iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 5 **Issue:** VI **Month of publication:** June 2017

**DOI:**

www.ijraset.com

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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

# Traffic Monitoring System Using IR Sensors

Mrs. Priya George[1], Disha D[2], Malavika[3], Soumya[4], Deekshitha[5]
[1]Assistant Professor Computer Science Dept, Shree Devi Institute of Technology
[2,3,4,5] Computer Science Dept, Shree Devi Institute of Technology

***Abstract:*** ***The project deals with counting the vehicle direction wise and also to alert the driver if there is any road block further ahead. system is implemented using two IR sensors in each signals and main roads. when the vehicle is sensed using first sensor the counter is incremented. When the second sensors sense the vehicle, the counter is added to "vehicle count" list and the previous counter is decremented .it also stores the details of direction and location. The vehicle owner is informed about the traffic jam through a display screen placed in every main roads with the details of an alternate deviation.***
***Keywords : IR sensors, microcontrollers, bridges, smart city developments, LED displays.***

## I. INTRODUCTION

In current world we are leading a busy life, problems like traffic jam can be really annoying .It would be helpful to know whether there is any traffic jam in a particular location before a head . For this purpose the proposed system is been implemented. It is based on Radio Frequency deals with counting the vehicle direction wise.This technique will consist of two IR sensors separated by specific distance fixed at a hump. When the first vehicle crosses the first hump the sensor at this hump will increment the count. When the same vehicle crosses the second hump the vehicle count at the second hump will be incremented and count will be decremented. If there is a traffic jam an information is stored in data base and directed towards the display like system to show deviation to reach destination path. If the first sensor senses some vehicles and the second sensor doesn't sense any vehicle for a particular time then it assumes that there is a traffic jam.

Advantage of this project is that people could be informed about the traffic jam on their way and also RTO don't have to maintain the vehicle count manually by making some employees to sit and 1count the vehicle. When the vehicle pass through Toll Gate if the vehicle is permitted then Gate gets open through sensor.

### *A. Traffic management Structure*

In general, traffic monitoring is mainly based on data from conventional stationary ground measurement systems such as inductive loops, radar sensors or terrestrial cameras. One handicap of these methods is the low spatial resolution depending on their distribution on the ground. New approaches include data by means of display measurement units which flow with the traffic. In order to handle traffic monitoring by remote sensing, a number of projects based on optical and SAR airborne sensors, as well as SAR satellite sensors are now running at DLR. One approach currently under development is to use a infrared sensors opposite to each other in near real time traffic management. The big advantage of the remote sensor techniques presented here is that the measurements can be applied nearly everywhere and there are no dependencies on any third party infrastructure.

By implementing this system it is possible to locate a traffic jam without manual help and at this time a message will be sent to all registered users. The message also contains the details of an alternative path. By using this system no labor is required to take the count of vehicles passing through that area thereby increasing the efficiency.

## II. LITERATURE SURVEY

In Existing system no sensor is present in the road. To count the vehicle RTO has to keep some labourers and make note of each vehicle pass by. Nowadays labourers are very expensive and no guarantee that they count each and every vehicle which pass.

It waste people's time and it can also make businessmen to lose their important deals .Not only it affects financially but also cost's a life in case of emergency.This technique will consist of two sensors separated by specific distance fixed at a hump. When the first vehicle crosses the first hump the sensor at this hump will increment the count. When the same vehicle crosses the second hump the vehicle count at the second hump will be incremented and the count will be decremented.

If there is a traffic jam it will indicate the user that the traffic is there in that area. At this time the message will be sent to all registered users.


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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
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*A.* Currently there is no option to know about a traffic jam occurred at a location.
*B.* It is also impossible to count the number of vehicles travelling through a particular route. Now it is done by assigning a labor and so the result is not trustworthy.
*C.* Existing system leads to waste of time and money.

By implementing this system it is possible to locate a traffic jam without manual help and at this time a message will be sent to all registered users. The message/screen also contains the details of an alternative path. By using this system no labor is required to take the count of vehicles passing through that area thereby increasing the efficiency. in this modulation of time the factor of traffic jam will be detected and solved. consumption of time is being reduced and we move through the destination within our thought limit. The display also contains the details of an deviation path

## III. COMPONENTS AND REQUIREMENTS

### *A. LCD Display Configuration*

LCD display which functions where it takes the information from the controller and sensor functioning parameter and it display the result from the binary format by generating ascii character.

Figure 1. LCD Display

### *B. Microcontroller types*

The predominant family of microcontrollers are 8-bit types since this word size has proved popular for the vast majority of tasks the devices have beenrequired to perform. Memory expansion is possible with offchip RAM and/or ROM; for some family members there is no on-chip ROM, or the ROMis either electrically programmable ROM (EPROM) or electrically erasable PROM (EEPROM) known as flash EEPROM which allows for the program to be erased and rewritten many times.

Figure 2. Microcontroller

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*C. Bridges*

A bridge is a device that connects two or more local area networks, or two or more segments of the same network. For example, suppose that your network includes both 10BaseT Ethernet and LocalTalk connections. You can use a bridge to connect these two networks so that they can share information with each other.In addition to connecting networks, bridges perform an additional, important function. They filter information so that network traffic intended for one portion of the network does not congest the rest of the network. (You may remember from the previous section that switches also performthe Ethernet or LocalTalk (MAC) destination address. They do not attend to network routing ortransport protocol information such as that carried within the TCP/IP, IPX/SPX, or AppleTalkportions of the signal.

*D. Software filters.*

In addition to packet-screening firewalls and proxies, some school districts implement software filters that screen information based on lists of restricted sites, types of application (for example, newsgroups), or types of offensive content (such as drugs). Generally, these software applications are designed specifically for use in schools and libraries, and they include lists of sites that are recommended for restriction.

*E. Image Sensors*

Video surveillance to monitor traffic states and detect incidents and hotspots is fairly common. It gives a comprehensive survey of the major computer vision techniques used in traffic applications. But the traditional setting for which vision algorithms exist can be seen in the lane based traffic. Usability in developing countries, algorithms are needed for scenarios involving chaotic traffic. Preliminary work on image processing algorithms for chaotic traffic sensing is done. The algorithms are offline, so the trade-off between computation and communication is not understood. Also the sensing accuracy itself has been tested on only few minutes of video clip. There are other works to use low quality images from CCTV for traffic sensing. But computational overhead, real-timeliness and accuracy of the designed algorithms haven't been evaluated. Thus though vision based traffic sensing for chaotic traffic seems feasible, there are several aspects that still need careful evaluation. In comparison,

*F. Infrared Sensors*

There are two types of infrared (IR) detectors; these are as follows;

Active infrared sensors operate by transmitting energy from either a light emitting diode (LED) or a laser diode. A passive infrared system detects energy emitted by objects in the field of view and may use signal-processing algorithms to extract the desired information. All objects emit some form of energy, which is in the form of heat or thermal radiation, this radiation most often falls in the infrared spectrum. Radiation cannot be seen by the naked eye, but can be detected by an infrared sensor that accepts and interprets it. In some infrared sensor like motion detectors, radiation enters the front and reaches the sensor itself at the centre of the device.

*G. Personal Computer (PC) and Memory*

The PC is interfaced with the microcontroller in order to provide all time traffic control to the administrator. This is done through serial port communication. To initiate the serial communication administrator has to configure the Communication port. Whenever administrator commands the microcontroller to send recorded data, the microcontroller sends all data, in terms of vehicle count recorded according to recording intervals, to computer. The microcontroller also sends the running configuration of parameters (Vehicle range values, delays, recording interval) on traffic light.

*H. LED/Traffic Lights*

A traffic signal controller system Personal Computer in which all timing related details are fed to the PC and then the control signals are passed to a 89C51 based board which light controls the various led LED traffic lights. According to the vehicle density information corresponding LED signal lights should glow to pass the traffic.

*I. Segment Display*

In traffic signals, seven segment displays are interfaced with the counter and controller, depending on the commands received; the counter displays the amount of waiting time. It is connected to pins of Port 1. Common Anode Connection which is suitable for this application. The microcontroller's timer is interfaced with seven segment display to display the delay of light



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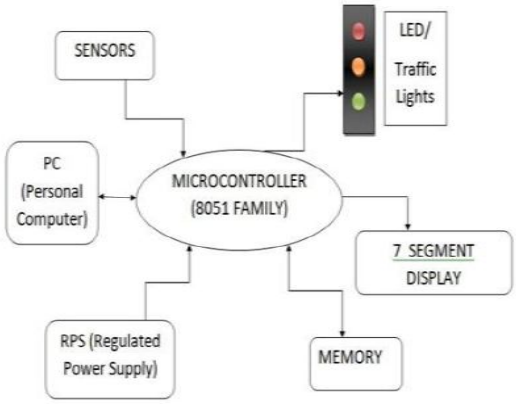
Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

*J. Regulated Power Supply*

As per the power requirement of the hardware of the intelligent traffic light control and monitoring system, supply of +5V with respect to GND is developed. The complete circuitry is operated with TTL logic level of 0V to 5V. It comprise of 0V to 9V transformer to step down the 220V AC supply to 9V AC. Further a bridge rectifier converts the 9V into 9V√2 DC. It is further filtered through a 1000uF capacitor and then regulated using 7805 to get +5V. To isolate the output voltage of +5V from noise further filtering 220uF capacitor is used

Figure 3. Block Diagram Of Vehicle Detection Technique




*K. Vehicle Detection Technique*

Traffic congestion leads to long and unpredictable commute times, environmental pollution and fuel waste. These negative effects are more acute in developing countries like India, where infrastructure growth is slow because of cost and bureaucratic issues. Frustration with the traffic lights results in an increase in accidents from cars moving when the traffic light, signals them to stop. Intelligent traffic management and better access to traffic information for commuters can help alleviate congestion issues to a certain extent.

## IV. REQUIREMENT AND SPECIFICATION

A system requirements specification (SRS) – a requirements specification for a software system is a complete description of the behaviour of a system to be developed. It includes a set of use cases that describes all the interactions the users will have with the software. In addition to use cases, the SRS also contains non-functional requirements. Non-functional requirements are requirements which impose constraints on the design or implementation (such as performance engineering requirements, quality standards or design constraints).

*A. Modules*

*1)* User Creation
*2)* Login
*3)* IR Sensor Detection
*4)* Movement Detection
*5)* SMS Notification
*6)* Traffic Jam with Alternae Path

*B. Specific Requirement*

*1) User Interfaces*

*a)* Man and machine interaction involves how people use the system and communicate with the system.
*b)* It is the front end of the system.
*c)* Goal of user interface is to make it easier to learn and easier to use.

*2) Hardware Interfaces*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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

*a)* Hard disk -10GB & above
*b)* Monitor –standard output
*c)* RAM 1GB or higher
*d)* 8051 PCB
*e)* Infra-Red Sensor x2

*3) Software Interfaces*
*a)* OS Windows XP/7/8
*b)* Programming language C#.Net

*4) Communication Interfaces*
*a)* Connectivity-TCP/IP and IR sensors

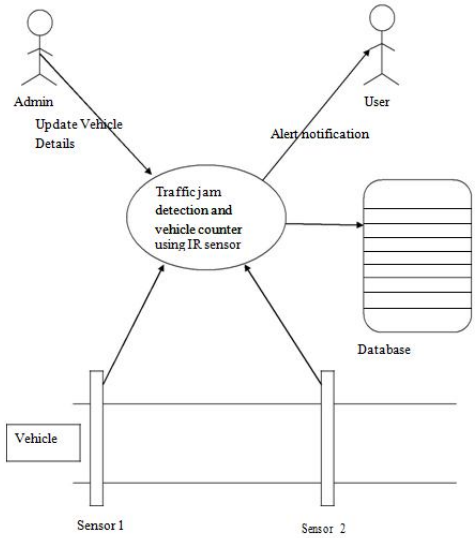
*5) Operating Environment*
*a)* Processor : Any processor above 2.4GHz.
*b)* Monitor : Standard output.
*c)* RAM : Min 1 GB of RAM or above.
*d)* Sensor : IR sensors
*e)* OS : windows XP / 2003 / 2000 / 7
*f)* Front End : Visual Studio 2010
*g)* Programming Language : C#.Net
*h)* Connectivity : TCP/IP
*i)* Back End : My Sql 5.0

## V. SYSTEM DESIGN

*A. Description Programs*

*1)* Architectural Design: This SRS document is intended for Users, Project managers and Developers. The documentation consists of the scope of the project i.e. the area in which it can be used,product requirements (both functional and non-functional), the product features, constraints on operation, and limitations of the system, glossary and improvements that can be made in the future. The reader must first go through the scope followed by overview and then the system features to extract the most from this document. A developer can also go through the non-functional requirement for gaining a better understanding of the product.

Figure 4. Architecture Diagram





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Volume 5 Issue VI, June 2017
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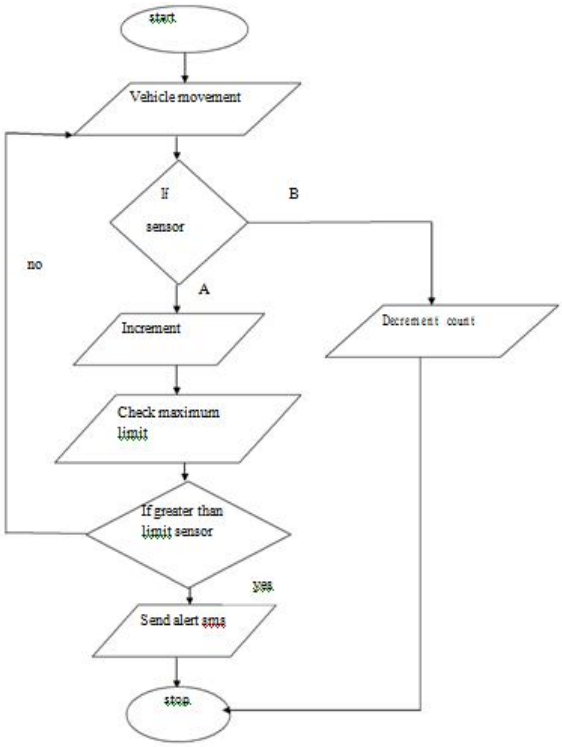
A ARCHITECTURAL DESIGN is a concept that focuses on components or elements of the structure or system and unifies them into coherent and functional whole, according to the particular approach in achieving the objectives under the given constraint and limitation.

*B. Data Flow Diagram (Dfd)*

*1) Data Flow Diagram:* A Data Flow Diagram (DFD) is a graphical representation of the "flow" of data through an information system. A data flow diagram can also be used for the visualization of data processing. It is common practice for a designer to draw a context- level DFD first which shows the interaction between the system and outside entities. This context-level DFD is then "exploded" to show more detail of the system being modeled. A DFD represents flow of data through a system. Data flow diagrams are commonly used during problem analysis. It views a system as a function that transforms the input into desired output. A DFD shows movement of data through the different transformations or processes in the system.

Dataflow diagrams can be used to provide the end user with a physical idea of where the data they input ultimately has an effect upon the structure of the whole system from order to dispatch to restock how any system is developed can be determined through a dataflow diagram. The appropriate register saved in database and maintained by appropriate authorities.

*C. Flow Chart For Monitoring*




*D. Use Case Diagram*

*1)* There are two main actors:

*a)* Admin

*b)* Vehicle

*2)* List of Use Cases:

*a)* Admin:

*i)* Login

*ii)* User Creation

*iii)* Add & manage Vehicle owner

*iv)* Add Vehicl



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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

*v)* Logout

*b)* Vehicle:

*i)* Vehicle movement

*ii)* Increment Count

*iii)* Decrement Count

Figure 5. Use Case Diagram For Admin

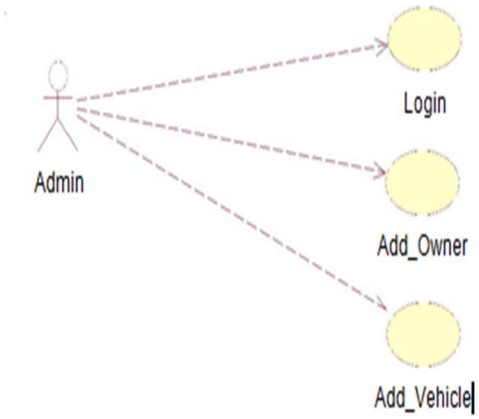
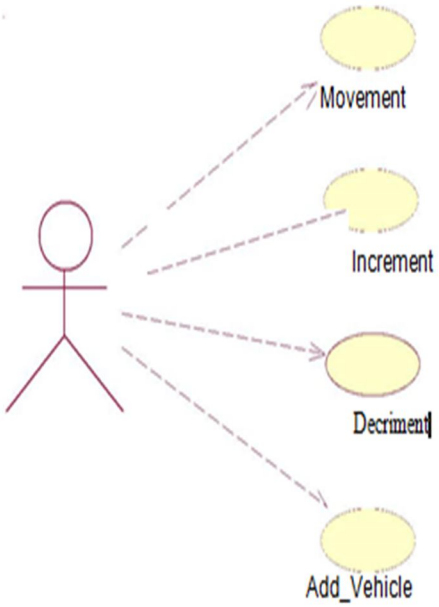



Figure 6. Use Case For Vehicle




A use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system. In software and systems engineering, a use case is a list of steps, typically defining interactions between a role and a system, to achieve a goal. The actor can be a human or an external system



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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
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*E. Activity Diagram*

Figure 7. Activity for the Login

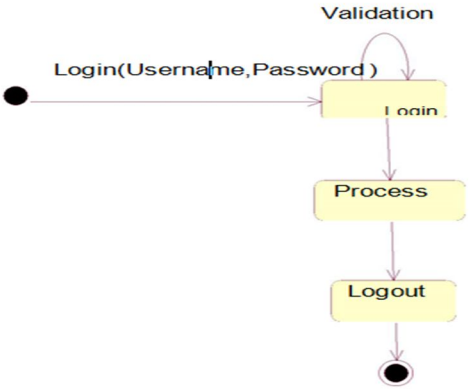
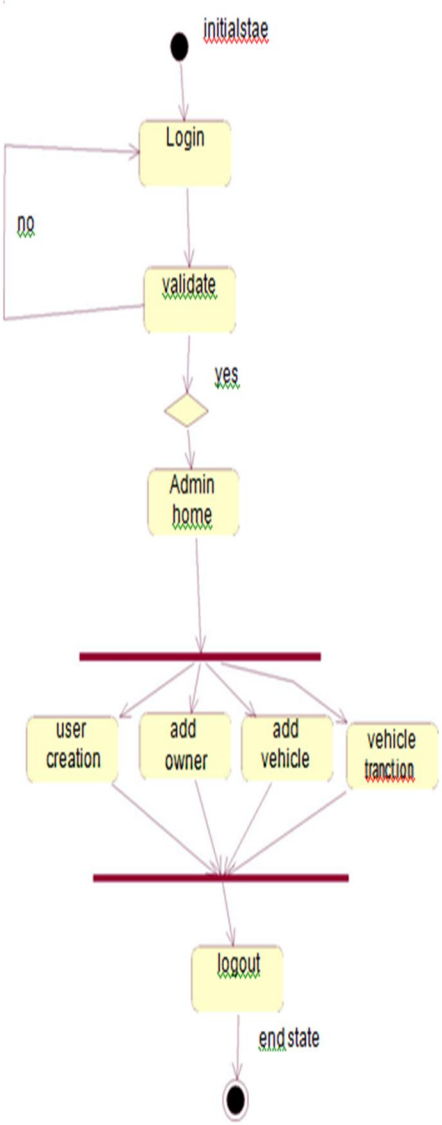



Figure 7. Activity for admin



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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
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*F. Sequence Diagram*

Figure 8. Sequence Diagram For Vehicle

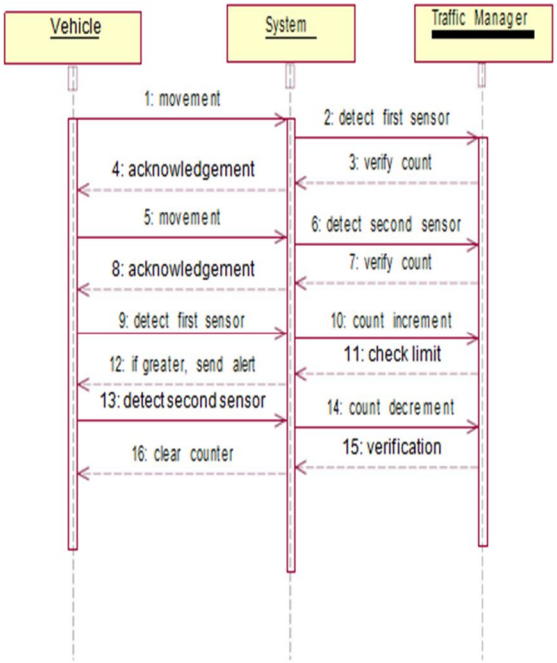
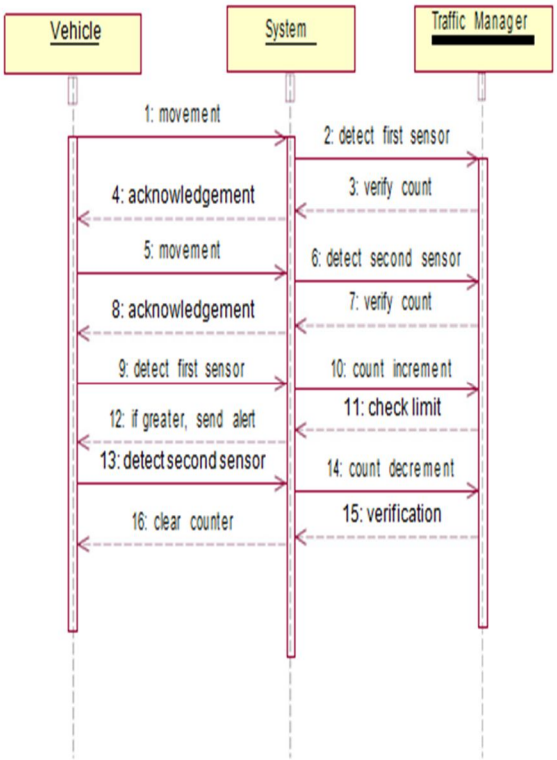



Figure 9. Sequence diagram for admin



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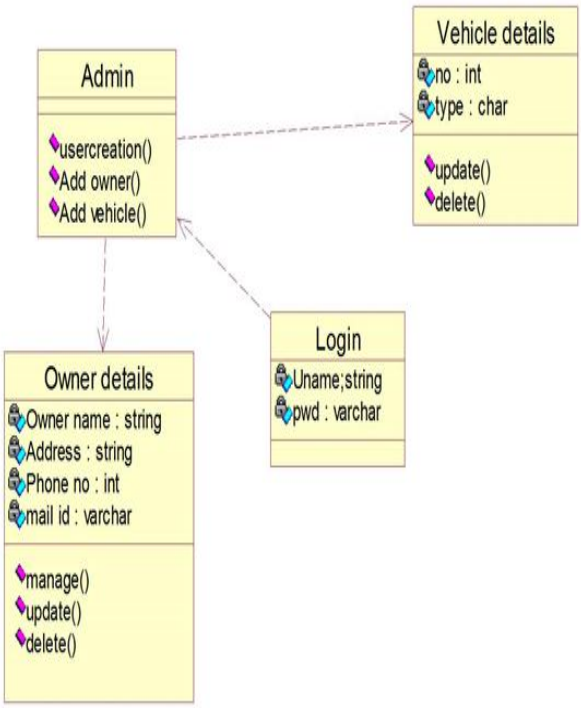
*G. Class Diagram*

Figure 10. Class diagram for admin




## VI. SOFTWARE TESTING

Software testing is the process used to help identify the correctness, completeness, security and quality of developed computer software. This includes the process of executing the program or application with the intent of finding errors. Quality is not an absolute; it is value to some person. With that in mind testing can never completely establish the correctness of arbitrary computer software; testing furnishes a criticism or comparison that compares the state and behavior of the product against a specification.

Testing forms the first step in determining the errors in a program. Clearly the success of testing in revealing errors in programs depends critically on the test cases. Because code is the only product that can be executed and whose actual behavior can be observed, testing is the phase where the errors remaining from all the previous phases must be detected.

The program to be tested is executed with a set of test cases and the output of the program for the test cases are evaluated to determine if the programming is performing as expected. Testing forms the first step in determining errors in a program. The success of testing in reveling errors in programs depends critically on the test cases.

TABLE 1. TESTING FOR DELETION

| Test case | Input | Test description | Output |
|---|---|---|---|
| 1 | Deletion attempted when no entries are present | Entries, if not present ,cannot be deleted | Appropriate error message |
| 2 | Valid deletion | Valid deletion | Entries deleted |



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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
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Table 2.testing for valid user name:

| Test case | Input | Test description | Output |
|---|---|---|---|
| 1 | User name is Special characters or numbers | Use name cannot be Special Characters or numbers | Must enter Characters |
| 2 | User name is left blank | User name cannot be left blank | Enter the User name |

Table 3. Testing for other cases

| Test case | Input | Test description | Output |
|---|---|---|---|
| 1 | Click on logout | Logouts from particular user type | Logouts from particular user type and redirects to login page |
| 2 | Click on clear | Entering details | Record is not submitted to the database and Text boxes cleared |
| 3 | Click on Submit | Entering details | Record is submitted to the database |
| 4 | Click on Submit | Not entering the details | Appropriate error message is displayed |
| 5 | Click on Drop down list | Selecting data | Data is displayed |

## VII. MODULE OF THE PROJECT

*A. Functional Requirement*

*1) User Creation:* Here the admin creates the different officers to handle the data of the registered users.

Input : username, password, type
Output : a new user is created
Processing : if duplicate username is entered error message is displayed

*2) Login:* This module says that only the authenticated users can access the system.

Input : username, password
Output : User logs in
Processing :if duplicate login is entered error message is displayed


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3) *IR Sensor Detection: This* module detects the vehicle and increases or decreases the count based on the vehicle density.
Input : Movement
Output : Vehicle is detected

4) *Movement Detection:* This module detects the vehicle movements and increases the count if the second sensor doesn't detect any vehicle movement for the specific period and the interrupt is recorded in the system.
Input : Movement
Output : Sensor is detected

5) *Traffic Jam:* The traffic congestion is detected and managed using the sensors.
Input : No of vehicles
Output : Exceeds maximum limit

6) *Alternate path:* The alternate path details will be sent to the registered user
Input :Exceeds maximum limit
Output :Alternate route is displayed

*B. Non-functional requirement*

1) Ease of use: This system is user friendly, any user with basic knowledge cane use the system.
2) Security: The details are secure. The admin and the user assigned by the admin can use the system and make the necessary changes. Proper information are sent to the display with appropriate deviation.
3) Maintainability:This project can be easily maintained. The details can be easily added, deleted and updated.
4) Accessibility:It is accessible to all the users especially for the visually impaired person.
5) Relibility:This project is reliable, since its coding is easy and can be easily maintained. It is easy to use the system only if the person has basic knowledge of using the system.

## VIII. CONCLUSION

The project has been successfully completed. The system is implemented to detect traffic jam and to inform all the registered users about that. This will help to avoid wastage of time. Also it can be implemented to count the number of vehicles and there by no labor charge is required.In all, the project was concluded successfully to the satisfaction of the concerned authorities.

*A. The main purpose of the project is*

1) To detect the traffic jam
2) To Informs the registered users about traffic jam
3) Provides the details of an alternative path
4) It saves time and money.

## IX. FUTURE ENHANCEMENT

sIn future vehicles can have IR sensor fixed to number plate and using this sensor can be communicate by using signals and hence path sending alert message using built in GSM modem. in this we can eliminate manually detecting hardware and also send sms without using internet. The vehicles having GPS settings in it can be provided with alternative path on their screen.

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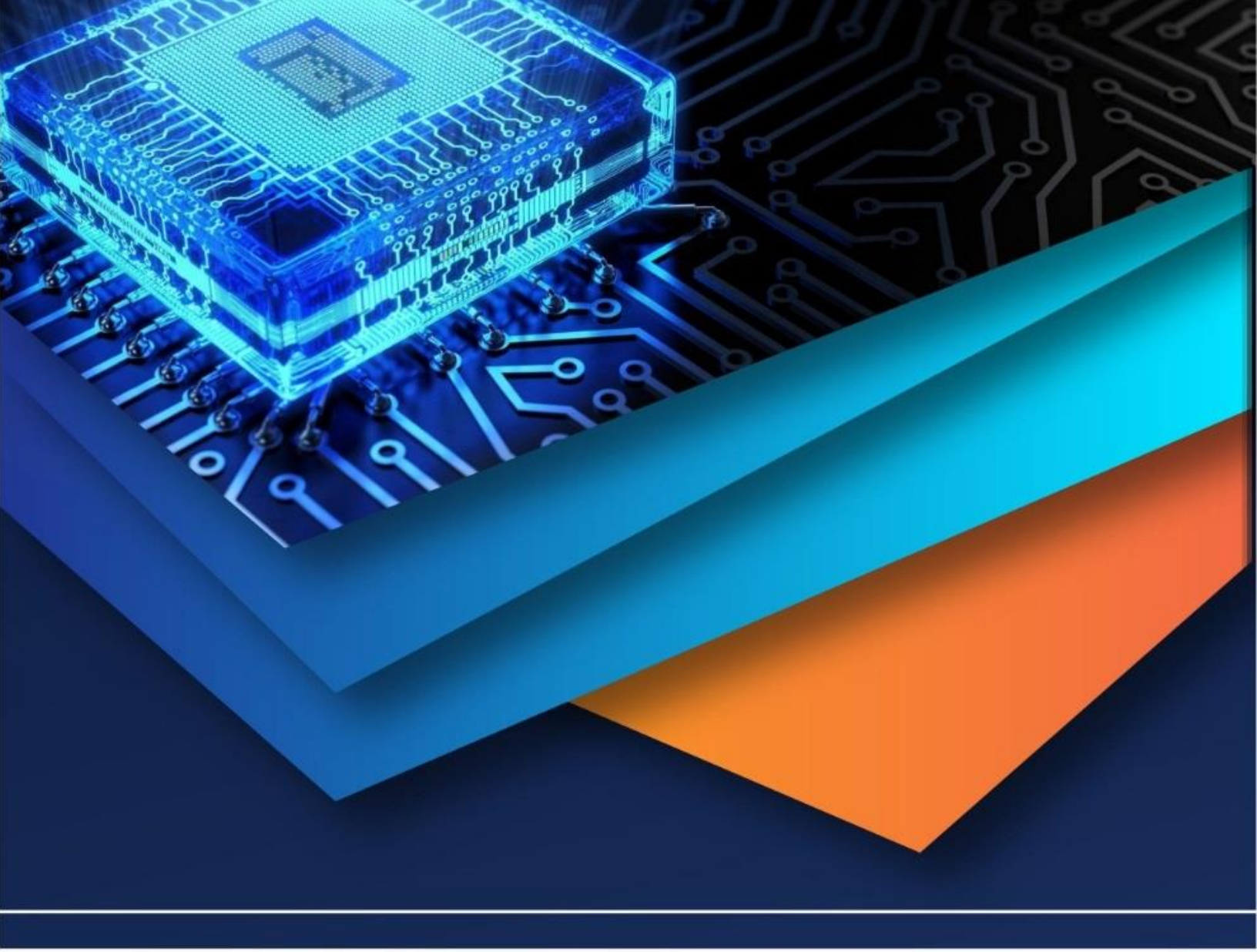

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