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Minimization Collision and Robbery Framework for Your Vehicle

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Abstract: Driving vehicles is one of the amusing things that individually do, a side interest for another but in the meantime is a hazardous instrument that could lead to death if used in the wrong way. Recently, the number of vehicle's theft had risen essentially which led to great losses at both individuals and establishment (insurance agencies) levels. Thus, a great interest emerged as ways to protect vehicles from theft. This study presents anti-robbery and protection framework that consists of two phases. In the first phase, face recognition techniques are employed to identify the vehicle's owner to secure the vehicle from burglary. Once recognized, the bluetooth on the phone activated and signally connected to the arduino which is fitted inside the vehicle. Then arduino connecting (shield, wires, servo motor) of the vehicle door lock and engine; opens the lock and start the engine. Otherwise, if the user has not identified the door remains locked and the alert system is activated. In the second phase, during driving the eye locomotion is observed using a mobile to reduce or limit collision. In the case of proven snoozing, the reflexes of the driver are translated by the designed system to warn the driver by a beep to save his life and also signal an alarm that stops the vehicle sequentially using its brake system. The process is repeated every 6 sec to perceive if there is any distraction or somnolence that might occur during driving or not. Three types of the database have been used to test the proposed framework namely, face 94, ORL and Live database. The performance evaluations metric based on the False Rejection Rate (FRR), False Acceptance Rate (FAR) and elapsed time have been used to assess the effectiveness of different facial recognition techniques. Software results using MATLAB on a test set of photos have proved that the Principle Component Analysis (PCA) technique has a superior performance. The executed framework uses the android operating system in a smartphone to assist in detecting drivers under fatigue and alert driver under sleepy conditions. Comparison different techniques, the Block Matching Algorithm (BMA) demonstrated a superior performance for tracking driver's eyes for limiting a collision in real-time according to elapsed time parameter. Hardware implementation is executed using mitsubishi lancer vehicle and smartphone (Samsung Galaxy S4) has been used for testing the proposed framework.

Key words: Face recognition, eye tracking android, template matching, Arduino, servo motor

INTRODUCTION

In the last ten years, official reports estimate that the vehicle robbery rates are approximately 150 vehicles per day in Egypt and the vehicle burglary operation has become an orderly fashion of specialized gangs. These gangs exploited the lawlessness to implement their goals and illegal vehicle burglary in broad daylight. In 2015, this number is doubled in addition to hundreds or even thousands of uninsured vehicles that approximately represent about 90% of the total vehicles in Egypt, knowing that the amounts paid by Egypt insurance company of the insured them who expose to cases of robbery amounted to 100 million pounds annually.

This study presents a new framework that can help in reducing the vehicle's theft by using different techniques to detect the driver face using his smartphone and saving the driver life by using eye tracking techniques. In the first stage when the designed software on the phone identifies the face of the vehicle owner, it gives a signal to unlock the vehicle door and start the engine. This not only protects the vehicle from burglary but also represents a prosperity for the driver. A flow diagram of this part is shown in Fig. 1.

The second stage of the framework is dedicated to saving the driver's life. This is achieved by detecting any driver suffering from somnolen ce through tracking of the driver's eye blinking. Recent studies have warned that alcohol and fatigue while driving is considered as major risk factors that stand behind traffic collision. The result confirmed that the absence of a normal number of hours of a shut-eye leads to increase somnolence and reduction of attention and the sluggish response. The dangerous complexity of fatigue disorders raised vehicle

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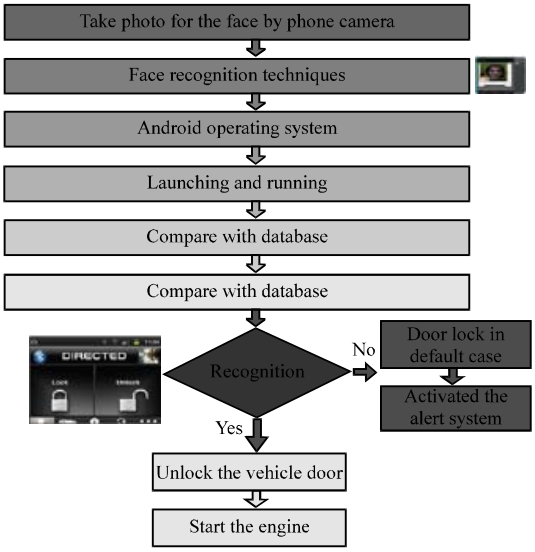

Fig. 1: The flow chart for the stage 1 proposed system to identify the vehicle owner and protect vehicle from robbery

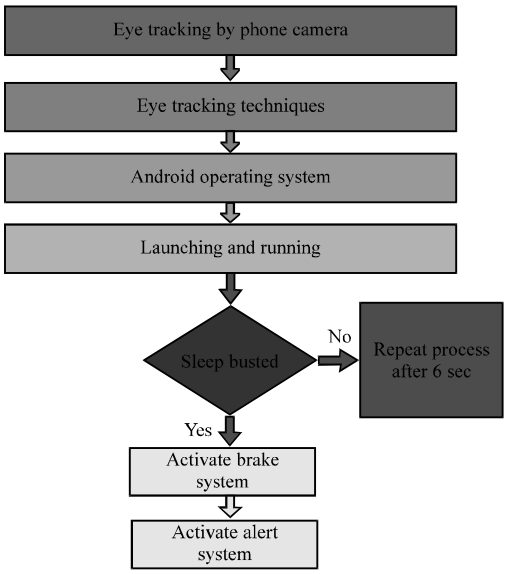

Fig. 2: The flow chart for stage 2 proposed system for protect the motorist life

collision generated by fatigue drivers. The incentives for raising sleepiness that might be driven to the driver fatigue behind the steering wheel. The lifestyle of the person and the circumstances of his work is a common reason for the number of hours if he had enough hours to rest at night or not. The need for sleepiness has become a global predicament emerging from the revolution that follows the modern societies. The number of hours of rest varies from person to person according to his need and the nature of his body. Every person appreciates the number of hourly demand to be active. Total 51% of drivers in the United States lasts to drive their vehicle, despite the deep sense of sleepy million drivers admitted that they closed eye through driving a vehicle which produced in a collision. A flow diagram of the proposed framework is shown in Fig. 2.

Transform the way of driving by supplementing an eye tracking technology for the vehicle protection framework, partner an eye tracking technique with cameras and android environment. Combining the automotive knowledge with eye tracking leads to deliver a truly superior driving solution and overcome difficulties such as reliably tracking drivers. Particularly, detecting somnolence by monitoring the details of an eyelid shut an effective protection system. Controller by a reliable way can discover if a driver is falling asleep and alerts subsequently or considered another activity. Discover distraction provides alerts if the eyes are removed away from the road. Merge eye tracking with arduino chip and use this observation to automatically change the vehicle's performance or alert the driver to potential dangers.

In 2006, Lexus presented the first driver monitoring model depends on the LS460 sensor, giving an alarm technique if the driver gets his eyes removed away from the street or it detects any sign of sleeping. Government reports show there is an enormous rise in the numbers of traffic collision all over the world are due to reduced driver's sleeplessness level. Due to this cause, generating a system to observe and warn drivers during any unusual circumstances is essential for collision limitation. Therefore, the mission of this study is to reduce the issues of rising fatigue collision of driving.

The operating system used was an android (open source) featuring both (system to operate android smartphones and a platform for software improvement). Inherently android gives developers or programmer's possibilities necessary to improve/update/develop smart phone's applications. Lastly, continuously remember and be very careful about the case of feeling somnolence whilst driving, rest in a safe place and take a break.

Face recognition; an overview: Technological development and information which conquered the world tried to take advantage of God Almighty and his wisdom in the creation of human beings different from every individual characteristic that distinguishes persons. The most important of these properties (e.g., faces and eyes), shall be considered as a technical distinction of persons.

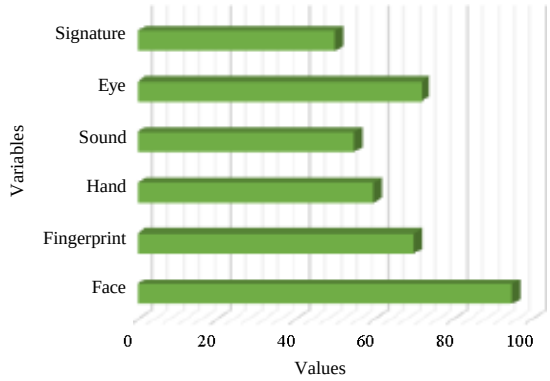

Fig. 3: The order of the physiological characteristics by Heitmeyer

Fig. 4: Illustration of face recognition obstacles

One of the most successful techniques within the field of photo analysis and perform operations technology comprises to recognize faces or facial imprint is the result of tremendous progress in all fields, especially in the field of photo technology has received attention from several bands on whether the scope of private and government-wide institutions or individuals.

Security is on the most important areas in which this technique is used on a large-scale in recent times, like other existing security systems that rely on other biometrics such as fingerprints or iris of the eye. "recognize faces" a study that estimated will make us distinguish people by reference to the available database which has a set of photos.

This process is hiding behind a lot of complex steps that will eat the explanation and clarification. This study discusses the idea behind the face of the existing fingerprint system. Human enjoyed many characteristics that allow for the identification joined with behavioral characteristics. These total properties are as follows: face, fingerprint, hand size and details, the sound, the eye Heitmeyer, footprint have identified the arrangement of these properties based upon the percentage of identification systems consider the current Heitmeyer result and manual signature. Ranked also gave in on many things Heitmeyer is shown in Fig. 3 were found that the face is the best characteristics adopted such as ease of application, steel gear requirements, acceptance when the public and others. The face is the significant characteristic biometric apply by persons as shown in Fig. 3. Identifying faces is a thing that people normally perform without effort and without much thinking. However, it has still a challenging difficulty in the range of computer vision. Face recognition has a number of useful characteristics that manage an investigation into practical systems. The face-recognition process is a set of two tasks: face identification and face verification. There are multiple obstacles that confront the design of a good face-recognition framework including head poses, lighting circumstance, appearance, facial accessories, influence of aging and various persons may have a similar appearance (twins, father and son) is shown in Fig. 4.

Generally, the major interest in any face-recognition system is its capability to precisely verify a claimed identity or discover a person's most likely identity from a collection of potential matches in a database. Three standards to examine the designated identifying power (Phillips *et al*., 2000), False Rejection Rate (FRR), False Acceptance Rate (FAR) and elapsed time.

Monitor operation; an overview: Monitoring operation can be performed by using two ways: monitor the vehicle or keep an eye on the driver manner. The first method for monitoring the vehicle could be implemented by steering wheel motion, gas pedal or 3 brake patterns, vehicle speed and lateral displacement. These ways are not annoying ways to detect sleepiness as it does not touch the driver. However, they have a defect; it's bound to driver conditions and vehicle model. The second method for observing the driver's manner could be implemented by recording the driver response and discover sleepiness. This periodically involves requesting the driver to deliver a reaction to the system to running alertness.

The annoying thing about this technique is that it will become uncomfortable sometimes to the driver. The best technique depends on the human physiological phenomena based on accuracy. This technique executes in two ways; measure the changing in physiological signals such as brain waves or heart rate. Sensing electrodes would be touched directly the driver's body and hence be distracting the driver so it's not actually comfortable. Furthermore, long time driving would cause in sweating on the sensors; decreasing their ability to observe accurately and registration physical variation eye blinking, leaning or the open/closed cases of the eyes or sagging posture of the driver's head. This technique

which presented throughout this study well convenient for real world driving conditions since it cannot touch the driver body and by using smartphone cameras to detect variation (Boening *et al*., 2006).

Eye tracking (overview): The National Highway Traffic Safety Administration (NHTSA) measures that somnolence is the major causative factor in 100,000 police announced that collision per annum. NHTSA makes an additional investigation which indicated that 80% of collisions happen within few seconds of a distraction. By providing cars with the facility to monitor somnolence and inattention, driving protection can dramatically be improved.

Eye tracking in the particular expression is the measure of eye activity. The theory is easy but the implementation of a system for interpretation is quite complicated. Namely, this is affected by extreme difficulties like head movement, closure of the eyelid, blink repetition, the presence of glasses, illumination and performing a real-time execution. All these difficulties can cause the system to fail in detecting eye position and influence system execution and accuracy.

Goals and challenges: The ultimate goals of this study design a framework using the android environment to verify the user's identity for automobiles; merge eye-tracking techniques and cameras into vehicles; give alerts to the driver to tell him/her when a shut-eye busted to occur and control the vehicle with lock engine, active alarm and control the brake system according to the proposed system. However, there are multiple challenges that complicate an accurate implementing of the framework these challenges stems from; the kind of lighting systems that can change the color of the face (outside the vehicle) and it made it difficult to track the eyes (inside the vehicle) over time because as a person grows older and face exposure to changes such as weight gain or frequent wrinkles that could prevent identification; one of the biggest concerns when implementing the system is to achieve respond quickly and effectively to save the life of the driver (achieved appropriate decision time) and the head movement freely makes the eye tracking difficult process (the tracking process of the eye limited by the range of the mobile camera).

Data collocation: Three types of the database have been used to test the robustness and accuracy of the proposed framework. Faces 94 collected at the machine vision and media processing unit, University of Oulu. It includes a photo at a fixed distance from the camera whilst a series of photos capture. Represent of individuals 153. The photo resolution; 180×200 pixels. The guide (20) female, (113) male (20) male staff (11); Olivetti Research Laboratory (ORL) Includes a collection of face photo captured between April 1992 and April 1994 at the lab. Used by Cambridge University. There are ten different photos of individually of 40 different subjects. The photos were captured at various times with changing in lighting. Facial appearance (open/closed eyes, laugh/not laughing). Facial specifics (glasses/no glasses). The photos are in PGM format and the size of the individual photo is 92×112 pixels with 256 gray levels/pixels and live database here a random live photo is taken by a smartphone in JPG format.

Table 1: The recognition percentage and recognition time for ORL database using Principle Component Analysis (PCA)

		PCA	
No. of test photo	No. of photo in database	Recognition (%)	Recognition time (sec)
360	40	80.00	0.118
320	80	88.75	0.124
280	120	94.64	0.161
240	160	95.00	0.188
200	200	95.50	0.198
160	240	97.50	0.193
120	280	98.33	0.170
80	320	97.50	0.130
40	360	98.50	0.074

Face recognition approaches: In literature, there are multiple approaches that are used for face recognition. Here four approaches will be investigated as they are the most efficient and widespread techniques.

Principal Components Analysis (PCA): The proposed Technique initialization; take the test collection and determine eigenfaces which represent eigenspace when current face encounters, determine its weight; determine if the photo is a face or not; if yes, categorize the weight pattern as distinguish or not and learning if the same undistinguished face appears several times combine it into distinguishing faces (Sirovich and Kirby, 1987). The result and the performance metrics is shown in Table 1.

Linear Discriminate Analysis (LDA): The proposed Technique; load photos from a database; divide the data into training and test collection; determine the LDA subspace used the test collection and determine training and test feature vectors using LDA for feature extraction. The result and the performance metrics is shown in Table 2.

Elastic Bunch Graph Matching (EBGM): The proposed Technique; construct a face graph by representing the scheme arrangement for the particular pose; construct

Table 2: The recognition percentage and recognition time for ORL database using Linear Discriminate Analysis (PCA)

		LDA	LBA
No. of test photo	No. of photo in database	Recognition (%)	Recognition time (sec)
360	40	80.00	0.119
320	80	88.75	0.126
280	120	93.64	0.164
240	160	94.00	0.189
200	200	95.50	0.199
160	240	95.50	0.195
120	280	96.33	0.174
80	320	97.50	0.134
40	360	98.50	0.078

Table 3: The recognition percentage and recognition time for ORL database using Elastic Bunch Graph Matching (EBMG)

		EBMG	
No. of test photo	No. of photo in database	Recognition (%)	Recognition time (sec)
360	40	81.00	0.217
320	80	88.78	0.225
280	120	93.67	0.263
240	160	94.06	0.285
200	200	95.57	0.294
160	240	95.54	0.292
120	280	96.37	0.271
80	320	97.56	0.231
40	360	98.58	0.177

a face bunch scheme; construct the representing gallery of schemes; construct the probing scheme for a new photo and shall obtain the described person in the gallery; the photo scheme is compared with all representing schemes and recognition by the representational scheme with the highest similarity with the photo scheme is the candidate to recognize's. The result and the performance metrics display in Table 3.

Discrete Cosine Transformation (DCT): The proposed Technique; the input photo has a size N×M and f (i, j) is the concentration of the pixel at x (i, j); compute the coefficient of DCT for the pixel at x (i, j). For most photos, the signal energy lies at low frequencies. These frequencies show in the upper left corner of the DCT. The lower-right values represent higher frequencies then compression accomplishes; these frequencies are often small enough to ignore with little visible deformation; normalization and zigzag scanning; gather low-frequency coefficients present at the top of the vector; the eye regions cropped with a size of 16×16 pixels; the nose and mouth region cropped; local features like eyes, nose and mouth extract from the given face photo; the maximum margin of the nose region is 40×25 pixels and the mouth region is 50×30 pixels. the result and the performance metrics is shown in Table 4.

Use your face to secure your vehicle: Unauthorized use of a vehicle is widespread in every country. The unauthorized use for instance a child taking a parent's

Table 4: The recognition percentage and recognition time for ORL database using Discrete Cosine Transformation (DCT)

		DCT	
No. of test photo	No. of photo in database	Recognition (%)	Recognition time (sec)
360	40	81.05	0.420
320	80	88.16	0.410
280	120	93.77	0.356
240	160	94.86	0.332
200	200	95.59	0.321
160	240	96.17	0.295
120	280	96.41	0.275
80	320	97.88	0.228
40	360	98.95	0.219

vehicle without authorization a servant driving the vehicle for a "joy spin", etc. The interested in this study is a vehicle burglary. Complicated techniques usually applied in the security of vehicles. Power door lock this is one of the most popular and regularly available techniques. This technique allows the driver or the front rider to lock or unlock concurrently all the doors of a vehicle by pressing a button or flipping a switch. Every vehicle design now quipped with this feature as at least facultative equipment. Nevertheless, if the unapproved person obtains passed to the switch then the system renders ineffective for security (Merino *et al*., 2002); remote keyless system this term commonly used as a keyless entry or remote central locking. Its include a short-range radio transmitter and necessities are inside a specific range, usually 5-20 m (15-60 ft) of the vehicle to work. Because it's short-range, this system becomes unbelievable (Sato *et al*., 1999) voice recognition system comparison of the methods presents earlier these are slightly more attractive and user-friendly methods. Hereabouts user easily demands to pronounce password and depending on signals created, the user is ensuring the access. Despite the excellent speech recognition, systems sometimes make mistakes. If there is noise or any other sound in the environment then the number of failures will rise (Almomani *et al*., 2011). Vehicle face recognition system this is one of the best techniques soon available. It involves launching of an electronic device in a vehicle connected to face recognition system to decide for accessing. This makes a vehicle more protected in cases of theft, preventive technique and effective.

Description of the face key system: The security alarm system equipped with arduino controlled automobile according to a mobile software design for giving a tremendous level of vehicle security. The mobile controlled vehicle security presents many characteristics of an efficient two-way interaction between the alarm

system and the vehicle owner. This system is capable of informing the owner instantly when broken into is detected. Additionally, the owner can relate to an automobile security system based on face recognition structure via a phone call. This system has the possibility to give location data to help the driver if he/she needs help, therefore, offering an improvement over the traditional alert system. The traditional system defects like single alert system exist that can't control. The block diagram consists of a memory unit in a phone store the different driver photo; the face detection system used to detect the face of the driver and compare it with the predefined photo and arduino to lock or unlock the vehicle door, control fire alarm and turn the engine. As shown in Fig. 5. The software design by the android environment is shown in Fig. 6.

Fig. 5: Illustration of the proposed block diagram for face recognition

The memory on the phone can save the photo of the owner and his family. Pending the opening lock process and start the engine the camera will capture a photo of the host or the vehicle owner and match it with the saved photos. If both photos match perfectly then there is no broken into. The face-recognition techniques which discuss early done such that by provides a contrast between the face and the background and thus the move of a face are not taken into account.

Two possibilities deal with at this instant: If the identification of the user has verified, the bluetooth of the phone is activated and related to the arduino which picking up the signal emerging from the phone. After that, arduino that is located inside the vehicle to perform task A which is related to the main door open the lock and start the engine. In the case of failure to recognize the bluetooth phone is activated and relate to arduino to perform task B which keeps the vehicle door locked and fire the alarm. The parts needed as shown in Fig. 7 and consist of Arduino (arduino Uno) practice here which having 14 pins. Pin [0, 1] is the external pin and the others are internal pins. Devices like motor or alarm related to [0, 1] pin. This pin used to transmit and receive the data

The electric door strikes to try on it or the vehicle door; Bluetooth module (here working with HC-05 Bluetooth which is so familiar and inexpensive), relate RX on the Bluetooth module to TX on arduino board, plus TX on the Bluetooth module is then related to RX on the arduino; GND is certainly related to ground and finally VCC is related to 5 V. Power Supply (to achieve the desired voltage and amperage vary among several doors, strikes or locks). TIP120 Transistor (it will

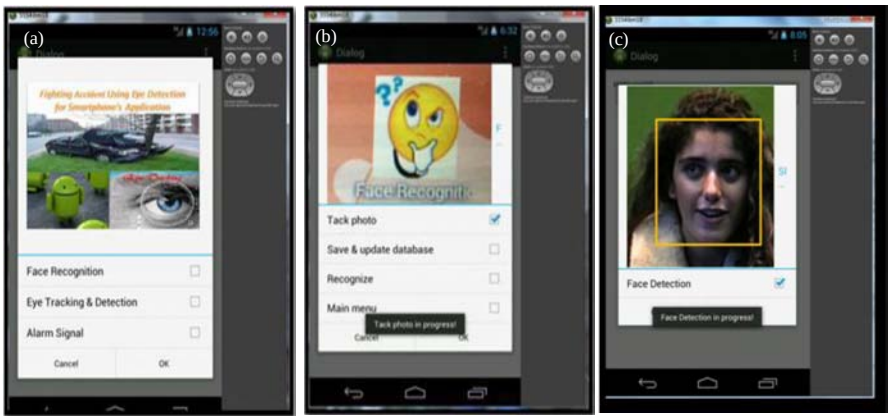

Fig. 6: Design of the main-menu and sub-menue of the android framework using Ecilps: a) Main menu for the safety drive system application; b) The process of organize the owner system in submenu and c) Face detection and identification submenu

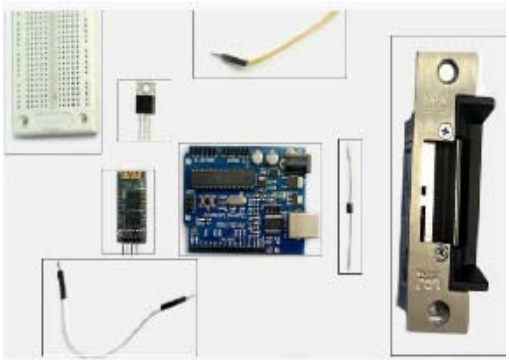

Fig. 7: The hardware component used to control the arduinu by android OS

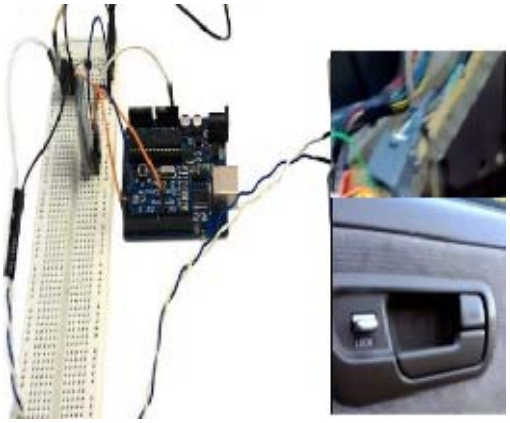

Fig. 8: The final product to control the vehicle door (lock/unlock)

permit controlling the device that demands extra current than the related arduino can provide by giving the transistor various values. Transferring the signal from pin 9 on the arduino to the base of the transistor and according to the value transfer, current will plus or minus). 1N4001 diode (it indicates away from the ground; it related to the collector of the transistor as well as the ground of the lock itself. It provides a safeguard for the electronics from any reverse voltage that might be generated when a lock turned off for managing the lock at this point-set pin 9 to high or low). Hookup wire and a solderless breadboard. Android phone (to transfer the serial observation to Bluetooth's modem).

The final product as shown in Fig.8 after related all components with each other, programming the arduino and receiving the bluetooth signal from the phone after confirming the identity of the driver. If the person does not recognize the vehicle lock after that the sound system activated to play an alarm to make the thief feel shocked. If the identification process was done then the lock of the vehicle door is opening after that turn on the engine. The following steps describe the components of this process The previous components. Total 1 shields on the smartphone. Vehicles fuse (removing the fuse in the vehicle power section that relates to the vehicle keys and the engine, can turn off the engine).

Relay (12 V- 40 A) OR 4X relay (10 A), putting a relay at this node to control whether to turn off the engine or not. The max current pass through it around 40 A so it is extremely high. To solve this problem finding a 40 A relay or here used 4 relays individually can carry 10 A and use them in parallel to split the total current on them. Uploading the code to the arduino and attaching it to Bluetooth's module and the fuse box in the vehicle. Open the application in mobile picked the desired shields (Bluetooth module) to relate and turn the engine on.

MATERIALS AND METHODS

Eye tracking methods: Eye tracking methods are generally classified into three main categories the first category is the Electrooculography (EOG). This technique is based upon the existence of an electric field that changes its potential as the eye moves in its orbit. To detect these changes in the electric potential, electrodes are put on the skin around the eyes. EOG is a very robust procedure for measuring eye motion related with a gaze at shifts and distinguish blinks.

EOG demands very low computational power, operates under various lighting conditions and can execute as a self-contained wearable system. The limitation of EOG is comparatively poor gazes at direction precision compared to a video tracker. Using EOG it is difficult to determine exactly where a subject is looking with good accuracy, though the time of eye movements. The system regarded as invasive due to the necessity of placing the electrodes directly on the user's face. The second type is contact lenses. This is an accurate method to track the user's eye achieved by special contact lenses. An integrated mirror with the contact lens enables measuring reflected light. Alternatively, combined coil in the contact lens enables to identify the coil's direction in a magnetic field. The limitation of contact Lenses is extremely invasive and the contact lenses that the user needs to wear are usually connected to wires, making the system very uncomfortable to use. The use of this technology is therefore limited to laboratory research. The third category is the video-based eye tracking. In this method, the camera is used to record the eye movements of the user and extract information of different eye features. The advantage; non-intrusive and in most cases,

the user does not need to wear any extra gear. video based systems are the most common eye tracking systems categorized to the remote system and head-mounted systems.

Head-mounted systems: Head-mounted systems, the camera and light sources placed on the head of the user. Usually mounted on a helmet or a pair of glasses. Such systems make mobile eye gaze at interaction on head-mounted displays possible.

Remote systems: The camera and light sources placed at a distance from the user non-intrusive configuration. The user is often given the possibility of moving in front of the screen as long as the eyes are kept within the field of view of the camera. This technique which implements is well convenient for real world driving situations because of it non-inserting in the driver body and by using smartphone cameras to detect changes.

Eye tracking algorithms: Eye tracking algorithms can commonly be classified into shape-based, appearance-based, feature-based, hybrid and template matching-based methods (Hansen and Ji, 2010). The template matching technique is a popular, successful method which has been used in photo recognition, it uses pixels, samples, models or textures as a pattern. The function of recognition computes the differences between the stored templates and these features, it uses distance measures and correlation.

It used for tracking the user's eye this is the fastest method and done by takes the input photos from a phone camera. This technique used in digital photo processing for detecting small portions of a photo which match with a template photo. Used in manufacturing as a portion of quality control, a method to navigate a mobile robot or as a method to distinguish and track eye in photos. In the photo and video processing, it has multiple applications like face recognition and eye tracking. The template-based method is an efficient way for stronger features or for the bulk of the template photo creates the matching photo. As mentioned earlier, considering template-based matching may probably demand to sample a huge number of points, it is possible to shrink the number of sampling points by decreasing resolution of the search and template by the same factor and execute the operation on the consequent downsized photos offering a search window of data points inside the search photo so that the template does not have to seek every viable data point or a mixture of both. The template matching fundamentals and algorithms.

Fixed template matching: This approach is beneficial if the target shapes do not vary with respect to observing the angle of the camera.

Deformable template matching: This algorithm is also proper for situations where targets in the database will change due to rigid and non-rigid deformations. The template describes the characteristic contour or the edges of a target shape. An objective function with transformation parameters which modify the shape of the template, formulated indicating the expense of such transformations. The aim function, reduced by iterative refreshing the transformation parameters to match the target sufficiently.

Multiple template matching: It uses multiple templates instead of a single template. It is more flexible to use multiple templates than a single template and consistently provides better solutions. The sequence to estimate for changes in the biometric information of a user, many templates comparing to every user may save. While authentication, a user's biometric information already repeatedly taken and processed and the extracted feature collection matched against the templates saved in the database in sequence to recognize an earlier enrolled validate a claimed to recognize. The matching precision of a biometrics-based authentication system relies on a balance of the biometric information connected with an individual over time (Jain *et al*., 2013).

Block Matching Algorithm (BMA): Broadly used, a method for stereo vision, visual tracking and video compression. It is a standard technique for encoding motion in video sequences. It aims at detecting the motion between two photos in a block. The blocks are regularly established by dividing the photo frame into non-overlapping square sections. Any block from the popular frame matched into a block in the target frame by shifting the current block over a predefined neighborhood of pixels in the target frame. At every shift, the sum of the intervals between the gray values of the two blocks calculated. The shift which provides the smallest total interval reflected the best match. The result of the template matching algorithms using the live database is shown in Fig. 9-13.

Save your life by eye tracking system: Now, eye tracking technology has shown great succeeds in automotive applications. Progress in this technology has reached into another manufacturing area. Generation of eye tracking technology to catch driver fatigue and began a key experiment for new protection technology is the main

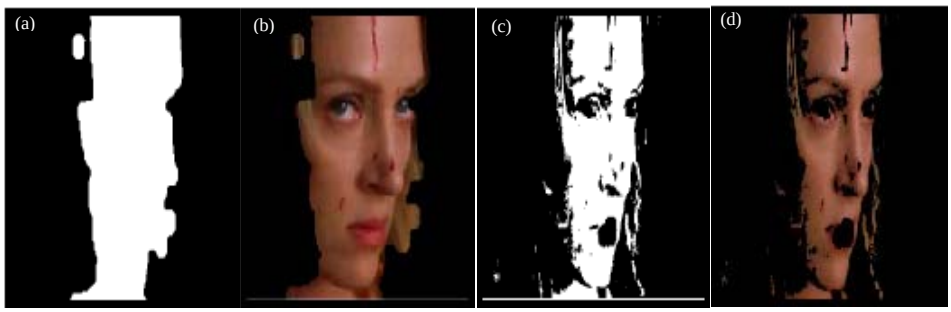

Fig. 9: Preprocessing steps of eye tracking: a) Extract ythe face in B/W format; b) The face area; c) Detaect the eye in B/W format and d) Detect the eye in the original format

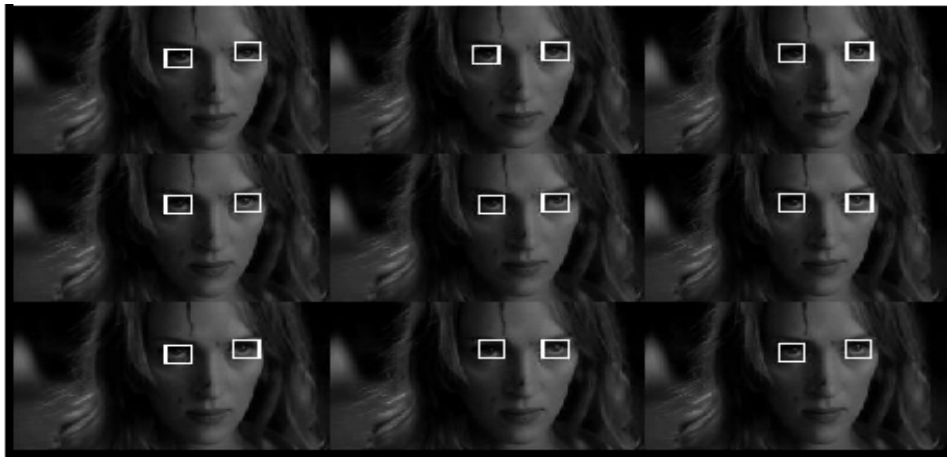

Fig. 10: An example of eye tracking using fixed templet matching for nine frame

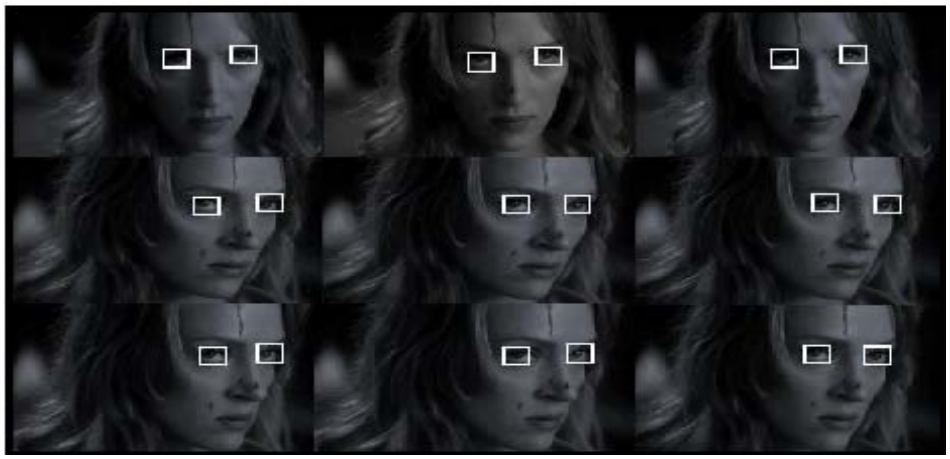

Fig. 11: An example of eye tracking using deformable templet matching for nine frame

object of the proposed system. The driver protection system technology starts its life in the mining, manufacturing but it has the potential to protect lives. The designed software system to detect driver fatigue and distraction is shown in Fig. 14. It counts on eye-tracking technology to obse rve the driver's face, sending a signal if it detects either distraction or fatigue. The system slows down the speed according to the bluetooth connection

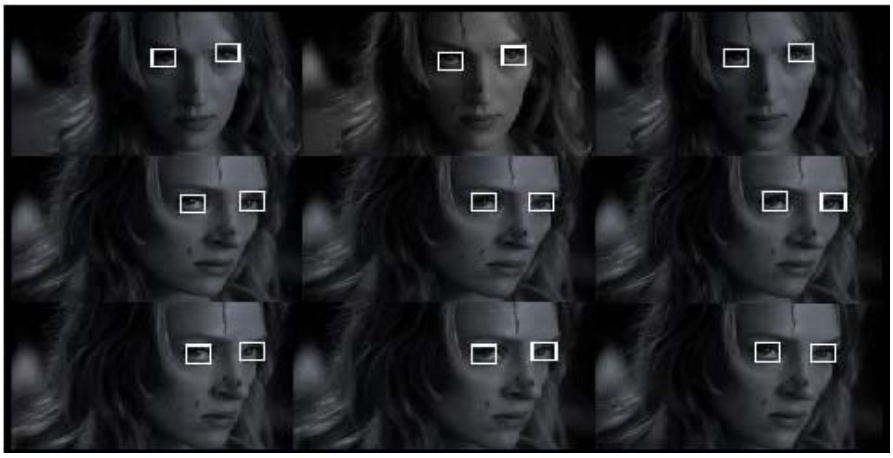

Fig. 12: An example of eye tracking using multiple templet matching for nine frame

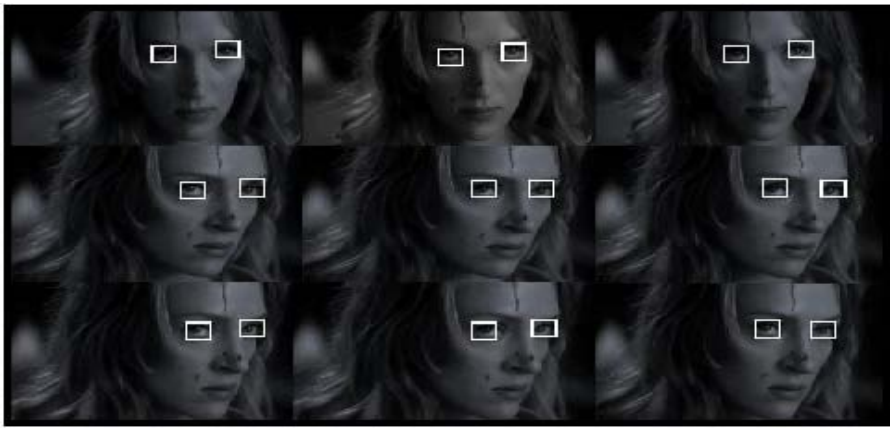

Fig. 13: An example of eye tracking using MBA for nine frame

Fig. 14: Illustration of the eye detection and tracking process

between the android system and arduino and the brake system. Brake systems in general classified into the "service brake" that decelerates moving wheels when the driver uses the brake pedal and the "parking brake" that

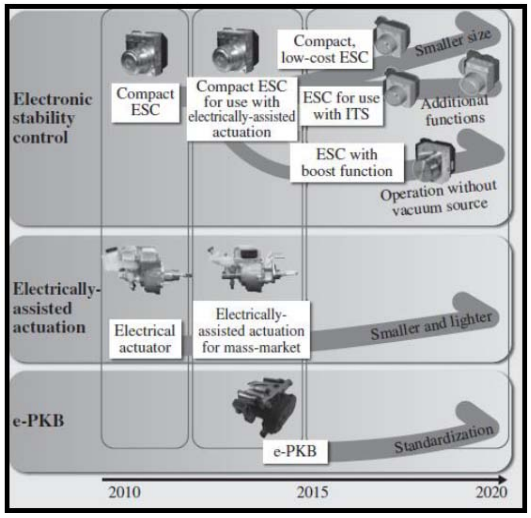

Fig. 15: Roadmap for controlled brakese-PKB electric parking brake ITS intelligent transport systems

Fig. 16: A flow diagram showing the car owner protection from collision in simplified steps

stops stationary wheels from moving. In addition to braking and parking, brake systems also need to afford exceptional protection with Antilock Brake Systems (ABSs) that prevent wheel lock and Electronic Stability Control (ESC) that prevent vehicle spin and drift-out that becoming standard features.

The protection, comfort and environmental performance of vehicles have also been improved through optimal control of the braking force with greater use being made of electric drive in parking brake mechanisms and devices for boosting the braking force applied by the driver. Controlling brake has become a significant part when examining the execution of improved vehicles. The developments in brake technology versus the background of these trends by Hitachi is shown in Fig. 15.

The hardware implementation of this part consists of three main parts; a memory unit in phone stores the different template matched photo for an eye; the eye tracking detection framework used to track the driver's eye and comparing it with the predefined template photo and arduino "here arduino Uno is used "to activate the vehicle brake system and activate the alarm also. The software design by the android environment is shown in Fig. 16. The component that needed in the design.

- Arduino board; Hc-06 Bluetooth module; NPN and PNP transistors SK100 and SL00; power supply
- Android phone; phone holder
- Servo motor (0-180°); relay

The system can execute speed reduction, gradually and automatically when detects any sleepy eyes. This system includes Hc-06 Bluetooth module which receiving a signal from the phone and activates the arduino according to the detection pulse information. Controlling to servo motor turn automatically by the pulse information then controls the braking system of the vehicle. Thus, this system configuration can assist the drivers when they may not ready to brake the vehicle perfectly at the desired time because of sleeping, fatigue, however, the vehicle can brake automatically according to the proposed system.

The servo motor can operate by a square wave which is generated by arduino board output at pin 3. A combination of NPN and PNP transistors SK100 and SL00, respectively, amplify the signal and fed to the servo motor. During the high state of the square wave, the transistor Q2 drives the servo through pin 3 and in the low state the transistor Q1 drive through the pin 4.

The arduino differentiates the input signal at the pin A_2 (analog input). The pin A_2 differentiates the received signal with the value of a normal signal received when no input on the arduino receiver. The initial analog value read by arduino when the power is ON in a normal state of the receiver circuit and this value used for the comparison.

The input of arduino reaches to the maximum value when there is no signal and the voltage magnitude value will reduce if any signal arrives. The servo motor drives by arduino when the signal detects, it turns from angle 45°-0. After delay timing (predefined by the user) and activates the relay to cut off the motor driving supply. When the normal state occurs, the servo rotates back to 45° and the relay to NC (Normally Closed). Consequently, the braking system activated each time and stops by using the servo mechanism and the relay to control the vehicle if any sleepy or somnolence detects.

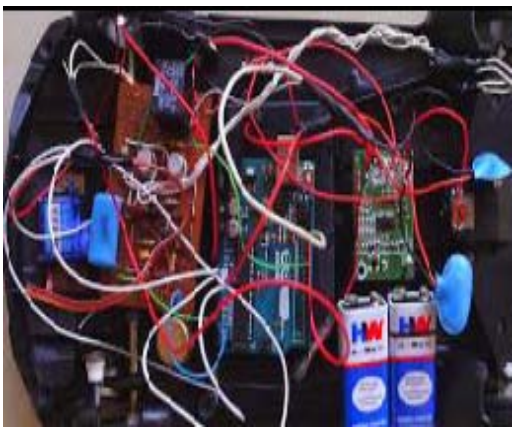

Fig. 17: The wiring process between the components (trial version)

Fig. 18: The final product to control the vehicle's brake

The programming process to communicate all the components with each other using arduino software. The wiring process of the previous component is shown in Fig. 17. A Mitsubishi Lancer vehicle and smartphone (Samsung galaxy S4) have been used for the proposed system and for the simulation process. Controlling the vehicle by using an eye tracking techniques will be a popular type of device control hence performing the procedure with comfortable, easier and with less driver presence. The system to monitor the driver fatigue by detecting an eye blink and thus save more lives is shown in Fig. 18.

RESULTS AND DISCUSSION

The recognition percentage and recognition time for the discussed face recognition techniques have been examined using MATLAB program. A sample of the result in ORL database is shown in Table 1-4. Although, when using recognition for the identification framework to prevent stolen, the FAR should be minimized and FRR should minimize too. In Table 5. Comparison between methods is presented and according to the proposed application, the result explained that the PCA method is the most proper performance. The designed android application menu and submenu to take face photo and performing face recognition using the Eclipse-java-juno-SR1-win32 program as shown in Fig. 6. The hardware component for protecting the vehicle is shown in Fig. 7. The final connection is shown in Fig. 8.

The result of the template matching algorithms using MATLAB program to exam live database is shown in Fig. 9-13. The comparison between the algorithms according to elapsed time and the number of frames is shown in Table 6. Combining eye tracking technique with the android platform to create smart eye to meet the market's requirement of a real-time and entirely non-invasive eyelid and head tracking technology.

The BMA algorithm overcomes problems associated with varying eye sizes and orientations with the smallest time for sequences of the photo. BMA method implemented considering to reduce the execution time. However, computation time-based BMA still needs to be reduced according to block search algorithm. The obtained result for BMA selected after trying different block size to reduce computation time in photo sequences.

The driver photos are recorded with a smartphone camera that captures eye locomotion. The sequence of photos is taken from the original photo to reveal the fixations of eyes per photo for better comprehension. After capturing photos and detecting the eyes by the designed android application is shown in Fig. 14 comparing with the stored photos in phone memory there are two events; detecting the eyes blinking the connection between phone and arduino deliver a signal to turn on the alert and another signal for the brake system to stop the wheels gradually (by using arduino, servo motor) as illustrated in flow diagram Fig.16 and no sleeping busted then keep taking photos every 6 sec. Eye tracking on the android devices are presented in this study and soon different domain of security and safety for the devices and proprieties will use it. The design software could be download and operated on any model of DROID phone. Figure 17-18 shown the final product in trial and actual version.

The proposed framework specification OS; Android 4.2.2 Jelly bean; face recognition u sing PCA and eye tracking using BMA; the elapsed time for software

Table 5: Comparison of the employed face recognition approaches according to verification rate False Acceptances Rate (FAR) and False Rejection Rate (FRR) for ORL database

	The verification rate (FAR) (%)				The verification rate (FRR) (%)			
Rate at (%)	PCA	LDA	EBGM	DCT	PCA	LDA	EBGM	DCT
1	86.79	88.00	90.00	92.00	10.75	5.150	3.250	3.450
0.1	66.79	69.43	71.43	75.43	15.79	18.79	9.390	10.39
0.01	45.00	47.29	49.29	50.29	35.00	36.00	24.00	25.00

Table 6: The video analysis by frames and the time elapsed

No. of frames	Elapsed time (sec) fixed template matching	Elapsed time (sec) deformable template matching	Elapsed time (sec) multiple template matching	Elapsed time (sec) Block Matching Algorithm (BMA)
9	6.510	5.440	7.230	4.920
18	14.32	12.31	15.12	11.33
36	29.41	27.45	30.13	25.95
72	46.33	42.36	47.31	40.29
116	51.69	59.68	52.42	57.95

simulation in the recognition process; 0.074 sec for testing 40 photos; the stored database consists of 360 photos; the elapsed time for software simulation in the tracking process: 4.94 sec for testing 9 frames; the stored database consists of 120 frames and the whole software process 5.014 sec.

CONCLUSION

Face recognition is a challenge compared with other biometric authentication such as fingerprint recognition, voice and speech recognition. Each of these could be executed in a design aimed at a broad customer. The face recognition on the other hand has the ability to be more precise than other kinds of biometric authentication and in the industry of this technology will witness a great increase notwithstanding. Sensors of all types become tinier and the software of biometric authentication becomes more intelligent, no necessity to type passcodes and passwords to obtain access to any devices, information, accounts or vehicles. This study has introduced an android-based software to reliably and securely locked the vehicle, by recognizing the owner's face. Software design using existing mobile cameras for authentication distinguishing persons of concern from archived video recordings or from the real-time (live) video. Three types of the database have been used to test the proposed framework Face94, ORL and Live database. Meaningful performance evaluations metric based on the false rejection rate, false acceptance rate and elapsed time have been used to assess the effectiveness of different facial recognition techniques. Results on a test set of images have proved that the PCA technique has a significant difference and superior performance according to the evaluation performed. Protect human life by reducing the proportion of exposure to accidents using an eye tracking technology. Road traffic is growing quickly because of accessibility of different public and private ways of transportation. The stream of traffic infrequently halts at any time of the day because of huge work schedules and traveling requirement. This sequential guide to continued driving time by not just people who are driving continues to suffer from the effect of fatigue [drowsiness and sleep privation]. The executed system uses an android-based smartphone to assist in detecting drivers under fatigue and alert driver under sleepy conditions. It is a driver fatigue detection system which uses templet matching (BMA) for tracking driver's eyes for limiting a collision in real-time is shown by elapsed time parameter. Designed algorithm tracks eyes to detect dozens, stop the vehicle wheels gradually by using the brake system also the warning system such as a beep to alert the driver and save his life.

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