Intelligent Traffic Control System

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ABSTRACT:
This paper is about Intelligent Traffic Control and Management System which uses intelligent components like RFID, IR sensors, microcontroller, etc. It also consists of modules for i) Allowing passage of prioritized vehicles viz. Ambulance, VIP, etc. ii) Enabling users to track their stolen or lost vehicles. iii) Help people to get information about the traffic density in specific area. iv) Avoiding corruption by automated fine deduction. RFID tags are used for unique identification of vehicles and IR sensors are used to get the vehicle count. RFID readers used are having frequency 125 KHz. PCB (Printed circuit Board) are used to mount circuit components.

Keywords: Emergency vehicle clearance, PCB, Stolen Vehicle Detection, RFID, IR.

INTRODUCTION:
In today’s world there is no efficient traffic system, one way of providing efficient traffic system is by manipulating traffic lights dynamically based on traffic size. Also there are no priority services for any priority vehicles like ambulance hence some services other than normal services must be provided to priority vehicles. User faces traffic jam due to lack of notification hence must be regularly notified about current traffic conditions if he wishes to. Some strict action is required against the rule breakers such as fine deduction or in worst case license invalidation. There is a drastic need to solve these problems for efficient management of traffic.

LITERATURE SURVEY:
Traffic Management on the road has become a severe problem of today’s society.
An efficient traffic management technique is needed to reduce waiting and travelling times, save fuel and money. We are known to the fact that, number of vehicles is increasing exponentially, but infrastructure for transportation we have, is not sufficient to satisfy their needs. Due to this, valuable time of public is being lost every day. This also leads to huge economic problems. Main problem occurs when this traffic congestion costs life of someone. It should not be surprising that traffic congestion affects almost all emergency vehicles, which can be too much hazardous to affected people. There isn’t any quick solution for this. Government can’t continue making roads everywhere.

The traffic system in today’s world is not up to date there is no update of traffic density also there are no priority services provided for priority vehicles such as ambulance. Traffic jam is the main cause of inefficient traffic system and it occurs because user is not aware of current traffic density or size. No strict laws have been implemented for rule breakers. There is a drastic need to solve these problems for efficient flow of traffic system.

Figure1. Today’s Traffic Scenario in Metropolitan Cities

Generally traffic light controllers use micro processors and controllers which used predefined hardware and have no flexibility for modification on real time basis. This results in wastage of car fuel, so they have implemented traffic signal controller with powerful hardware interface. In this paper, GSM interface is also provided for sending traffic alerts.

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 1. [1]

PROPOSED SYSTEM:
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. It mainly consists of three parts. First part contains automatic signal control system. Here, each vehicle is equipped with an RFID tag. When it comes in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how many vehicles have passed through for a specific period and determine the congestion volume. Accordingly, it sets the green light duration for that path. The second part contains Stolen Vehicle Detection. Here when the RFID reader reads the RFID tag, it compares with list of stolen RFIDs tags. If the match is found it sends the SMS to the police control room and change the traffic light to red. So that vehicle is made to stop in the traffic junction and local police can take appropriate actions. The third part is for emergency vehicle clearance. The buzzer will be switched on when the vehicle is used for emergency purpose. The signal will be sent to CTS and it will change the traffic light to green. Once the Ambulance passes it will turn it to red. The fourth part consists of license invalidation where the license of the registered user will be invalidated on breaking the rules for specified number of times.

COMPONENTS OF SYSTEM ARCHITECTURE:
A. IR SENSORS:-
IR sensors use infra red light to sense objects in front of them and gauge their distance. The commonly used Sharp IR sensors have two black circles which used for this process, an emitter and a detector. A pulse of infra red light is emitted from the emitter and spreads out in a large arc. If no object is detected then the IR light continues forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector. This forms a simple triangle between the object, emitter and detector.

Figure 3: IR sensors
The detector is able to detect the angle that the IR light arrived back at and thus can determine the distance to the object. This is remarkably accurate and although interference from sunlight is still a problem, these sensors are capable of detecting dark objects in sunlight now.

B. RFID TAGS:-
RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line, RFID-tagged pharmaceuticals can be tracked through warehouses, and implanting RFID microchip in livestock and pets allows positive identification of animals.

Figure 4: RFID tags
Since RFID tags can be attached to cash, clothing, and possessions, or implanted in Animals and people, the possibility of reading personally-linked information without

C. 8051 MICROCONTROLLER:-
The Intel MCS-51 (commonly referred to as 8051) is Harvard architecture, CISC Instruction set, single chip microcontroller (C) series which was developed by Intel in 1980 for use in embedded systems. Intel’s original versions were popular in the 1980s and early 1990s and enhanced binary compatible derivatives remain popular today.

WORKING MODELS:
In this system the RFID’s tags are classified as normal, priority and lost for the prioritization.
A. DYNAMIC TRAFFIC CONTROL:-
In this module, IR sensors will detect the passing vehicle from road. Vehicle count detected through IR sensors is forwarded to the microcontroller. Microcontroller will perform computation and central computer system will perform clustering using K-Means algorithm and dynamic traffic light switching will be done.

B. EMERGENCY VEHICLE CLEARANCE :-
Here input is taken from RFID reader and pass to the central computer system. CCS will perform matching of priority vehicle RFID tags database & input. And traffic light of the signal will switch to Green.

C. STOLEN VEHICLE DETECTION :-
Here input is taken from RFID reader and pass to the central computer system. CCS will perform matching of lost vehicle RFID tags database & input. And traffic light of the signal will switch to Red.

D. LICENSING CONTROL:-
When people will break the traffic rules, then fine will be deducted. If rule breaking count exceed above three then licence invalidated.
E. ANDROID APP:-
When user login to the app from the android, then application notifies about the density of the traffic area wise as per need.

![Android App processing](image)

Figure10.Android App processing

TECHNICAL ASPECTS:
Below is the K-Means algorithm which will be used in the implementation.

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Algorithm 1: K-Means Algorithm
Input: E = \{e_1, e_2, ..., e_n\} (set of entities to be clustered)
        k (number of clusters)
MaxIters (limit of iterations)
Output: C = \{c_1, c_2, ..., c_m\} (set of cluster centroids)
        L = \{l(e_i) | \epsilon = 1, 2, ..., k\} (set of cluster labels of E)

foreach c_i \in C do
    c_i \leftarrow e_j \in E (e.g. random selection)
end

foreach e_i \in E do
    l(e_i) \leftarrow \arg\min_{c_j \in C} \{\text{Distance}(e_i, c_j)\} 
end

changed \leftarrow false;
iter \leftarrow 0;
repeat
    foreach c_i \in C do
        UpdateCluster(c_i);
    end
    foreach e_i \in E do
        minDist \leftarrow \arg\min_{c_j \in C} \{\text{Distance}(e_i, c_j)\};
        if minDist \neq l(e_i) then
            l(e_i) \leftarrow minDist;
            changed \leftarrow true;
        end
    end
    iter \leftarrow iter + 1;
    until changed \leftarrow true \& iter \leq MaxIters;
```

FUTURE SCOPE:
Further enhancements can be done to the prototype by testing it with longer range RFID readers and long range IR sensors. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle can be tracked and SMS service can be used to send this location. 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. By implementation point of view this system is more serialized while implementing it on broader scale we can use distributed computing and parallelization of high level. Also this same system can be extended to implement automated toll system.

CONCLUSION:
The dynamic change of state using background referencing method is successful in solving the issue of fixed timing of controller in controlling traffic and consequently will minimize the traffic congestion on the roads. The use of real time data obtained through RFID sensor technique that serves as input to traffic light will be an innovative way of controlling traffic volume in developing countries. Also the logs obtained are used to send traffic density to users so that congestion can be controlled. Licensing control module enforces discipline in users and thereby minimizing the breaking of traffic rules. 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 the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through.

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