SMART TRAFFIC LIGHT

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ABSTRACT:In many metropolitan cities we face the most common problem particularly at peek time of business hour. Everyday struggle and efforts to dozing traffic, pollution and rush driver the biggest cause of frustration, stress and psychological problem. At certain junctions, sometimes even if there is no traffic, people have to wait. Because the traffic light remains red for the preset time period, the road users should wait until the light turns green.To solve such serious problem most of the urban communities are providing ideas and planning to implement updates in our traffic control system as in every field old version are replaced by smart version.

Conventional system does not handle variable flows approaching the junction in addition the mutual interference between adjacent traffic light system, the accidents, the passage of emergency vehicle this all leads to traffic jam and congestion There are Information and Communication technologies that can be used to develop smart traffic control system using sensor devices and other system that sense data.

KEYWORDS: GSM module, Arduino Uno, RFID, traffic light.

1. INTRODUCTION

Road transport is one of the leading/ancient modes of transport in many parts of the world today. The number of vehicles using the road is increase rapidly every day. Due to this reason traffic congestion major problem increase daily in many developed countries so to control this problem Traffic light system was introduced. The world's first traffic light was a manually operated gas-lit signal installed in London in December 1868. It exploded less than a month after it was implemented, injuring its policeman operator. Earnest Sirrine from Chicago patented the first automated traffic control system in 1910. It used the words "STOP" and "PROCEED", although neither word was illuminated. Nowadays, Traffic light placed at road intersections, pedestrian crossings, rail trains, and other

locations. Traffic lights consist of three universal colored lights: the green light allows traffic to proceed in the indicated direction, the yellow light warns vehicles to prepare for short stop, and the red signal prohibits any traffic from proceeding. Secondly, the current traffic light system is implemented with hard coded delays where the lights transition time slots are fixed regularly and do not depend on real time traffic flow. The third point is concerned with the state of one light at an intersection that influences the flow of traffic at adjacent intersections First, the traffic flow depends on the time of the day where the traffic peak hours are generally in the morning and in the afternoon; on the days of the week where weekends reveal minimum load while Mondays and Fridays generally show dense traffic oriented from cities to their outskirts and in reverse direction respectively; and time of the year as holidays and summer. As we see traffic signal are most convenient method of controlling traffic in a congestion road, but in the today's world these signal fail to control the traffic when a particular lane got more traffic than the other lanes. This situation makes that particular lane more congested than the other lane, thus due to this the commuters around the world have to face traffic congestion every day costing enormous amounts of time and money.From New York, to Paris, to manila, commuters spend hundreds of hours sitting in traffic. Most severe is the struggle of the morning commute, when everything goes planned it can take two or three hour to reach destination at rush hour, Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. Inefficient management of traffic causes wastage of invaluable time, pollution, wastage of fuel, cost of transportation and stress to drivers, etc. but more importantly emergency vehicles like ambulance get stuck in traffic. In the financial capital of India, journey during rush-hour taken 65 percent longer. In Delhi it is 58 per cent longer, Road traffic jams continue to remain a major problem in most cities around the world, especially in developing regions resulting in massive delays, increased fuel wastage and monetary losses. Partial solution was offered by constructing new roads implementing flyover and bypass roads. Presently various system is providing a cost effective solution, but the rate of successful operation is bad. Inductive loop detectors installed under surface, this fails in case of poor road condition Traffic is one of most significant challenge for many cities that are experiencing rapid growth of vehicles on the road that are strain on the environment. The common reason for traffic congestion is due to poor traffic prioritization. This is happening because of today's traffic light is not operating with real time data. Traffic is a critical issue of transportation system in most of all the cities of Countries. This is especially true for countries where population is increasing at higher rate. As a result, many of the arterial roads and intersections are operating over the capacity 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 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. 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. The design of intelligent traffic control system is an active research topic. Researchers around the world are inventing newer approaches and innovative systems to solve this stressful problem.

2.1 Why Toll is Collected?

Any structure, building or system needs maintenance and rehabilitation which are of course costly. Highways and roads are also not an exception. From the very past, the construction, extension, maintenance and operating costs of highways, roads, bridges and tunnels were collected directly or indirectly. In the older indirect method, the expenses are compensated either by tax payment on fuel or by budget allocation from the national income. The shortcoming of this method is that a number of tax payers, who do not use some of the roads and carriageways, have to pay extra money.

However, in the other system, called direct method, the tolls are taken directly from the drivers passing that road or street. The other three main reasons why tolling, or road pricing, is implemented are listed below.

a) **Finance/Revenue Generation:** To recoup the costs of building, operating and maintaining the facility. Road pricing is becoming a more appealing means of funding transportation. Moreover, toll financing allows projects to be built sooner instead of waiting for tax revenues to accumulate.

b) **Demand Management:** To moderate the growth in demand on the transportation system, and to encourage more use of public transportation and carpooling. For example, vehicles are charged to enter inner London, England, as a way of regulating the demand in the region

c) **Congestion Management:** To place a price on limited roadway space in proportion to demand. In this application the toll increases with the level of congestion. In the absence of such pricing, drivers do not appreciate the costs they impose on others as a result of the congestion they cause.

2.2 Different Types of Toll Collection Systems

Three systems of toll roads exist: open (with mainline barrier toll plazas); closed (with entry/exit tolls) and all-electronic toll collection (no toll booths, only electronic toll collection gantries at entrances and exits or at strategic locations on the mainline of the road).On an open toll system, all vehicles stop at various locations along the highway to pay a toll. While this may save money from the lack of need to construct tolls at every exit, it can cause traffic congestion, and drivers may be able to avoid tolls by exiting and re-entering the highway. With a closed system, vehicles collect a ticket when entering the highway. In some cases, the ticket displays the toll to be paid on exit. Upon exit, the driver must pay the amount listed for the given exit. Should the ticket be lost, a driver must typically pay the maximum amount possible for travel on that highway. Short toll roads with no intermediate entries or exits may have only one toll plaza at one end, with motorists traveling in either direction paying a flat fee either when they enter or when they exit the toll road. In a variant of the closed toll system, mainline barriers are present at the two endpoints of the toll road, and each interchange has a ramp toll that is paid upon exit or entry. In this case, a motorist pays a flat fee at the ramp toll and another flat fee at the end of the toll road; no ticket is necessary. In an all-electronic system no cash toll collection takes place, tolls are usually collected with the use of a transponder placed before the Gate as soon as the vehicle reaches near the Transponder the amount is deducted and the gate will be opened customer account which is debited for each use of the toll road. On some road's automobiles and light trucks without transponders are permitted to use the road a bill for the toll due is then sent to the registered owner of the vehicle by mail; by contrast, some toll ways require all vehicles to be equipped with a transponder. Modern toll roads often use a combination of the three, with various entry and exit tolls supplemented by occasional mainline tolls. Open Road Tolling (ORT), with all-electronic toll collection, is now the preferred practice, being more efficient, environmentally friendly, and safer than manual toll collection.

2.3 Drawbacks of Existing System

The above-mentioned method for collecting toll tax is time consuming method. Chances of escaping the payment of toll tax are there. It leads to queuing up of following vehicles. Suppose the manual toll collection system is very efficient then for one vehicle to stop and pay taxes total time taken is 50 seconds. And suppose 200 vehicles cross the toll plaza. Then, time taken by 1 vehicle with 60 second average stop in a month is: 50x30= 1500 seconds

Yearly total time taken = 1500x12 = 18000seconds = 5.0 hours

On average each vehicle that passes through the toll plaza has to wait 5.0 hours in engine start condition yearly. The figure is staggering if on an average we take 200 vehicles pass through the toll plaza each day, then yearly 72000 vehicles pass through the toll plaza. And each year 72000 vehicles

just stand still for 5.0 hours in engine start condition thereby aiding pollution and wasting fuel and money. This study is if the system is very efficient but what if the vehicle has to wait for 5 minutes? This is a figure considering one toll plaza. If considering 50 toll systems the above figure will drastically increase and the wastage of fuel, money will increase and pollution will also increase.

2.4 Proposed System

To control traffic more efficiently, System need to be upgraded and to solve the severe traffic congestion, alleviate transportation troubles, reduce traffic volume and waiting time so we have to introduce the Smart Traffic Control System To minimize overall travel time, optimize cars safety and efficiency, and many more expanded benefits in health, economic, and environmental sectors. Smart Traffic Management is a system where centrally-controlled traffic signals and sensors regulate the flow of traffic through the city in response to demand. A system which operate with real time information, operators can adjust traffic flows and reduce congestion across the road network. This system based on PIC microcontroller that controls the various operations, monitors the traffic volume and density flow via infrared sensors (IR), and changes the lighting transition slots accordingly

In this System design, a density based traffic light control system was developed for traffic control at four -way road intersection to reduce unnecessary time wastage and minimize road traffic casualties which the existing conventional traffic light control system has failed to achieve. This system will add gain to this sector with efficient operation replacing the current primitive timer traffic control system. This helps the emergency casualties to be attended quickly without panic of traffic congestion. Successful implementation of our research will result in faster clearance of traffic and improvement in the transportation of emergency vehicles.

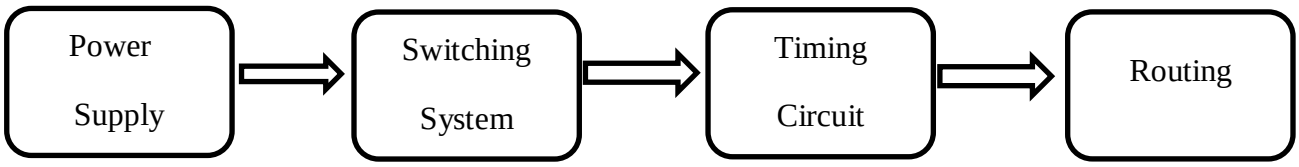

Figure 1: Proposed System Model

Design of Smart traffic control system: -The input subsystem is made of sensors, programmed and implemented using some already existing principles to achieve optimum performance. The control unit is realized by a microcontroller-based control program, which interprets the input and qualifies it to produce a desired output.

In choosing the sensors, the following features were taken into consideration: accuracy, range, calibration, resolution and affordability. Although the infrared (IR) sensors are usually disturbed by noise in the surrounding such as radiations, ambient light etc., they were used for this design because they are cheap and readily available in the market and are easy to interface.

Just like the conventional traffic light indicator in this design controls traffic using three light emitting diodes, 'GREEN', 'YELLOW' and 'RED', each having their usual meaning of 'GO', 'READY' and 'STOP' respectively. They are controlled by the control buses of the microcontroller depending on the logical decisions taken by the controller to control the lanes of traffic according to their densities.

Mode of Operation

Once the traffic control commences operation, the states of all the sensor arrays on each lane of traffic is read and given as input to the microcontroller for logical operations. The system assigns serial number to each lane based on their density, where the lane with the most density is assigned lane one. Accordingly, the system sets the ready flag for lane one where the YELLOW light shows; in preparation for the passing of traffic in that lane and delays for a certain time before giving the go signal with the GREEN light.

The Infrared Sensor is used to senses the amount of density of a particular road. IR sensor consists of IR transmitter and receiver sensing the density of the road and produces an output signal. The output IR signal is provided as an input to the microcontroller.

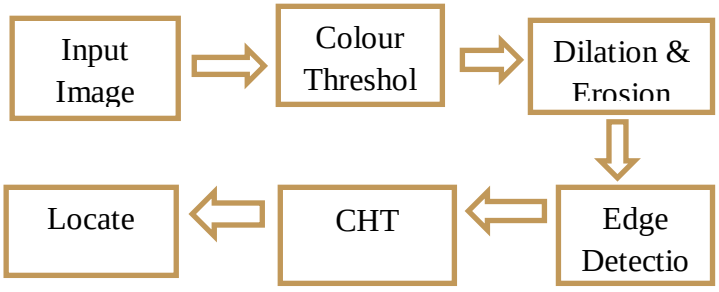

Figure2: Block Diagram

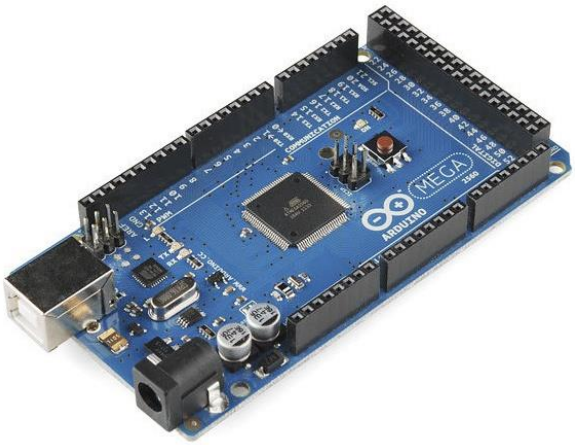

Figure 3: MODEL

CONCLUSION

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