

# Design of Accident Prevention System Using QRD 1114 and CNY 70 Sensors

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**Abstract**—The goal of this project is to design an Accident Prevention System which helps in preventing/avoiding accidents. The driver is more prone to accidents due to drowsiness and the disturbing intruders. It consists of infrared sensors which helps in detecting the cause of accidents and prevents the vehicle. This project when implemented in real time makes use of imported glass sensors for high accuracy. To implement this, the sensors are connected to the microcontroller. This is programmed in such a manner that the vehicle is automated against accident prevention. The actual range of this circuit can be increased to 150 cm. the eye blink module works against drowsiness and makes the driver aware of accident. And the distance sensors connected works against the disturbing intruders.

**Keywords**—Sensor QRD 1114, Sensor CNY 70, Microcontroller IC 89C52, IC LM 2903, IC 7400, Car talk 2000.

## I. INTRODUCTION

### A. Background

“Driving to save lives, time, and money in spite of the conditions around you and the actions of others.” - This is the slogan for Defensive Driving.

Vehicle accidents are most common if the driving is inadequate. These happen on most factors if the driver is drowsy or if he is alcoholic. Driver's drowsiness is recognized as an important factor in the vehicle accidents. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20% of all vehicle accidents. But the life lost once cannot be re-winded. Advanced technology offers some hope to avoid these up to some extent.

This project involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eyes. The IR receiver is used to receive the reflected infrared rays from our eyes. If the eyes are closed it means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position of the eyes. This output is given to logic circuit to indicate the final output i.e. alarm.

### B. Scope

We can automatically park the car by first using Automatic braking system, which will slow down the car and simultaneously will turn on the parking lights of the car and will detect the parking space and will automatically park the car preventing from accident.

By using wire-less technology such as Car Talk2000 If the driver gets a heart attack or he is drunk it will send signals to vehicles nearby about this so driver become alert.

### C. Problem definition

Sleep related accidents tend to be more severe, possibly because of the higher speeds involved and because the driver is unable to take any avoiding action, or even brake, prior to the collision. Horne describes typical sleep related accidents as ones where the driver runs off the road or collides with another vehicle or an object, without any sign of hard braking before the impact.

Accidents are also caused when street lights are out specially on highways, long distance routes. Here, usually the upper dipper lights are in upper mode. So, when the driver fails to change the mode of the light and at the same time when the car comes from the opposite side.it causes the opposite driver to miss the judgement and gives rise to accident.

Accidents are also caused due to the intruders coming suddenly in either side of the vehicle i.e. front, left or right. Due to which the driver misses the judgement and meets with an accident.

## II. LITERATURE REVIEW

Infrared (IR) technologies (materials, devices and systems) represent an area of excellence in science and technology and, even if they have been generally confined to a selected scientific community, they have achieved technological and scientific highlights constituting ‘innovation drivers’ for neighbouring disciplines, especially in the sensors field.

The development of IR sensors, initially linked to astronomical observations, since World War II and for many years has been fostered essentially by defense applications, particularly thermo-vision and, later on, smart vision and detection, for surveillance and warning. Only in the last few decades, the impact of silicon technology has changed the development of IR detectors dramatically, with the advent of integrated signal read-outs and the opening of civilian markets (EO communications, biomedical, environmental, transport and energy applications).

The history of infrared sensors contains examples of real breakthroughs, particularly true in the case of focal plane arrays that first appeared in the late 1970s, when the superiority of bi-dimensional arrays for most applications pushed the development of technologies providing the highest number of pixels. An impressive impulse was given to the development of FPA arrays by integration with charge coupled devices (CCD), with strong competition from different technologies (high-efficiency photon sensors, Schottky diodes, multi-quantum wells and, later on, room temperature microbolometers/cantilevers). This breakthrough allowed the development of high performance IR systems of small size, light weight and low cost – and therefore suitable for civil applications – thanks to the elimination of the mechanical scanning system and the progressive reduction of cooling requirements (up to the advent of microbolometers, capable of working at room temperature). In particular, the elimination of cryogenic cooling allowed the development and commercialization of IR Smart Sensors; strategic components for important areas like transport, environment, territory control and security.

Infrared history is showing oscillations and variations in raw materials, technology processes and in device design and characteristics. Various technologies oscillating between the two main detection techniques (photon and bolometer effects) have been developed and evaluated as the best ones, depending on the system use as well as expectable performances. Analysis of the ‘waving change’ in the history of IR sensor technologies is given with the fundamental theory of the various approaches.

Highlights of the main historical IR developments and their impact and use in civil and military applications is shown and correlated with the leading technology of silicon microelectronics: scientific and economic comparisons are given and emerging technologies and forecasting of future developments are outlined.

Infrared detectors are in general used to detect, image, and measure patterns of the thermal heat radiation which all objects emit. Early devices consisted of single detector elements that relied on a change in the temperature of the detector. Early thermal detectors were thermocouples and bolometers which are still used today. Thermal detectors are generally sensitive to all infrared wavelengths and operate at room temperature. Under these conditions, they have relatively low sensitivity and slow response.

Photon detectors were developed to improve sensitivity and response time. These detectors have been extensively developed since the 1940's. Lead sulfide (PbS) was the first practical IR detector. It is sensitive to infrared wavelengths up to ~3  $\mu\text{m}$ .

Beginning in the late 1940's and continuing into the 1950's, a wide variety of new materials were developed for IR sensing. Lead selenide (PbSe), lead telluride (PbTe), and indium antimonide (InSb) extended the spectral range beyond that of PbS, providing sensitivity in the 3-5  $\mu\text{m}$  medium wavelength (MWIR) atmospheric window.

The end of the 1950's saw the first introduction of semiconductor alloys, in the chemical table group III-V, IV-VI, and II-VI material systems. These alloys allowed the band-gap of the semiconductor, and hence its spectral response, to be custom tailored for specific applications. MCT (HgCdTe), a group II-VI material, has today become the most widely used of the tunable band-gap materials.

As photolithography became available in the early 1960's it was applied to make IR sensor arrays. Linear array technology was first demonstrated in PbS, PbSe, and InSb detectors. Photovoltaic (PV) detector development began with the availability of single crystal InSb material.

In the late 1960's and early 1970's, "first generation" linear arrays of intrinsic MCT photoconductive detectors were developed. These allowed LWIR forward looking imaging radiometer (FLIR) systems to operate at 80K with a single stage cryoengine, making them much more compact, lighter, and significantly lower in power consumption.

The 1970's witnessed a mushrooming of IR applications combined with the start of high volume production of first generation sensor systems using linear arrays. At the same time, other significant detector technology developments were taking place. Silicon technology spawned novel platinum silicide (PtSi) detector devices which have become standard commercial products for a variety of MWIR high resolution application

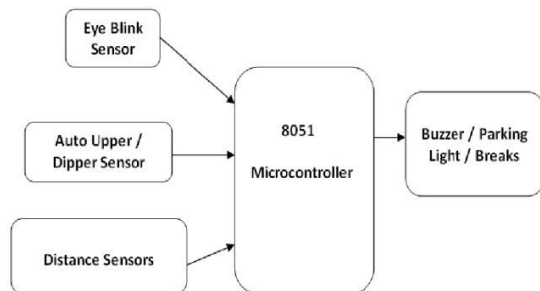
### III. METHODOLOGY

The block diagram depicts the total blue print of the proposed project. The total essence and the functioning of the project is represented in a single block diagram. The block diagram mainly consists of 5 parts. They include

- i. Eye Blink Sensor
- ii. Auto upper/dipper sensor
- iii. Distance Sensors
- iv. 8051 Microcontroller
- v. Buzzer/parking lights/breaks

#### A. Eye blink sensor module

Here, we have used the infrared sensor CNY 70. It consists of Infrared transmitter which is one type of LED, which emits infrared rays generally called as IR Transmitter. Similarly, IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. The comparator is constructed with LM 2903 operational amplifier.



**Figure 4.1: BLOCK DIAGRAM**

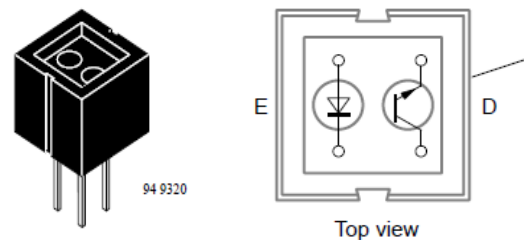
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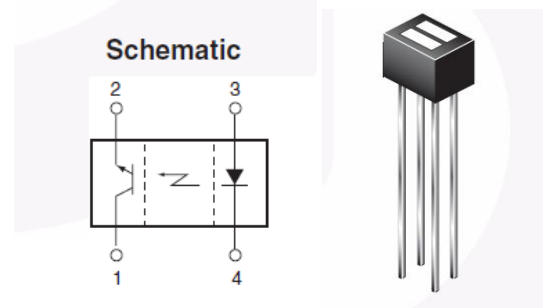
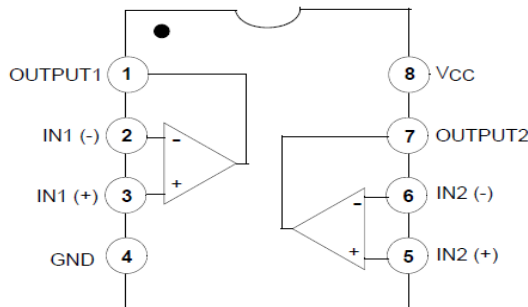
In the comparator circuit the reference voltage is given to inverting input terminal. The non-inverting input terminal is connected IR receiver. When interrupt the IR rays between the IR transmitter and receiver, the IR receiver is not conducting. So the comparator non inverting input terminal voltage is higher than inverting input. Now the comparator output is in the range of +5V. This voltage is given to microcontroller or PC and so led will glow.

When IR transmitter passes the rays to receiver, the IR receiver is conducting due to that non inverting input voltage is lower than inverting input. Now the comparator output is GND so the output is given to microcontroller or PC.



#### C. Auto upper dipper module

It consists of LM 2903 and LDR. The two 10k resistor acts as voltage divider which gives output 2.5V which is given to inverting terminal of the Op-amp. Here, this 2.5V acts as threshold voltage. When light falls on LDR, its resistance reduces and gives the corresponding output in terms of voltage. If this voltage increases above the threshold voltage then it activates the Op-amp and its output is given to microcontroller at pin 16. The controller gives the output from pin number 38 to base of the transistor BC 547. The transistor circuit turns on and acts as closed switch which activates the LED's and turns on the dipper light.



Now, when the o/p voltage of the LDR goes below the threshold voltage the microcontroller o/p at pin no 39 activates the transistor BC 547 and turns on the led's which again activates the upper lights as it does not senses any intruder.

#### D. Distance sensor module

Here, we have used six sensors which are installed on the front bumper. These sensors are connected to port 2 .If any of the sensor senses the intruders and if the o/p of any one of the sensor goes high it activates the corresponding pin of port 2 and makes the pin high. The microcontroller makes the pin no 2.7 high which acts as an output. It is connected to the brake of car, which apply the brake and stops the car.

Here, we have used 12 sensors, six on right side and six on left side. The left sensors are connected to the port 0 and right ones are connected to port 1. If atleast one of the sensors activated the corresponding pin goes high then o/p pin 0.2 is activated if the intruder is on left side or o/p pin 1.7 goes high if the intruder is on right side. The activated pin turns on the transistor which acts as close switch and glows the led indicating on which side the intruder is.

Here, the sensor used is QRD1114. The output indicated is under the driver's vicinity and as soon as the output is indicated by any of the indicator the driver takes action to the situation and protects it himself from accident.

#### I. Problem definition stage

This is the very first stage to develop any project. It actually defines the aim and the concept of the project. The aim of the project is to design a Car which provides prevention of accident for securing vehicle and driver. The main cause of accident is due to drowsiness and disturbing intruders.

## IV. DISCUSSION AND RESULT

### II. Designing block diagram

At this stage we have categorized the whole system into different individual modules. These modules (block diagrams) will be helpful in understanding the concept and working of the integrated system. It also simplifies the entire debugging and testing process. So the result was the block diagram of the project.

### III. Designing circuit diagram

In this stage a circuit diagram of the device was made showing how the different components will be linked to each other. The circuit diagram is very useful in understanding the real working of the project as it shows how each and every component is connected and working. So the circuit diagram of the project was ready at the end of this stage.

### IV. Purchasing parts from the market

After the circuit diagram was made the components that were required to make the project were purchased from the market.

### V. Testing individual components

In this stage all the components were tested that they are working fine before they are implemented. This stage was very much necessary as it would have been difficult to manage if any component would had been found faulty after it was actually implemented.

### VI. PCB Designing

The circuit diagram was then drawn on the P. C. B. with permanent marker and then it is dipped in the solution of ferric chloride so that unwanted copper is removed from the P.C.B., thus leaving components interconnection on the board.

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### VII. Soldering

After designing the PCB all the components were inserted and soldered. The joint to be soldered is heated with the help of soldering iron. Heat applied should be such that when solder wire is touched to joint, it must melt quickly. The joint and the soldering iron is held such that molten solder should flow smoothly over the joint. When joint is completely covered with molten solder, the soldering iron is removed. The joint is allowed to cool, without any movement.

### VIII. Testing and Troubleshooting

After soldering each and every component is tested once again. It is required to check that all the components are working fine after implementation is done. If any problem occurs then it is rectified and solved properly.

### IX. Developing algorithm for software

To get the logical flow of the software, the development of algorithm is having a prominent role. We have analyzed the complete system and organized the algorithm in such a manner that one can understand the complete working of the software.

### X. Writing individual part of software

After the development of the algorithm we write the code for all the individual parts in the project. Code is written in "Embedded Basic" language.

### XI. Compiling the code

The code is implemented on the computer for which we have used a compiler named BASCOM8051 pre-installed on PC. The BASCOM8051 is a Computer Aided Program which is used for burning the program code into the microcontroller.

### XII. Testing and Running

This time we tested our project for actual working, after loading the software into the microcontroller. Any errors found were removed successfully. This is the last and final stage of development of our project.

## V. CONCLUSION

Nowadays, people have become more prone to accident. So, we as an engineer need to take some action against this and provide the desired solution. For the safety of the human being some automation is made. We have used some high quality sensors, which helps in manipulating cause of accidents.

This report consist of different applications combined together to fulfill the safety precautions.

We experimented this application to provide the prevention of accident due to drowsiness of the driver and disturbing intruders. We have made the vehicle and driver secure against such severe problems.

We first designed the circuits for different module i.e. for different cause of accidents. Then tested each circuit first, to ensure the output provided is desired or not.

Later, we prepared the hardware and designed the program accordingly. The code is written in embedded basic language which is compiled using compiler known as BASCOM 8051. Then after burning the microcontroller we tested the entire hardware module.

Some troubleshooting was required, like a sensor was not getting the required frequency due to which it was not working. So, we made another clock sensor circuit using comparator IC LM 2903 which provided the desired frequency.

Thus, we have successfully designed a car model which is fully secured from accident, hence providing safety measures of accident.

## VI. APPLICATION

- i. The prime purpose is to provide safety measures.
- ii. It is used for Automatic parking.
- iii. It can be used in wireless technology.
- iv. The eye blink module of this project can be separately used for RFID detection in global industries.
- v. It can be used in image processing application by replacing sensor by camera module.

## VII. FUTURE SCOPE

We can automatically park the car by first using Automatic braking system, which will slow down the car and simultaneously will turn on the parking lights of the car and will detect the parking space and will automatically park the car preventing from accident. By using wire-less technology such as Car Talk2000 If the driver gets a heart attack or he is drunk it will send signals to vehicles nearby about this so driver become alert.

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