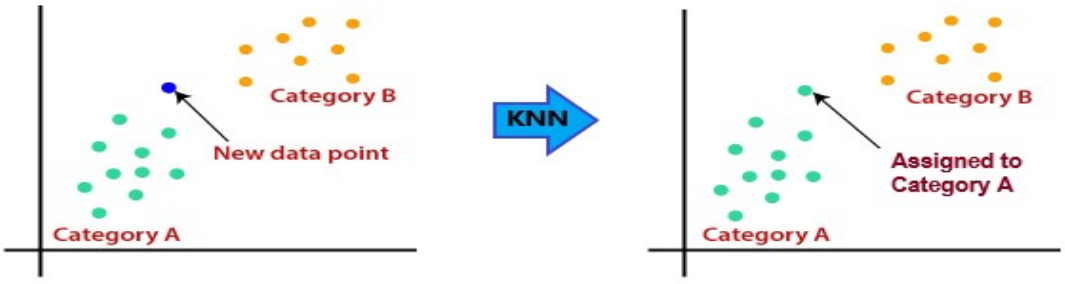

Fig 4.2 : KNN algorithm

CHAPTER 5

REQUIREMENT SPECIFICATION

HARDWARE REQUIREMENTS

5.1 PULSE SENSOR

A detector that monitors this volume change is a pulse rate sensor or pulse oximeter sensor and is used by doctors to check for signs of arrhythmia its simple to check your pulse with just your fingers using either your wrist or the side of neck, according to the Harvard medical school special health report on diseases of heart. Apply pressure at the wrist, just below the base of the thumb, with the index and middle fingers of one hand, below your jawbone, and lightly press the side of your neck. Taking a count of heart in 15 seconds is multiplied by four is the number is your heart rate. Micro controller such as Arduino and Raspberry Pi can be interfaced with a pulse sensor to receive alert messages when the heartbeat meets the threshold through sensing the heartbeat by pulse sensor.

Fig 5.1 : Pulse sensor

5.1.1 PULSE SENSOR WORKING PRINCIPLE

You may feel a pulse in some of the blood vessels close to the skins surface when your heart pumps blood through your body, such as in your wrist, or upper arm. Quickly your heart beat can be easily determined by counting your pulse rate. Students, artists, athletes, mobile and game developers can easily incorporate live heart rate data into their projects with the pulse sensor, which is designed to be an easily-to-use plug-and-play heart rate sensor. One requirement is that the sensor should clip onto a fingertip or earlobe or any part of the body that can measure the heartbeat accurately. With the help of jumper cables, it can easily connect to the micro controller and get

date or draw real-time graphs of your pulse. A basic optical heart rate sensor is combined with this sensor via a circuit. This circuit is used to quickly obtain reliable pulse readings by amplifying and cancelling noise. It is excellent for mobile application because it only consumes 4mA at 5v.

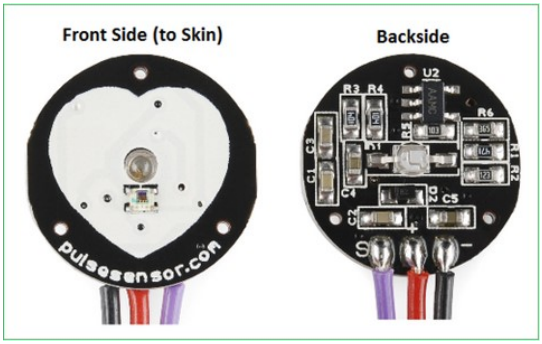

Fig 5.1.1 : working of pulse sensor

Now let us look at what the sensor looks like from the front and back views shown above, as you can see a heart shape on the side that contacts the skin. An LED is in the center of sensor, and a little below the LED is an ambient sensor used to eliminate the noise called noise called noise elimination circuitry. The back view of the sensor as the electronic components are mounted at the center LED Is reversely mounted. This is done because it does not meet the skin.

5.1.2 FEATURES

1.This sensor measures the heart rate and biometric pulse rate.

2.This sensor is a plug-and-play model.

3.This sensor operates at a voltage of +5V/+3.3V.

4.Integral amplification circuit for noise cancellation,

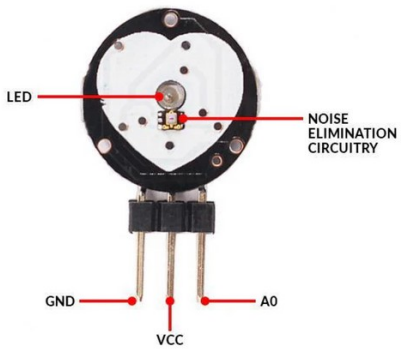

Fig 5.1.2 : Pin configuration

5.2 TEMPRATURE SENSOR

Temperature sensors measure temperature readings via electrical signals. They contain two metals that generate an electrical voltage or resistance when a temperature change occurs. The sensor plays a vital role in maintaining a specific temperature for a variety of industries, including medical applications, HVAC systems, and electrical appliances in our homes. Temperature sensors are critical for accuracy and temperature control in industries like these. Achieving temperature sensor accuracy, repeatability and stability are key factors that determine how well an application performs. For some medical applications, such as measuring blood or body fluid temperatures, response to small changes in temperature is critical to patient health. When the voltage increases, the temperature also increases. The sensors come in different types, which are categorized based on their connection. There are two main categories when it comes to temperature sensors, depending on the type of application being used or the industry you are working in:

5.2.1 CONTACT TEMPERATURE

Contact temperature sensors measure the degree of hotness or coldness of an object or substance via direct contact. They are generally used to detect a wide range of temperatures in different solids, liquids, or gases.

5.2.2 NON CONTACT TEMPERATURE

These temperature meters are never in direct contact with an object or substance, therefore, they are widely used in hazardous environments such as power plant industries. They measure how hot or cold something is via radiation emitted by a heat source.

5.2.3 MEDICAL APPLICATION

Temperature sensors are used for patient monitoring as well as within machines and devices for a range of medical procedures. To be used in this industry temperature sensors will require various safety standards and approvals.

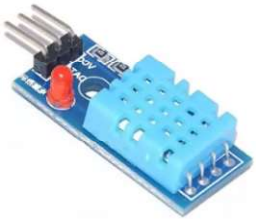

Fig 5.2.3: Temperature sensor

5.3 WEB CAMERA

The camera is equipped with an infrared sensor, so there is no need to enter a password to log in to a Windows 10 device with Windows Hello, just look into the lens is enough to log in. Webcam Face trackers allow full control of mouse functions without the use of hands. They can be used to access a computer (Windows, Mac), as well as a tablet or smartphone (Android only at present). Primary users of these technologies are people with motor impairments

Fast and secure facial recognition supports the use of multiple accounts. The biometric identification prevents from logging in with just a photo. The webcam offers crisp and true color video and image quality thanks to the 1080p resolution. The omnidirectional microphone guarantees professional sound in any environment. Place the camera where it suits best - on the monitor, notebook, tripod or tabletop. The practical clip for attachment enables uncomplicated installation within a very short time. There is no need to install additional software or drivers because the webcam works with Plug & Play. Simply plug the integrated USB cable (1.5m) of the camera into the notebook or computer and the webcam is ready to use in a few seconds. Camera cover and light when used to protect privacy. You don't have to install any kind of costly retina scanning hardware or complex hardware system. All you need is Gaze Pointer Webcam eye tracker software and a webcam. The software will track your eye gaze and move the mouse on screen accord

Fig 5.3 : Webcam

5.4 GSM

A GSM modem or GSM module is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. A customised Global System for Mobile communication (GSM) module is designed for wireless radiation monitoring through Short Messaging Service (SMS). This module is able to receive serial data from radiation monitoring devices such as survey meter or area monitor and transmit the data as text SMS to a host server. The GSM network has four separate parts that work together to function as a whole: the mobile device itself, the base station subsystem (BSS), the network switching subsystem (NSS) and the operation and support subsystem (OSS). The mobile device connects to the network via hardware.

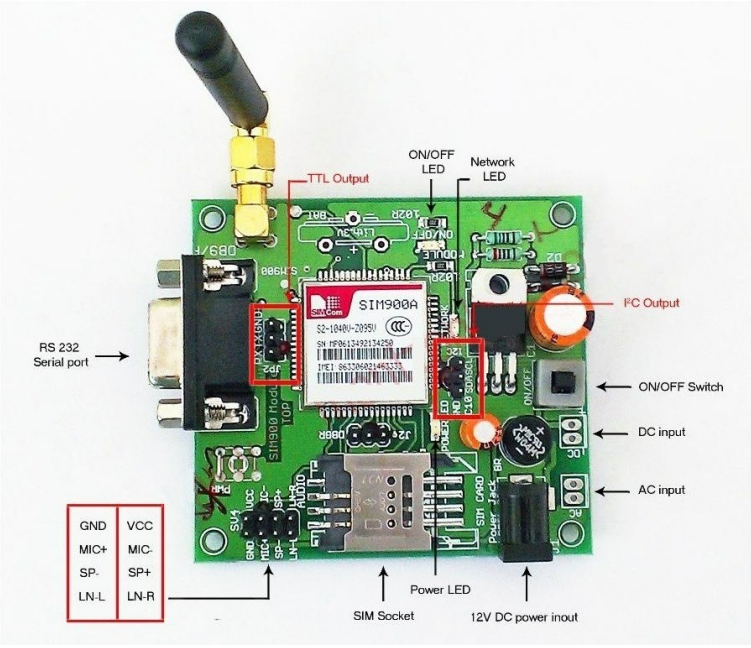

Fig 5.4: Gsm module

The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network.

5.5 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. The name Arduino comes from a bar in Ivrea, Italy, where some of the project's founders used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014. The word "uno" means "one" in Italian and was chosen to mark a major redesign of the Arduino hardware and software. The Uno board was the successor of the Duemilanove release and was the 9th version in a series of USB-based Arduino boards.

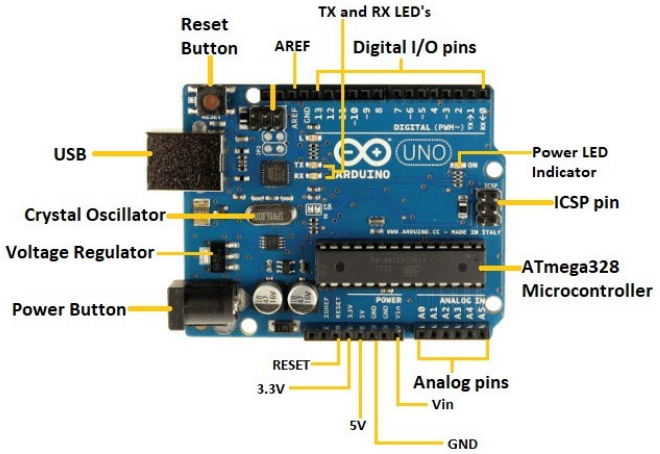

Fig 5.5: Arduino uno board

SOFTWARE REQUIREMENTS

5.6 VISUAL STUDIO

Visual Studio Code is a source-code editor that can be used with a variety of programming languages, including C, C#, C++, Fortran, Go, Java, JavaScript, Node.js, Python, Rust, and Julia. It is based on the Electron framework, which is used to develop Node.js web applications that run on the Blink layout engine. The library face recognition is based on deep learning, it supports single-shot learning which means it needs a single picture to train itself to detect a person. The above code took two pictures of the prime minister, and it returned True because both photos were of the same person. Face recognition.

CHAPTER 6

DESIGN

6.1 FLOW CHART

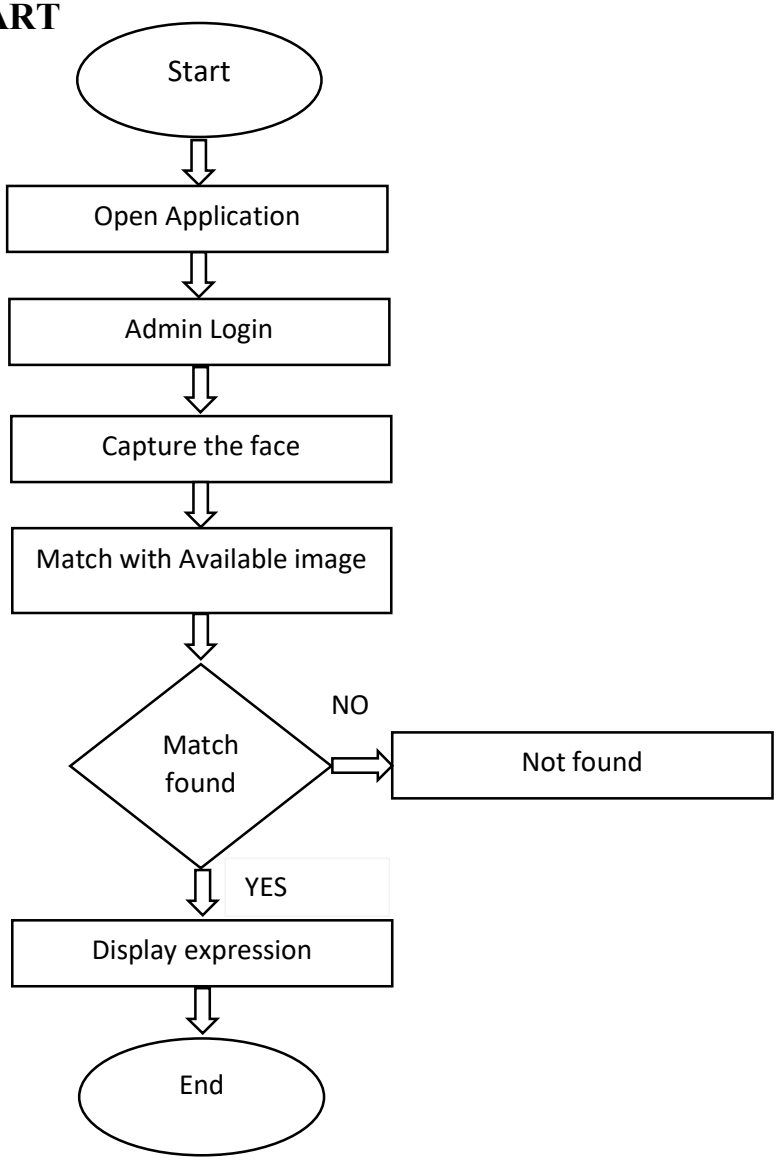

Fig 6.1 : Flow Chart

Web cam captures the driver expression and that captured data is pre processed and compared with the reference images this helps to extract the feature which leads to face recognition. As soon as the driver keeps his hand on the steering wheel pulse sensor which is incorporated in the steering wheel converts the blood pressure from the driver or user into the electrical signal and notifies whether he is facing High BP or Low BP. And it notifies to user , Even though the driver is not in the condition to take care of himself then the system make sure that the notification is sent to family.

6.2 ACTIVITY DIAGRAM

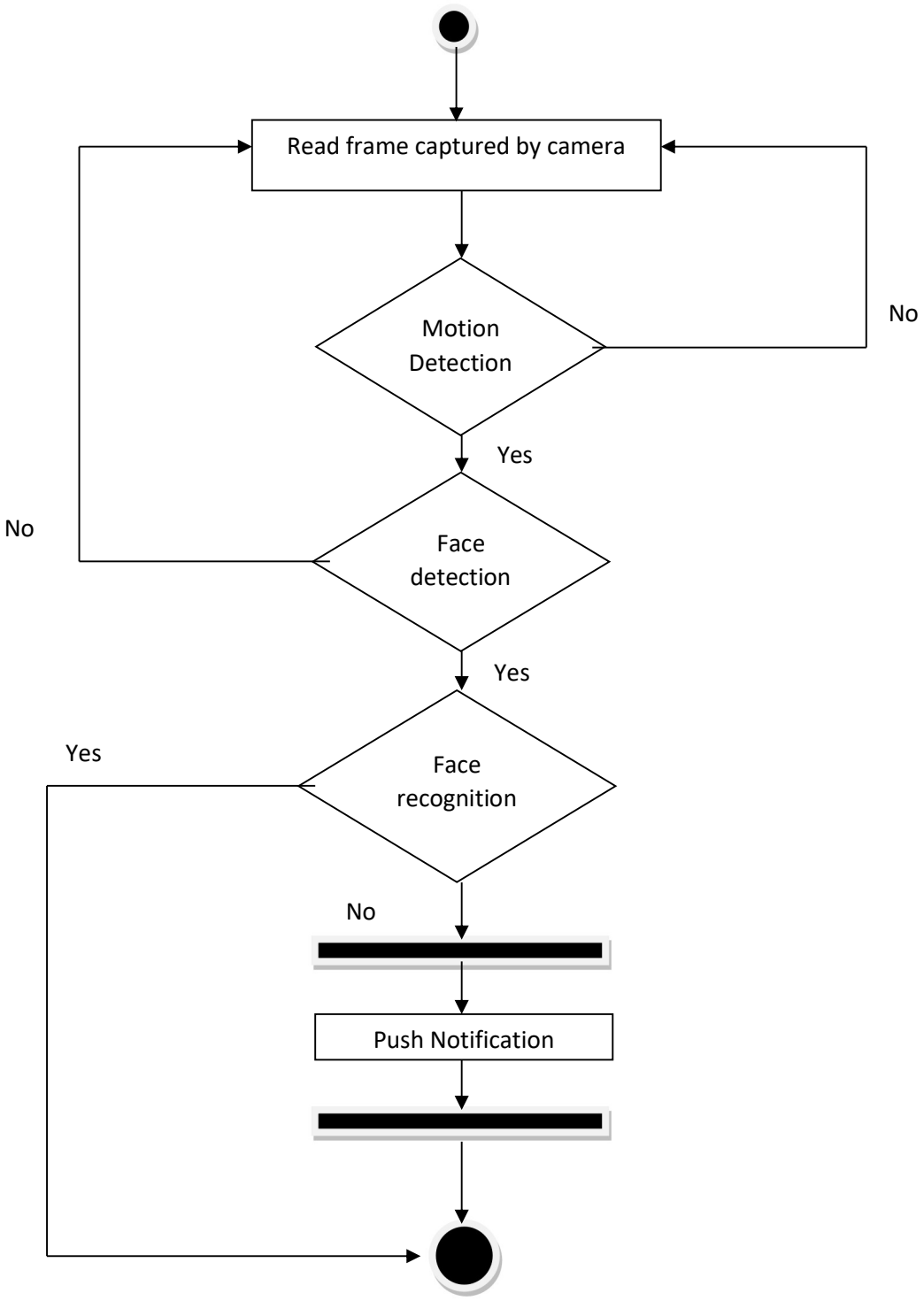

Fig 6.2 : Activity Diagram

6.3 USECASE

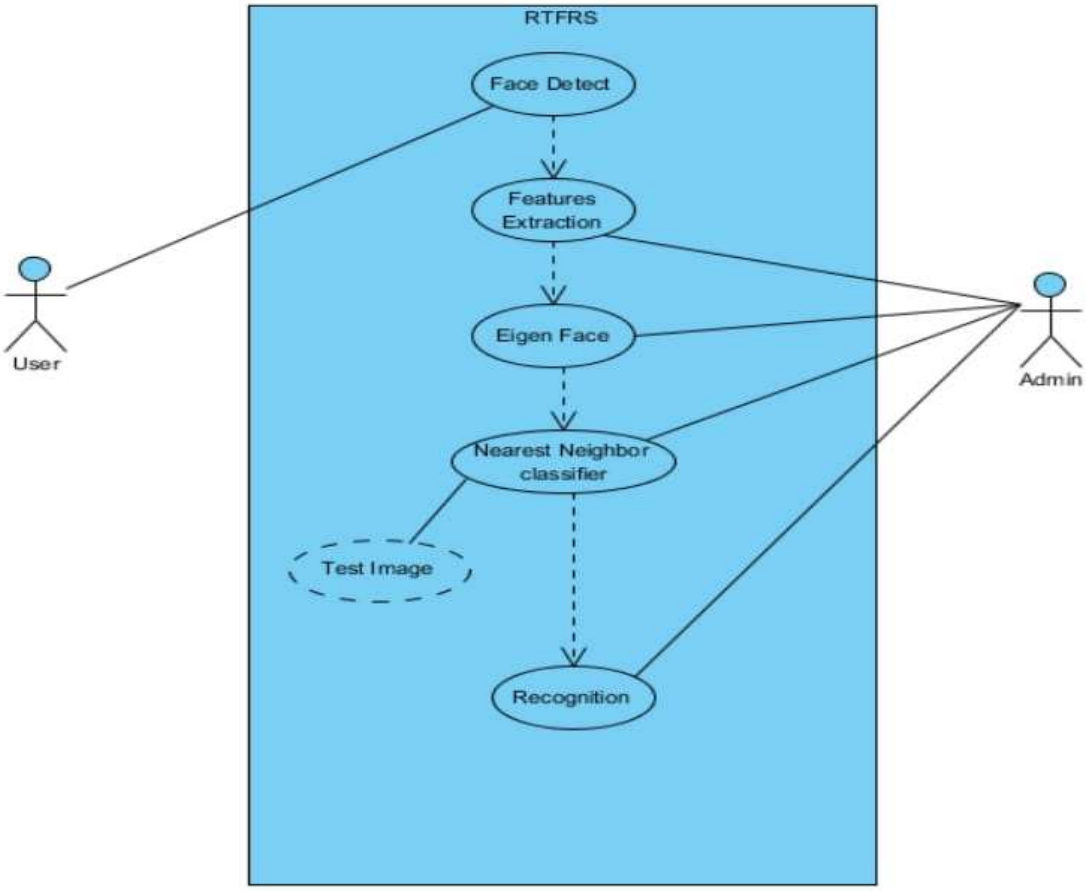

Fig 6.3 : Use case Diagram

Generally Use case defines the relationship between the actors and use cases or system. Here the actors can be user and admin. Driver activates the camera and system can relate it. System detects the face in the surveillance area , from detected face the feature is extracted and processed. Driver activates the sensor , sensor seeks / senses the BP and pressure .At last it notifies the user about the variation in BP and pressure.

CHAPTER 7

METHEDOLOGY

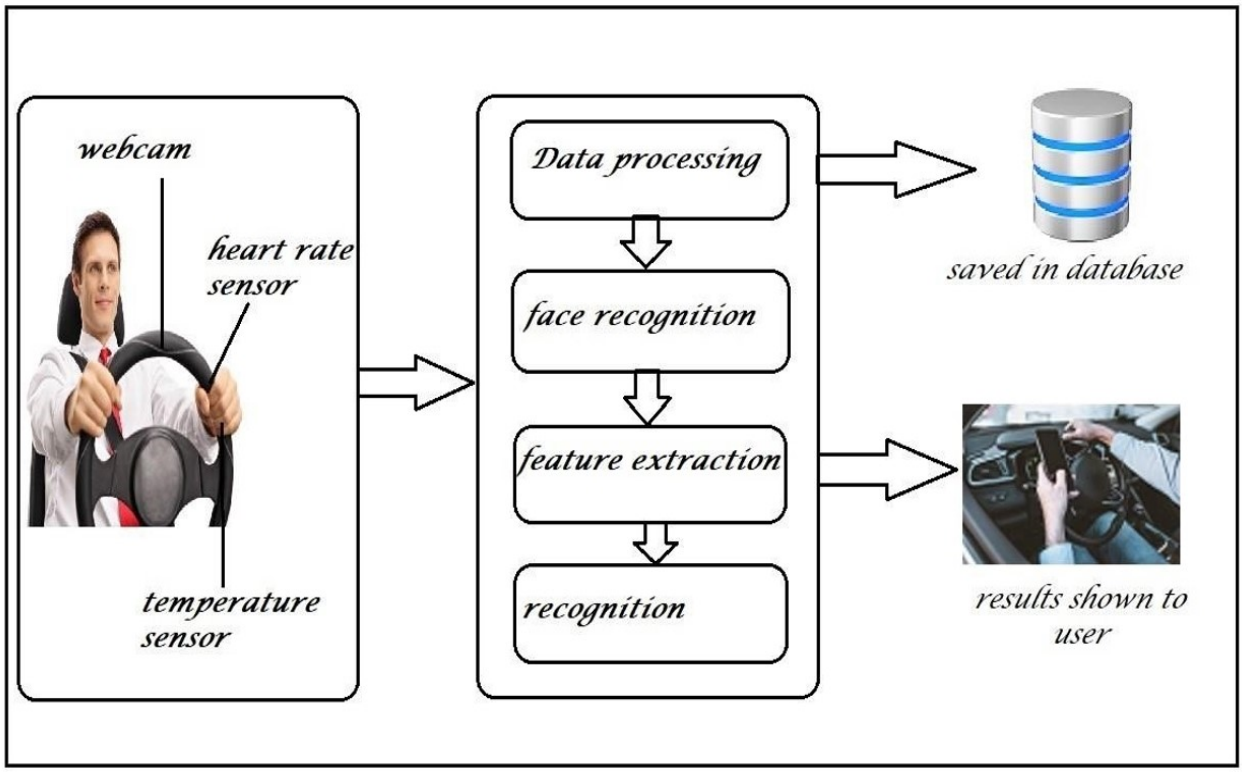

Fig 7.1: Methodology

The IOT here refers to the interconnections of physical devices, such as appliances and vehicles, that are embedded with software, sensors, and connectivity which enables these objects to connect and exchange data. This technology allows for the collection and sharing of data from vast network of devices, creating opportunities for more efficient and automated systems. The proposed work comprises of Face recognition system that detects the faces in a picture taken by web-cam, and these face images are then checked with training image datasets, and sensors which detect the BP of the user.

Facial Gesture analysis comprises of four steps:

a) face detection

b) facial expression detection

c) expression classification to an emotional state

d) sending notification to user

The human face is capable of generating thousands of facial expressions. Machine learning approaches to Facial Gesture Detection all require a set of training image examples, each labelled with a single emotion category. A standard set of four emotions classified here is:

1)User under Pressure

2)User under Tension

3)User under Low BP

4)User under High BP

After detecting the face, the classification process takes place but we cannot completely depend on the face recognition system and come to a conclusion therefore a heart rate sensor will be attached which detects the physical or medical situation of the driver. The heart rate/pressure sensor is an electronic device that detects, regulates, or monitors pressure, and converts perceived physical data into an electronic signal.

In case the driver has a medical issue while in the vehicle and cannot grab a emergency alert device, his phone or the registered phones of his close relations will be getting his continuous health reports and they can take up an emergency evacuation strategies. In this way the driver specially in case of any old aged, disordered or any illness oriented person can travel in his own vehicle alone and still be careful about himself/herself.

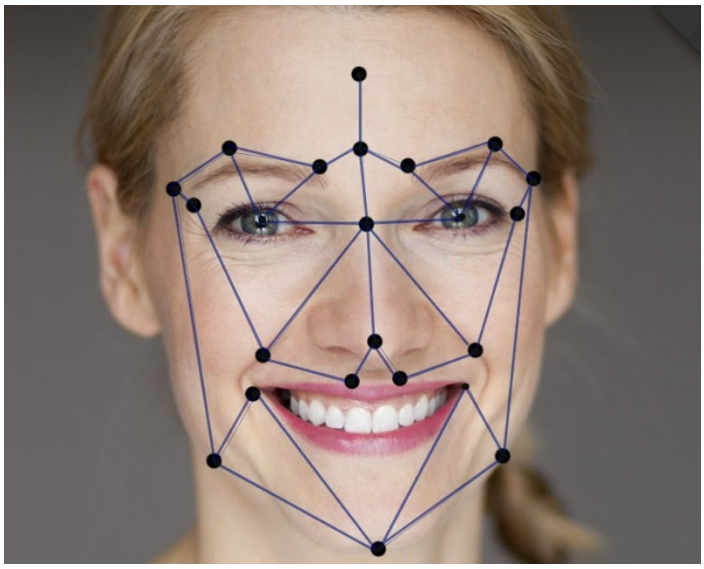

Fig 7.2: Real time face alignments

CHAPTER 8

EXPERIMENTAL RESULTS

8.1 STRESSED PERSON

Fig 8.1: Real time stressed person

8.2 NOT STRESSED PERSON

Fig 8.2: Real time not stressed person

8.3 OUTPUT

Fig 8.3: Readings of Heart Beat

8.4 NOTIFICATION

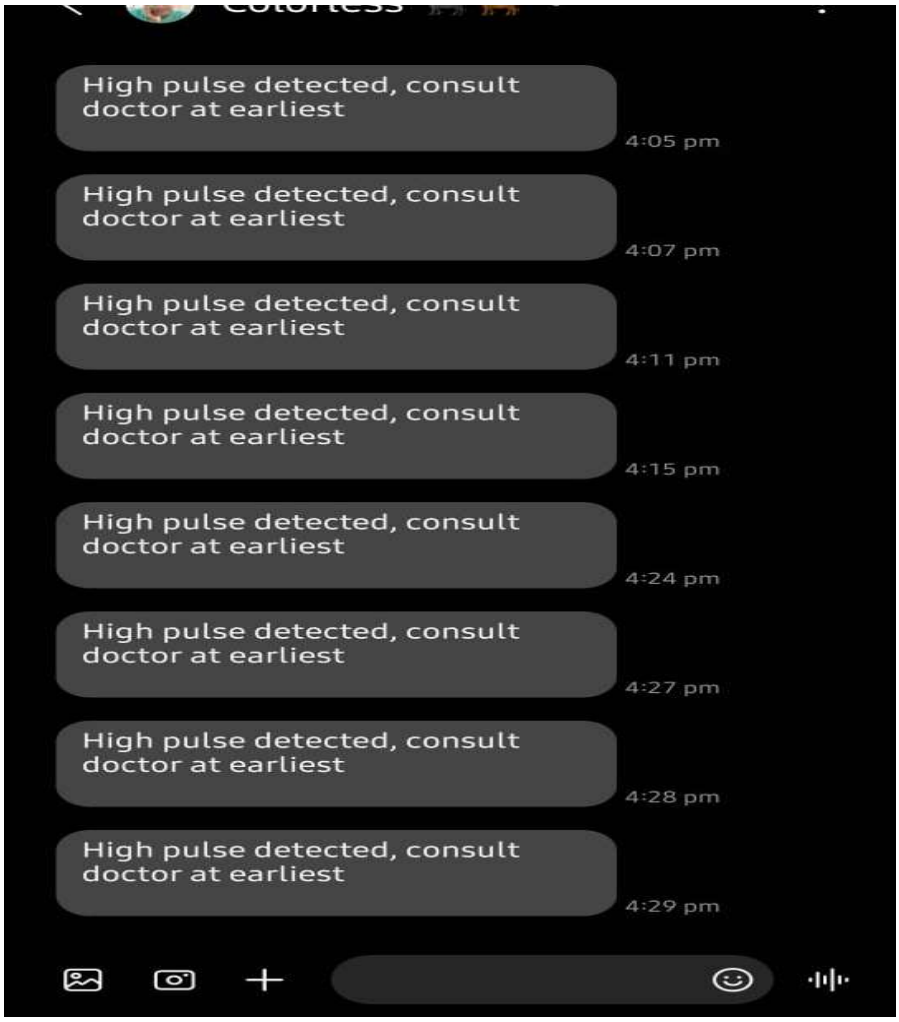

Fig 8.3: Received Notifications

CHAPTER 9

CONCLUSION

In this project, we presented a new FER method based on geometric features for real-time embedded systems, especially those of intelligent vehicles. As the initial step for building a real-time system, we first limited the number of landmarks used for generating geometric features instead of using all the landmarks. We plan to improve our algorithm to reduce the false recognition rate when the face is rotated or partially occluded by objects. Moreover, a field test should be conducted with a programmed embedded board in a real driving environment. Our goal is to provide the users a wonderful experience of studying and gathering knowledge.

The computational models, which were implemented in this project, were chosen after extensive research, and the successful testing results confirm that the choices made by the researcher were reliable. The system with manual face detection and automatic face recognition did not have recognition accuracy over 90%, due to the limited number of model faces that were used for the PCA transform. This system was tested under very robust conditions in this experimental study and it is envisaged that real-world performance will be far more accurate. The fully automated frontal view face detection system displayed virtually perfect accuracy and in the researcher's opinion further work need not be conducted in this area. The fully automated face detection and recognition system was not robust enough to achieve a high recognition accuracy.

The only reason for this was the face recognition subsystem did not display even a slight degree of in variance to scale, rotation or shift errors of the segmented face image. This was one of the system requirements identified in section However, if some sort of further processing, such as an eye detection technique, was implemented to further normalize the segmented face image, performance will increase to levels comparable to the manual face detection and recognition system. There are better techniques such verification applications since this need a very high degree of accuracy. The real-time automated pose invariant face detection and recognition system would be ideal for crowd surveillance applications. we obtained in this study, which was conducted under adverse conditions.

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