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A MINI PROJECT REPORT
ON

"AUTOMATIC TRAFFIC LIGHT CONTROLLER FOR EMERGENCY VEHICLE "

Submitted in partial fulfilment of the requirements for the award of the degree

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CERTIFICATE

This is Certified that the project work entitled "**AUTOMATIC TRAFFIC LIGHT CONTROLLER FOR EMERGENCY VEHICLE"** carried out by ALI AKBAR K, GOKUL KRISHNAN R, SIDDHARTH P and SAHADEV AMBANNAGOL **,** bearing USNs 1VJ20EC001, 1VJ20EC004, 1VJ20EC010 and 1VJ21EC400 students of **Vijaya Vittala Institute of Technology** in partial fulfilment for the award of **Bachelor Of Engineering** in **Electronics and Communication** of the **Visvesvaraya Technological University,** Belagum during the year **2022-2023**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said Degree.

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DECLARATION

We, ALI AKBAR K, GOKUL KRISHNAN R, SIDDHARTH P and SAHADEV AMBANNAGOL**,** bearing USNs 1VJ20EC001, 1VJ20EC004, 1VJ20EC010 and 1VJ21EC400 students of VI semester, Department of Electronics and Communication Engineering, **Vijaya Vittala Institute of Technology** - Bangalore, hereby declare that the dissertation title "**AUTOMATIC TRAFFIC LIGHT CONTROLLER FOR EMERGENCY VEHICLE** " Embodies report of my project work carried out independently by me under guidance of **Mrs. Ashwini MA**, Assistant Prof. Dept of ECE, VVIT, Bangalore as partialfulfilment of requirements for the award of Bachelor of Engineering in Electronics & Communication by the Visvesvaraya Technological University, Belagavi during the academic year 2022-2023. Further, the matter embodied in the dissertation has not been submitted previously by anybody of the award of any degree to any other university.

We also declare that, to the best of our knowledge and belief, the work reported here does not form part of any other report on the basis of which a degree or award was conferred on an earlier occasion on this by any other student.

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Place:Bangalore

Date:

CONTENT

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ABSTRACT

Traffic Congestion is a serious issue in many densely populated cities. Especially during the passage of emergency vehicles in such congestions. This work mainly aims on providing a solution for the emergency faced by the ambulance during such traffic blocking. The implementation needs the usage of sound sensors and monitoring the ambulance to pass traffic signal lanes using Arduino. Fire disaster management prevention can also be the further application of sound detecting sensors.

Index Terms - sound detector, sensors, traffic congestion,

.

CHAPTER 1

INTRODUCTION

1.1 Overview

INDIA is the second most populous Country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints [1]. Also, Indian traffic is non lane based and chaotic. It needs a traffic control solutions, which are different from the developed Countries. Intelligent management of traffic flows can reduce the negative impact of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options [2]. Technologies like ZigBee, RFID and GSM can be used in traffic control to provide cost effective solutions. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID tag and RFID reader. Some RFID systems will only work within the range inches or centimeters, while others may work for 100 meters (300 feet) or more. A GSM modem is a specialized type of modem, which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. AT commands are used to control modems. These commands come from Hayes commands that were used by the Hayes smart modems. The ZigBee operates at low-power and can be used at all the levels of work configurations to perform predefined tasks. It operates in ISM bands (868 MHz in Europe, 915 MHz in USA and Australia, 2.4 GHz in rest of the world). Data transmission rates vary from 20 Kilobits/second in the 868 MHz frequency band to 250 Kilobits/second in the2.4 GHz frequency band [3], [4]. The ZigBee uses 11 channels in case of 868/915 MHz radio frequency and 16 channels in case of 2.4 GHz radio frequency. It also uses 2 channel configurations, CSMA/CA and slotted CSMA/CA [5].

The whole paper is grouped into 5 parts. Sections II talks about the literature survey. Section III discusses about the current problems that exist in making way to an ambulance and other vehicles. It also talks of how the proposed model will overcome the problems faced in developing Countries as well as developed countries. Section IV gives the implementationdetails of the proposed model. Section V presents the enhancement of this work.

1.2 EXISTING SYSTEM

As the population of the modern cities is increasing, the vehicular travel is also increasing leading to congestion on roads. The average number of vehicles in India is growing at the rate of 10.16% annually, over the last few years. Spending hours in traffic jam has become part and parcel of metropolitan life style.

The traditional method for traffic control uses fixed traffic poles on the left side of the road at the traffic junctions that display the traffic light.

The steady increase in the number of automobiles on the road has amplified the importance of managing traffic flow efficiently to optimize utilization of existing road capacity. Presently major cities are covered under the surveillance of CCTV camera so that the vehicles and humans are tracked.

Limitations:-

- ✓ Automatic traffic light systems are often programmed based on predefined timing patterns or fixed algorithms.
- ✓ Automatic traffic light systems rely on sensors, such as cameras or inductive loops, to detect vehicles and adjust signal timings accordingly.
- ✓ Automatic traffic light systems may face challenges when dealing with special events, such as parades, road races, or emergencies.

1.3 PROPOSED SYSTEM

Vehicles during RTO registrations required to have a smart tag embedded into it, which can later be used to authenticate a vehicle and its owner information.

While few sensors (or readers), installed on gantry or metal frame running across the road side, would capture the smart tag id every time a vehicle pass in-front of it and even during the case of red light run, the system can now easily identify the correct vehicle on crime and even capture still images/videos for the purpose of issuing the *fine chalan*, they would also provide 24

hour feedback to the Traffic Management Centre for maintenance of records on all vehicles passing through a given area. So if the police want to check on a vehicle for security reasons, they will just need to key in its registration number/tag id in the main system to learn about its movement across the city. When any vehicle skips the Red light, its complete details areobtained through the RFID card attached to the vehicle, further automatically a fine chalan is raised and posted to vehicle owner address and its details is sent as a message to the concerned user registered mobile number.

With details of the offence available, traffic police processes the information at its Traffic Management Centre and obtain the registered owner's name from the Regional Transport Office and the offending vehicle is issued a notice to show cause and give information as to who was using the vehicle at the time. Further action will be initiated as per law.

1.4 APPLICATION

- ✓ Our proposed plan with this application is expected to go a long way in reducing the number of accidents.
- ✓ Keeping the application always active can be more advantageous for tracking the movements of vehicles in different areas.
- ✓ E.g. If any vehicle is been stolen, using the current application we can easily track every movements of those vehicle as on when is passes through the traffic junctions.
- ✓ Creation of this application makes it even surpass the expected behavior.

CHAPTER 2

LITERATURE SURVEY

Traffic congestion is a major problem in cities of developing Countries like India. Growth in urban population and the middle-class segment contribute significantly to the rising number of vehicles in the cities [6]. Congestion on roads eventually results in slow moving traffic, which increases the time of travel, thus stands-out as one of the major issues in metropolitan cities. In [7], green wave system was discussed, which was used to provide clearance to any emergency vehicle by turning all the red lights to green on the path of the emergency vehicle, hence providing a complete green wave to the desired vehicle. A 'green wave' is the synchronization of the green phase of traffic signals. With a 'green wave' setup, a vehicle passing through a green signal will continue to receive green signals as it travels downthe road. In addition to the green wave path, the system will track a stolen vehicle when it passes through a traffic light. Advantage of the system is that GPS inside the vehicle does not require additional power. The biggest disadvantage of green waves is that, when the wave is disturbed, the disturbance can cause traffic problems that can be exacerbated by the synchronization.

Fig 2.1: Traffic in Bangalore city

In such cases, the queue of vehicles in a green wave grows in size until it becomes too large and some of the vehicles cannot reach the green lights in time and must stop. This is called over-saturation [12], [13].

In [8], the use of RFID traffic control to avoid problems that usually arise with standard traffic control systems, especially those related to image processing and beam interruption techniques are discussed. This RFID technique deals with multivehicle, multilane, multi road junction areas. It provides an efficient time management scheme, in which, a dynamic time schedule is worked out in real time for the passage of each traffic column. The real-timeoperation of the system emulates the judgment of a traffic policeman on duty. The number of vehicles in each column and the routing are proprieties, upon which the calculations and the judgments are done. The disadvantage of this work is that it does not discuss what methods are used for communication between the emergency vehicle and the traffic signal controller. In [9], itproposed a RFID and GPS based automatic lane clearance system for ambulance. The focus of this work is to reduce the delay in arrival of the ambulance to the hospital by automatically clearing the lane, in which, ambulance is travelling, before it reaches the traffic signal. This can be achieved by turning the traffic signal, in the path of the ambulance, to green when the ambulance is at a certain distance from the traffic junction. The use of RFID distinguishes between the emergency and non-emergency cases, thus preventing unnecessary traffic congestion. The communication between the ambulance and traffic signal post is done through the transceivers and GPS. The system is fully automated and requires no human intervention at the traffic junctions. The disadvantage of this system is it needs all the information about the starting point, end point of the travel. It may not work, if the ambulance needs to take another route for some reasons or if the starting point is not known in advance.

Traffic is a critical issue of transportation system in most of all the cities of Countries. This is especially true for Countries like India and China, where the population is increasing at higher rate as show in figure 2.1. For example, Bangalore city, has witnessed a phenomenal growth in vehicle population in recent years. As a result, many of the arterial roads and intersections are operating over the capacity (i.e., v/c is more than 1) and average journey speeds on some of the key roads in the central areas are lower than 10 Km/h at the peak hour. In [10], some of the main challenges are management of more than 36,00,000 vehicles, annual growth of

7–10% in traffic, roads operating at higher capacity ranging from 1 to 4, travel speed less than 10 Km/h at some central areas in peak hours ,insufficient or no parking space for vehicles, limited number of policemen. In [11], currently a video traffic surveillance and monitoring system commissioned in Bangalore city. It involves a manual analysis of data by the traffic management team to determine the traffic light duration in each of the junction. It will communicate the same to the local police officers for the necessary actions.

2.1 RFID INTRODUCTION

RFID (Radio Frequency Identification) allows an item, for example a library book, to be tracked and communicated with by radio waves. This technology is similar in concept to a cell phone. RFID is a broad term for technologies that use radio waves to automatically identify people or objects.

There are several methods of identification, but the most common is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID transponder or an RFID tag). The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it.

The heart of the system is the RFID tag, which can be fixed inside a book's back cover or directly onto CDs and videos. This tag is equipped with a programmable chip and an antenna. Each paper-thin tag contains an engraved antenna and a microchip with a capacity of at least 64 bits.

Components of an RFID System

A comprehensive RFID system has four components:

- ✓ RFID tags that are electronically programmed with unique information.
- ✓ Readers or sensors to query the tags.

- ✓ Antenna.
- ✓ Server on which the software that interfaces with the integrated library software is loaded.
- ✓ Tags.

2.2 History of RFID tags

In 1946 Léon Theremin invented an espionage tool for the Soviet Union which retransmitted incident radio waves with audio information. Sound waves vibrated a diaphragm which slightly altered the shape of the resonator, which modulated the reflected radio frequency. Even though this device was a passive covert listening device, not an identification tag, it has been attributed as the first known device and a predecessor to RFID technology. The technology used in RFID has been around since the early 1920s according to one source (although the same source states that RFID *systems* have been around just since the late 1960s).

Similar technology, such as the IFF transponder invented by the United Kingdom in 1939, was routinely used by the allies in World War II to identify airplanes as friend or foe. Transponders are still used by military and commercial aircraft to this day.

Another early work exploring RFID is the landmark 1948 paper by Harry Stockman,titled "Communication by Means of Reflected Power" (Proceedings of the IRE, pp 1196–1204, October 1948). Stockman predicted that "…considerable research and development work has to be done before the remaining basic problems in reflected-power communication are solved, and before the field of useful applications is explored."

Mario Cardullo's U.S. Patent 3,713,148 in 1973 was the first true ancestor of modern RFID; a passive radio transponder with memory. The initial device was passive, powered by the interrogating signal, and was demonstrated in 1971 to the New York Port Authority and other potential users and consisted of a transponder with 16 bit memory for use as a toll device.

The basic Cardullo patent covers the use of RF, sound and light as transmission medium. The original business plan presented to investors in 1969 showed uses in transportation (automotive vehicle identification, automatic toll system, electronic license plate, electronic

manifest, vehicle routing, vehicle performance monitoring), banking (electronic check book, electronic credit card), security (personnel identification, automatic gates, surveillance) and medical (identification, patient history).

A very early demonstration of reflected power (modulated backscatter) RFID tags, both passive and semi-passive, was done by Steven Depp, Alfred Koelle and Robert Freyman at the Los Alamos Scientific Laboratory in 1973. The portable system operated at 915 MHz and used 12 bit tags. This technique is used by the majority of today's UHF and microwave RFID tags.

The first patent to be associated with the abbreviation RFID was granted to Charles Walton in 1983 (U.S. Patent 4,384,288).

CHAPTER 9

PROPOSED MODEL

From the current problem section, it can be seen that, existing technologies are insufficient to handle the problems of congestion control, emergency vehicle clearance, stolen vehicle detection, etc. To solve these problems, we propose to implement our Intelligent Traffic Control System. The implementation includes two sound detecting sensors to detect the frequency of the heading ambulance. These sensors are connected to an Arduino,. The sensor is placed at a distance of 100mts away from the traffic signal. Normal traffic lights operations continue when no ambulance is detected in Senso. When sensor is detected with an ambulance, the respective lane in which it is traveling is made green for a duration of 150 sec for the ambulance to reach sensor 2 which is placed at a traffic signal, and the remaining lane signals are made red. After that the green signal for the respective lane where the ambulance is detected is continued with a delay of 5sec for the ambulance to pass the lane completely and the rest of the lanes remains red. After the ambulance passes the lane completely the traffic signal resumes its normal operations.

3.1 BLOCK DIAGRAM

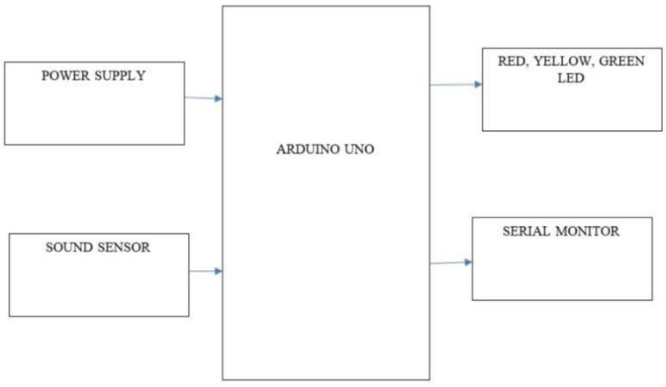

Fig 3.1: Block diagram

CHAPTER 4

SOFTWARE REQUIREMENTS SPECIFICATION

5.1 FUNCTIONAL REQUIREMENTS

Functional Requirements are the statements of services the system should provide and how the system reacts to particular inputs and how the system should behave in particular situation.

The requirement specifies that a function that a system or component must be able to perform. These include inputs, outputs, calculations, external interfaces, communications, and special management information needs. Functional requirements are also called behavioral requirements because they address what the system does. A specification constraining the way in which a given task is to be performed, the results to be obtained (speed, accuracy, etc.) as well as the elements of the functional entities involved (initiator, source, receptor, etc.).

5.2 NON-FUNCTIONAL REQUIREMENTS

In systems engineering and requirements engineering, non-functional requirements are requirements which specify criteria that can be used to judge the operation of a system, rather than specific behaviors. This should be contrasted with functional requirements that specify specific behavior or functions. Typical non-functional requirements are Reliability, Scalability, Performance, Usability, Maintainability, Portability and Cost. Other terms for non-functional requirements are "quality attributes" and "quality of service requirements".

Non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. Functional requirements define what a system is supposed to do whereas non-functional requirements define how a system is supposed to be. The non-functional requirements are the constraints or the environment in which the software is developed.

Non-functional requirements are often called Qualities of a system. Other terms for non-functional requirements are "constraints", "quality attributes", "quality goals", "quality of service

requirements" and "non-behavioral requirements" Qualities, that is non-functional requirements, can be divided into two main categories:

 Execution qualities, such as security and maintainability, which are observable.

 Evolution qualities such as performance, testability, extensibility and scalability, which are embodied in the static structure of the software system.

Non-functional requirements are divided into several groups. The first group of categories reflects the five qualities attributes:

- Usability
- Efficiency
- Reliability
- Maintainability
- Reusability

These requirements constrain the design to meet specified levels of quality. The second group of non-functional requirements categories constrains the environment and technology of the system.

Efficiency

Efficiency in general describes the extent to which time or effort is well used for the intended task or purpose. It is often used with the specific purpose of relaying the capability of a specific application of effort to produce a specific outcome effectively with a minimum amount or quantity of waste, expense, or unnecessary effort. "Efficiency" has widely varying meaningsin different disciplines.

Scalability

Scalability, as a property of systems, is generally difficult to define and in any particular case it is necessary to define the specific requirements for scalability on those dimensions that

are deemed important. It is a highly significant issue in electronics systems, databases, routers, and networking. A system, whose performance improves after adding hardware, proportionally to the capacity added, is said to be a scalable system.

Interoperability

Interoperability is a property referring to the ability of diverse systems and organizations to work together (inter-operate). The term is often used in a technical systems engineering sense, or alternatively in a broad sense, taking into account social, political, and organizational factors that impact system to system performance.

Reliability

Reliability (systemic def.) is the ability of a person or system to perform and maintain its functions in routine circumstances, as well as hostile or unexpected circumstances.

Usability

"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." The word "usability" also refers to methods for improving ease-of-use during the design process.

5.3 Requirement Specification

Hardware Requirements

- **Arduino UNO**

Fig 5.1: Arduino UNO Board

- **Speech Recognition Board**

Fig 5.2: Speech Recognition Board

- **USB to UART**

Fig 5.3: USB to UART

Multi Road Traffic Light Model (With Red, Yellow & Green LEDs), RF Tags and Readers, RF Transceivers for Server Communication and GSM Modem (Used to send SMS Notice)

Software Requirements

Operating System	:	Windows XP or Higher
IDE	:	Ardino Software IDE
Language	:	Python (lng)

CHAPTER 5

SOFTWARE DESIGN

5.1 Software Introduction

Software design is a process of problem solving and planning for a software solution. After the purpose and specifications of software are determined, software developers will design or employ designers to develop a plan for a solution. It includes low-level component and algorithm implementation issues as well as the architectural view.

- **Abstraction** - Abstraction is the process or result of generalization by reducing the information content of a concept or an observable phenomenon, typically in order to retain only information which is relevant for a particular purpose.

- **Design concept -** The design concepts provide the software designer with a foundation from which more sophisticated methods can be applied. A set of fundamental design concepts has evolved.
- **Refinement -** It is the process of elaboration. A hierarchy is developed by decomposing a macroscopic statement of function in a stepwise fashion until programming language statements are reached. In each step, one or several instructions of a given program are decomposed into more detailed instructions. Abstraction and Refinement are complementary concepts.
- **Modularity -** Software architecture is divided into components called modules.

- **Software Architecture -** It refers to the overall structure of the software and the ways in which that structure provides conceptual integrity for a system. Good software architecture will yield a good return on investment with respect to the desired outcome ofthe project, e.g. in terms of performance, quality, schedule and cost.

- **Information Hiding** - Modules should be specified and designed so that information contained within a module is inaccessible to other modules that have no need for such information
- **Design considerations-** There are many aspects to consider in the design of a piece of software.

The importance of each should reflect the goals the software is trying to achieve. Some of these aspects are:

- **Compatibility -** The software is able to operate with other products that are designed for interoperability with another product. For example, a piece of software may be backward-

compatible with an older version of itself.

- **Extensibility -** New capabilities can be added to the software without major changes to the underlying architecture

5.2 IMPLEMENTATION MODULE

1. Automatic Signal Light Control Module

This module will be used for vehicle identification and controlling signal lights.

• RFID readers installed in our demo model on every road and near the signal light junction will be used to read every passing vehicles and the model will transmit information like the street id and the vehicle id to our centralized server using RF transceivers.

• USB port at Centralized Server will be communicated to receive RF Signal with the available vehicle. Information received will also get recorded at server machine for later tracking purpose.

• Centralized Server maintains counts/density of vehicles waiting at Signal Light

• Here Dynamic Time Scheduling Algorithm will be used to control signal lights respective to the queuing vehicle density.

Eg:- If the count is more than 10, the green light duration is set to 30 seconds, if count is between 5 and 9, the green light duration is set to 20 seconds. If the count is less than 5, the green light duration is set to 10 seconds. The red light duration will be for 10 seconds and orange light duration will be for 2 seconds.

2. Emergency Vehicle Clearance System

In this module, we compare the unique RFID tag read by the RFID reader to the emergency vehicles RFIDs stored in the system. If a match is found, then the traffic signal is immediately turned to green.

CHAPTER 6

TECHNOLOGY SPECIFICATION

6.1 INTRODUCTION TO ARDUINO IDE:

Arduino Software, also known as the Arduino IDE (Integrated Development Environment), is a user-friendly platform used to write, compile, and upload code to Arduino boards. It provides

a simple and accessible way for beginners and experienced developers alike to program and interact with Arduino microcontrollers effectively.

Here's an introduction to the Arduino Software and its essential features:

Installation: To get started, you need to download and install the Arduino IDE on your computer. It's available for Windows, macOS, and Linux. You can find the latest version on the official Arduino website.

Code Editor: The Arduino IDE offers a straightforward code editor where you can write your Arduino sketches (programs). The editor is similar to a basic text editor, with syntax highlighting to make the code more readable. It supports the C/C++ programming language with a few specific Arduino libraries and functions.

Sketch Structure: In the Arduino world, a program is called a "sketch." A sketch typically consists of two essential functions: setup() and loop(). The setup() function is executed only once when the board starts up, while the loop() function runs repeatedly after the setup() is complete.

Boards Manager: Arduino supports a wide range of microcontroller boards. Within the IDE, you can select the appropriate board from the "Tools" menu. The "Boards Manager" allows you to add support for new boards and update existing packages.

Serial Monitor: The Arduino IDE includes a Serial Monitor tool that allows you to communicate with your Arduino board via the computer's serial port. You can use this for debugging and to send/receive data between the board and your computer.

Library Manager: Arduino has a vast collection of libraries that provide pre-written code to handle various functionalities and components. The Library Manager in the IDE lets you easily search for and install new libraries to extend the capabilities of your Arduino projects.

Upload: Once you've written your code, you can compile and upload it to the Arduino board via a USB connection. The Arduino IDE compiles the code into machine code that the microcontroller can understand and then flashes it to the board's memory.

Examples: The Arduino IDE comes with a collection of example sketches that demonstrate how to use different components and sensors. These examples are a great starting point for learning and experimenting with Arduino projects.

Community: Arduino has a vibrant and active community of makers, hobbyists, and developers who share their projects, knowledge, and troubleshooting tips. The official Arduino forums and various online communities are excellent resources for getting help and inspiration

6.2 INTRODUCTION TO EMBEDDED C:

Traffic light controllers are crucial components of modern traffic management systems. They regulate vehicular and pedestrian traffic at intersections, ensuring a smooth and safe flow of vehicles and pedestrians. In this software introduction, we will present a Python-based traffic light controller system that emulates the behavior of a real-world traffic light

Intersection Simulation: The software will simulate an intersection with multiple traffic lights governing different directions of traffic flow.

Time-Based Control: The traffic light controller will operate based on predefined time intervals for each traffic phase (e.g., green, yellow, and red lights). These intervals will be adjustable to suit various traffic conditions.

Multi-Threading: The implementation will use multi-threading to handle simultaneous control of multiple traffic lights independently.

User Interface: The software will provide a user-friendly command-line interface (CLI) or graphical user interface (GUI) to monitor and adjust traffic light timings and view the current state of each traffic light.

Event Handling: The system will handle events such as pedestrian crossing requests or emergency vehicle signals that may impact traffic light behavior.

Safety Measures: The software will incorporate safety mechanisms to prevent conflicting green signals, such as diagonal traffic movements**.**

CHAPTER 7

IMPLEMENTATION

7.1 INTRODUCTION

A crucial phase in the system lifecycle is the successful implementation of the new system design. Implementation simply means converting a new system design into operation. Implementation is a stage in which the design is converted into working system.

Implementation is the process of bringing the developed system into operational use and turning it to the user. This stage is considered to be the most crucial stage in the development of a successful system since a new system is developed and the users are given the confidence of its effectiveness.

Implementation Phases are as follows:

 First phase includes table design for Traffic signal module.

 Second phase includes coding for Ardino uno modules

 Third phase includes the Voice recognition modules

 Fourth phase includes connection establishment between the front-end and back-end.

 Fifth phase includes error handling and message generator in software.

7.2 Dynamic Time Scheduling Algorithm

Pseudo code :-

Input:-vehicle sound

Output:-signal light control, emergency vehicle clearance
Step 1:- initialize vehicle sound
Step 2:-detect vehicles on traffic (read com port to fetch detected vehicle id and street id)

Step 3:-update vehicle sound density by descending order
Step 4:-pick highest density sound
Step 5:-check if any traffic signal has emergency vehicle (on emergency)IF YES,
Step 6:-wait for total vehicle (sound)*2sec

Step 7:-2 *sec for each vehicles at that signal to pass
ELSE, Check if highest sound vehicle
Step 8:-IF YES,
Send red light code to highest density street using COM port
Step 9:-Send SMS to software to alert
Step 10:-Pick second highest sound signal

Step 11:-Send green light code to second highest density sound using COM portStep 12:-Wait for total vehicle (sound)*15sec ELSE.
Send green light code of highest density street using COM Port
Step 13:-Wait for total vehicle (sound)*15sec
END
END

CHAPTER 8

TESTING

Testing is the process of evaluating a system or its component(s) with the intent to find that whether it satisfies the specified requirements or not. This activity results in the actual, expected and difference between their results. In simple words testing is executing a system in order to identify any gaps, errors or missing requirements in contrary to the actual desire or requirements.

A good testing program is a tool for the agency and the integrator/supplier; it typically identifies the end of the "Development" phase of the project, establishes the criteria for project acceptance, and establishes the start of the warranty period.

8.1 PURPOSE OF TESTING

There are two fundamental purposes of testing: Verifying Procurement Specifications and Managing Risk. First, testing is about verifying that what was specified is what was delivered: it verifies that the product (system) meets the functional, performance, design, and implementation requirements identified in the procurement specifications. Second, testing is about managing risk for both the acquiring agency and the system's vendor/developer/integrator. The testing program is used to identify when the work has been "completed" so that the contract can be closed, the vendor paid, and the system shifted by the agency into the warranty and maintenance phase of the project.

Testing is used to provide customers with bug free Software and Reliable software. The software developed should not get any problem while in use, in order make efficient use of the software developed Software testing is conducted. Because software once developed costs much and if the customer faces problem while in use he has to incur huge losses .So to avoid such loss software testing is conducted.

Testing is done to Analyze whether the application developed is according to the Requirements. The main course of testing is to check for the existence of defects or errors in a

program or project or product, based up on some predefined instructions or conditions. (It can be a scope document or HLDD (High Level Design Document))

Testing enforces in obtaining Quality in the application. Testing helps in removing errors, the more we remove the errors the better would be the Quality of the product. The purpose of testing can be quality assurance, verification and validation, or reliability estimation. Software testing is a trade-off between budget, time and quality.

RESULTS

Emergency vehicle clearance

An automatic traffic light controller is an efficient and reliable system that can effectively manage traffic flow at intersections. It utilizes various sensors and algorithms to detect and analyze vehicle presence, prioritize traffic movements, and optimize signal timings.

By employing intelligent control mechanisms, such as adaptive algorithms or machine learning techniques, an automatic traffic light controller can adapt to changing traffic conditions in real-time. This flexibility allows for improved traffic flow, reduced congestion, and enhanced safety at intersections.

Additionally, the implementation of an automatic traffic light controller can bring several benefits. It minimizes human error and subjectivity in signal timing decisions, leading to more consistent and fair traffic management. It can also enhance energy efficiency by optimizing signal timings based on traffic demand, reducing unnecessary idling and fuel consumption.

Furthermore, an automatic traffic light controller can integrate with other intelligent transportation systems, such as traffic monitoring systems, to provide a comprehensive solution for traffic management and planning. The data collected by the controller can be used for traffic analysis, future planning, and optimizing overall transportation networks.

However, it is important to consider that the successful implementation of an automatic traffic light controller requires careful planning, system design, and coordination with existing infrastructure. Additionally, public acceptance and awareness of the system are crucial for its effectiveness.

In conclusion, an automatic traffic light controller has the potential to significantly improve traffic management, reduce congestion, enhance safety, and optimize overall transportation systems. Continued research and development in this field can further refine and advance these systems, leading to more efficient and intelligent traffic control solutions in the future.

CONCLUSION

With automatic traffic signal control based on the traffic density in the route, the manual effort on the part of the traffic policeman is saved. As the entire system is automated, it requires very less human intervention. With stolen vehicle detection, the signal automatically turns to red, so that the police officer can take appropriate action, if he/she is present at the junction. Emergency vehicles like ambulance, fire trucks, need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, precious lives of many people may be in danger. With emergency vehicle clearance, the traffic signal turns to green as long as theemergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through.

From a proper analysis of positive points and constraints on the component, it can be safely concluded that the product is a highly efficient GUI based component. This application is working properly and meeting to all user requirements. This component can be easily plugged in many other systems.

The system has been developed with much care that it is free of errors and at the same time it is efficient and less time consuming. The important thing is that the system is robust. Avoid malfunction from outsiders .It goes through all phases of software development cycle. So product is accurate. Also provision is provided for future developments in the system

FUTURE ENHANCEMENTS

Further enhancements can be done to the prototype by testing it with longer range RFID readers. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known. Currently, we have implemented system by considering one road of the traffic junction. It can be improved by extending to all the roads in a multi-road junction.

Though it is well modulated system, it has been limited to certain restrictions. By understanding trends in technology we can sometimes make accurate predictions about what will happen in the future. This Project can be enhanced by

 Adding the GPS Technology to the existing system.

 Designated Check Posts can be equipped with cameras, and static scanners for more reliability and security.

 Speed violations can also be tracked by the integration of the Interceptor to the existing system.

 Unit tracking ability with Google Maps, both road and satellite.

 Detailed replay of all activities in graphical and tabular reports.

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APPENDIX

Project Code:

```
int B=0;
void setup()
{
Serial.begin (9600);
pinMode(7,INPUT);
pinMode(8,OUTPUT);//red
pinMode(9,OUTPUT);// yellow
pinMode(10,OUTPUT);// green

}
void loop()
{
Serial.println("EMERGENCY TRAFFIC CONTROL SYSTEM");
digitalWrite(8,HIGH);// RED LIGHT ON
digitalWrite(9,LOW);// YELLOW OFF
digitalWrite(10,LOW);// GREEN OFF
delay(1000);

int A=digitalRead(7);

if(A==HIGH)
{
if(B==0)
{
Serial.println("AMBULANCE DETECTED");
```

```
digitalWrite(8,LOW);
delay(1000);
digitalWrite(9,HIGH);// YELLOW LIGHT ON
delay(1000);

digitalWrite(8,LOW);
digitalWrite(10,HIGH);// GREEN LIGHT ON
delay(15000);
B=1;
}

}

else
{
Serial.println("NORMAL CONDITION");
digitalWrite(8,HIGH);// RED LIGHT ON
digitalWrite(9,LOW);// YELLOW OFF
digitalWrite(10,LOW);// GREEN OFF
B=0;
delay(1000);
}


}
```