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SAFETY HELMET WITH ALCOHOL DETECTION AND THEFT CONTROL FOR BIKERS

Dangeti Anu Preetham[1] , Mukundala Sai Rohit[2] , Arun. G. Ghontale[3] M. Jasmine Pemeena Priyadarsini[4]

anupreetham2@gmail.com, rohit22444@gmail.com, arun.gorakhnath2013@vit.ac.in, jasmin@vit.ac.in

School of Electronics and Communication Engineering, VIT University, Vellore, India

Abstract: **In this paper, we've designed a Smart Helmet for the safety of bike riders which includes an alcohol sensor to ensure the one who is driving the bike is sober and a rider authentication using face recognition to control theft. The programmed microcontroller 8051 indicates whether the rider is wearing the helmet with the help of two IR sensors, the alcohol sensor MQ-3 which is used to check the alcohol consumption level and the ARM 7 board, which is integrated with the PC using COM port1. A face detection algorithm called Viola-Jones coupled with SVM (support vector machines) for classification is used to track down faces for additional safety and security for the bike rider. If all the parameters are ok, then the biker is all set to use the vehicle.**

Keywords: 8051 Microcontroller, Advanced RISC Machines (ARM)7, MQ-3 sensor, Viola jones face detection, Support vector machines(SVMs).

I. INTRODUCTION

In Present days, Road accidents kill 382 in India every single day. India's daily death index due to road accidents especially two wheelers is more than four times the annual death toll from terrorism. Predictably, most of those who die on the roads perish because of preventable causes: speeding, drink driving and driving without a helmet. [20]Two-wheelers account for the largest share of vehicles on Indian roads. So, it is not a surprise that they also account for the largest number of fatalities. Wearing a helmet can reduce the risk of severe injury by 72% and the risk of death by 39%, according to the World Health Organisation .keeping all this in mind, a safety and smart helmet is designed to reduce the fatalities. [1]This ensures the rider to buckle the helmet, checking if he is sober to drive and also provides authentication for security. If all the conditions are satisfied, then the owner of the bike is all set. The objective at hand is to develop a safety[17] measure for the 2 wheeler riders to avoid fatality, lower the number of accidents and provide security to their vehicles from theft.

The prototype includes the safety unit of detection of the wearing of the helmet, alcohol detector and security unit of face recognition to allow the rider to start vehicle. One need to verify the following conditions to start the bike:

- Face Recognition of the authorised owner.
- Helmet should be worn.
- No alcohol should be consumed.
- If any one of the above conditions are violated then the vehicle will stop.

II. HARDWARE

A. Micro Controller

This segment shapes the control unit of the entire undertaking. This area fundamentally comprises of a Microcontroller with its related hardware like Crystal with capacitors, Reset hardware, Pull up resistors (if necessary) et cetera. The Microcontroller shapes the heart of the task since it controls the gadgets being interfaced and speaks with the gadgets as per the system being composed.

B. AT89S52

The AT89S52 is a low-control, elite CMOS 8-bit microcontroller with 8K bytes of in-framework programmable Flash memory. The on-chip Flash permits the project memory to be reinvented in-framework or by a customary nonvolatile memory software engineer. By joining an adaptable 8-bit CPU with in-framework programmable Flash on a solid chip, the Atmel AT89S52 is a capable microcontroller which gives a very adaptable and financially savvy answer for some implanted control applications. The AT89S52 gives the accompanying standard components: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, two information pointers, three 16-bit clock/counters, a six-vector two-level interfere with design, a full duplex serial port, on-chip oscillator, and clock hardware.

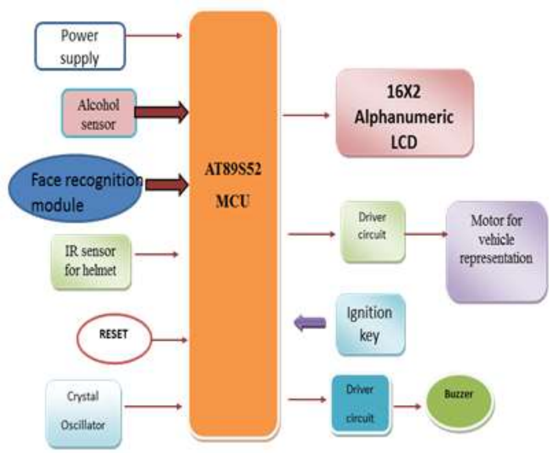

Fig 1. Block Diagram of Smart Helmet

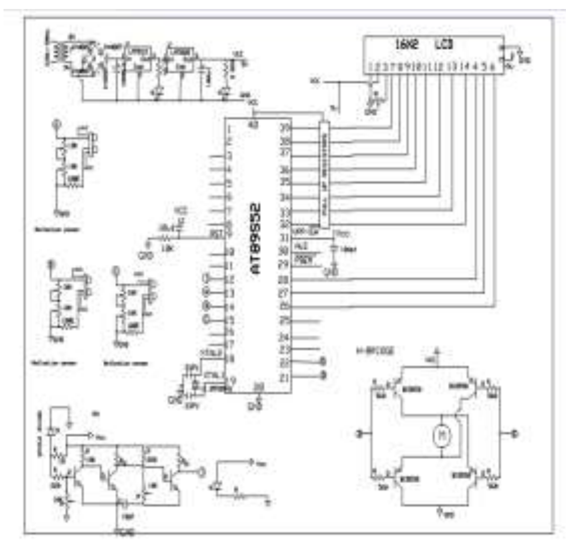

Fig 2.Circuit Diagram

III. BOARD HARDWARE FEATURES

For the most part in this present day world the utilization of vehicles is considerably more and the spot gave is less. [21]Typically in the daily busy life of the people, we see the negligence of carrying the helmet. Here is a smart helmet which is essential to carry always to start the vehicle. This helmet comes with a alcohol detector and face recognition also. The MQ-3 alcohol sensor detects the whether the rider is sober enough to ride the vehicle. This alcohol sensor is suitable for detecting alcohol concentration on person's breath, just like a common breathalyzer. Really here the idea is giving an opening to the vehicle protection and safety at a time. Here we have a prototype of helmet which is furnished with an IR sensor which actually detects the wearing of helmet.

A. ALCOHOL SENSOR

Sensitive material of MQ-3[18] gas sensor is SnO2, which with lower conductivity in clean air. When the target alcohol gas exist, the sensor's conductivity is more higher along with the gas concentration rising. So we used a simple electro circuit, which converts the change of conductivity to correspond output signal of gas concentration. MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapor. The sensor could be used to detect alcohol[16] with different concentrations, and it is of low cost and can be used for the different applications.

B. IR TRANSMITTER AND RECIEVER

Transmitter and recipient (Fig.3) are joined in a solitary lodging.[7] The tweaked infrared light of the transmitter strikes the article to be identified and is reflected diffuse. Part of the reflected light strikes the recipient and begins the exchanging operation. The two states – i.e. reflection got or no reflection – are utilized to decide the nearness or nonappearance of an article in the detecting range.

This framework securely recognizes all protests that have adequate reflection. For items with a terrible level of reflection (matt dark unpleasant surfaces) the utilization of diffuse reflection sensors for short ranges or with foundation concealment is suggested.

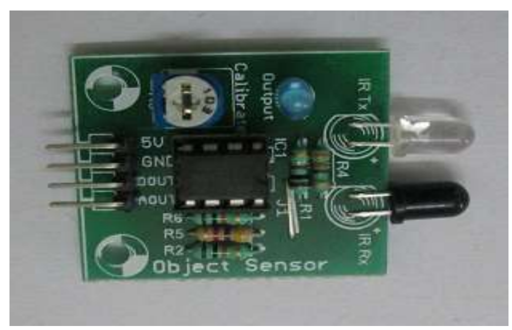

Fig 3. IR Sensor

The prototype in Fig 4 includes a pair of IR Sensors for detecting whether the rider is wearing the helmet, an alcohol sensor to check whether the rider is sober enough to drive the motor vehicle. Firstly, the prototype detects if the driver is wearing the helmet. If yes, the LCD displays 'HELMET IS ON' and checks for the alcohol detection on the next step. If both the conditions are satisfied then the rider is safe to drive. If any one condition is not satisfied the LCD will display warnings stating to do so. On the other hand, we employed an face recognition using The Viola Jones algorithm for face detection which detects the face of the authorised owners.

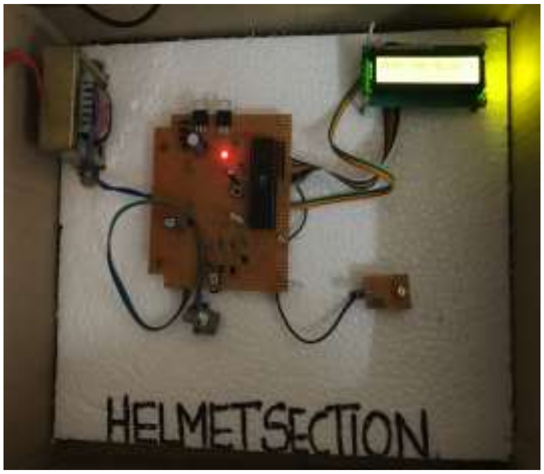

Fig 4. Helmet Prototype

Fig 5 . Bike Prototype

Image acquisition is considered the most critical step in our project since all subsequent stages depend highly on the image quality. In order to accomplish this, we used a CCD camera. We set the resolution to 640x480, the type of the image to jpeg, and the mode to white and black for greater details. Furthermore, we took the eye pictures while trying to maintain appropriate settings such as lighting and distance to camera. The camera is situated normally between half a meter to one meter from the subject. (3"to 10 inches). The CCD-cameras job is to take the image from the optical system and convert it into electronic data. Find the iris image by a monochrome CCD (Charged couple Device) camera transfer the value of the different pixels out of the CCD chip. Read out the voltages from the CCD-chip. Thereafter the signals of each data are amplified and sent to an ADC (Analog to Digital Converter).We implemented face detection using Voila Jones method.

C. VIOLA JONES ALGORITHM

It is a widely used method for real-time object detection. The training process is slow but the detection process is fast. [3]The training data consists of faces and non-faces which are normalized to scale and translation invariance. To achieve the invariance many variations of a single training data namely illumination, pose .etc are augmented. We used an already existing viola jones face detection algorithm in the computer vision toolbox in matlab.

There are four main ideas: [4]Feature extraction using *haar* like features, *Integral image* method which uses summed are table data structure to reduce the time complexity of the algorithm simple and efficient classifier which is built using the *AdaBoost* learning algorithm which linearly combines different weak classifiers to form a single strong classifier having lesser false positive rates .Method for combining classifiers in a "cascade" which allows background regions of the image to be quickly discarded. [5]Features detected are knowing the below information

I. First feature: The region of the eyes is often darker than the region of the nose and cheeks.
II. Second feature: The eyes are darker than the bridge of the nose.

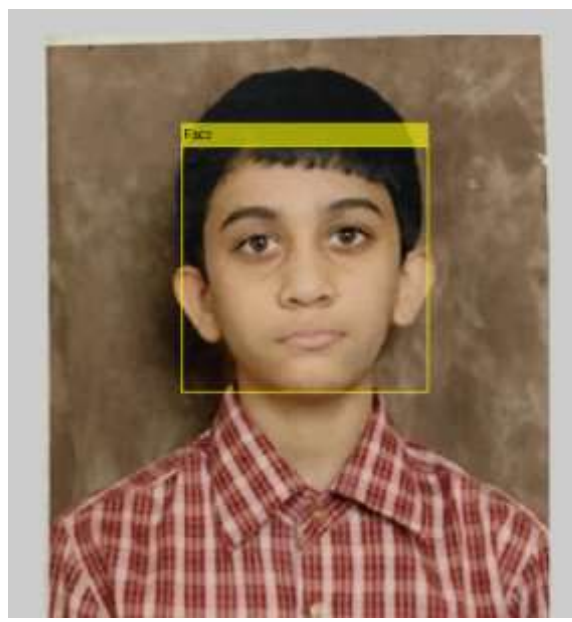

Fig 6. Face Detection

III. FACE RECOGNITION

Numerous face recognition papers have been published; in the last decade. A survey can be found in [6]. The number of real world applications (e.g. surveillance, secure access, human/ computer interface) and the abundance of cheap and powerful hardware and the advent of CUDA software for parallel processing leading to training of large datasets on GPUs rather than CPUs also lead to the development of commercial face recognition systems. Despite the success of some of these systems in constrained scenarios, the general task of face recognition still poses a number of challenges with respect to changes in illumination, facial expression, and pose. In the following we give a brief overview on face recognition methods. Focusing on the aspect of pose invariance we divide face recognition techniques into global approach in which a single feature vector that represents the whole face image is used as input to a classifier. Global techniques work well for classifying frontal views of faces. However, they are not robust against pose changes since global features are highly sensitive to translation and rotation of the face.

Fig 7. The upper two rows are example images from our training set. The lower two rows show the image parts extracted by the viola jones face detector.

A. SUPPORT VECTOR MACHINE CLASSIFICATION

There are two basic strategies for solving *q*-class problems with SVMs:

i) In the one-vs-all approach *q* SVMs are trained. Each of the SVMs separates a single class from all remaining classes [7,8].

ii) In the pairwise approach *q(q-1)/2* machines are trained. Each SVM separates a pair of classes. The pairwise classifiers are arranged in trees, where each tree node represents an SVM. A bottom-up tree similar to the elimination tree used in tennis tournaments was originally proposed in [9] for recognition of 3-D objects and was applied to face recognition in [10]. A top-down tree structure has been recently published in [11]. There is no theoretical analysis of the two strategies with respect to classification performance. Regarding the training effort, the one-vs-all approach is preferable since only *q* SVMs have to be trained compared to *q(q-1)/2* SVMs in the pairwise approach. The run-time complexity of the two strategies is similar: The one-vs-all approach requires the evaluation of *q*, the pairwise approach the evaluation of *q-1* SVMs. Recent experiments on person recognition show similar classification performances for the two strategies [12]. Since the number of classes in face recognition can be rather large we opted for the one-vs-all strategy where the number of SVMs is linear with the number of classes.

The training data for the face recognition system was recorded with a webcam at a frame rate of about 30fps. The training set consisted of 200 gray face images of 20 subjects. The resolution of the face images ranged between 80x80 and130x130 pixels. The test set was recorded with the same camera under different illumination and with different background. The set included 60 images of all 20 subjects in our database. Two experiments were carried out. In the first experiment we trained on all 200 faces in the training set and tested on the whole test set. The following experiment was conducted using linear SVM using the classification Learner interface in MATLAB. The classification accuracy was at 87% and under better illumination and more training images the accuracy would be much more significant. Hence the proposed technique was found to be a robust solution to help recognize the face of the rider with a good accuracy.

Fig 8. Warnings and Indications

Fig 9. Smart Helmet

The circuit in the helmet Completes only when the rider wears the helmet and the information is passed to the bike ignition module through transmitter-receiver communication and then the biker will be able to start the bike.

IV. Conclusion

In this paper we have talked about the smart helmet which we developed. It has two sections i.e, a helmet section and a bike section. The helmet section includes alcohol detection and has the ability to detect whether the rider is wearing the helmet. The second portion of the project deals with the face recognition of the authorised owner. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology both the prototype and real time working model has been successfully implemented.

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