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Smart Traffic Management System at Railway Crossing Based on IOT

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ABSTRACT: In the course of the Internet's growing importance within the last decade, the Internet of Things (IOT) has also been a subject of much debate. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices. Now-a-days vehicular traffic on roads has grown at an uncontrollable rate mostly in railway crossing areas inside city limit due to the increased density of traffic. Traffic congestion occurs mostly in the junctions where two or more roads meet and also in the railway crossing areas inside city limit. The main reason for this traffic at railway crossing junctions due to the increased density of traffic from both directions of railway crossing. Being exposed to the daily hassles of traffic can lead to late arrival for employment, delay to schools and colleges, higher chronic stress. Commuters who are exposed to air pollution, like those riding in non-air-conditioned vehicles such as jeepers and motorcycles, double their health risk.To overcome this issue, we have proposed a new approach to avoid traffic congestion near railway crossing by installing sensors and LCD panel boards which indicates the closure of railway gate to the drivers priorly and also notified through a mobile application. This results in diverting most of the vehicles through alternative route by prior indication and reducing the density of traffic accumulation at the particular railway crossing. As a result, the emergency vehicles respond to the gate closure and opt for an alternative route to reach nearby destination faster.

KEYWORDS: LED Panel boards, Motorcyclist, Railway crossing, Traffic congestion
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I. INTRODUCTION

Traffic congestion is a significant problem in many cities around the world. India, second largest populous country, faces this problem every day. There are several policies that have been implemented to reduce traffic congestion, such as improvement of public transport, car and motor cycle restriction on several roads, and an even-odd license plate policy. Traffic on roads and on railway crossings may consist of pedestrians, ridden or herded animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel. Traffic laws are the laws which govern traffic and regulate vehicles, while rules of the road are both the laws and the informal rules that may have developed over time to facilitate the orderly and timely flow of traffic near railway crossings and on road. Organized traffic near railway crossings generally has well established priorities, lanes, right of way, and traffic control at intersections. Although Safety is a core issue in railway operation and in terms of rail transport safety, grade crossings have created serious conflicts among rail and road transport. This project deals with traffic management at railway crossing based on IOT for detecting traffic by means of sensors and transmitters.

Traffic congestion at railway crossing junctions is mainly due to the increased density of traffic from both directions of railway crossing. This causes delays that may lead to late arrival for employment, delay to schools and colleges, stressed motorcyclists and wear and tear of vehicles.

Being exposed to the daily hassles of traffic can lead to higher chronic stress. The stress related problems lead to other road problems like accidents, road rage etc. The manual traffic management generates serious problems to traffic police in charge. The study says that about 79.4% of traffic police gets fatal mental disorders within a year of their field work. Many other automated and semi-automated traffic management techniques have been discovered but still they do not address on major psychological issues. Aside from stress, they are also exposed to pollutants that can affect the lungs

Traffic congestion occurs when a volume of traffic or modal split generates demand for space greater than the available street capacity this point is commonly termed saturation. There are a number of specific circumstances which cause or aggravate congestion; most of them reduce the capacity of a road at a given point or over a certain length, or increase

the number of vehicles required for a given volume of people or goods.Economist Anthony Downs argues that rush hour traffic congestion is inevitable because of the benefits of having a relatively standard work day. In a capitalist economy, goods can be allocated either by pricing (ability to pay) or by queueing (first-come first-served); congestion is an example of the latter.

   The internet of things (IoT) is the network of physical devices, vehicles, buildings and other items-embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.

II. PROPOSED SYSTEM

The proposal of this project is to overcome or reduce this traffic congestion at railway crossings by reducing the traffic at the particular area by diverting most of the vehicles through alternative route by priorly indicating that the road is closed for railway crossing at that particular time. Now-a-days vehicular traffic on roads has grown at an uncontrollable rate over the years making traffic jams. Traffic congestion occurs mostly in the junctions where two or more roads meet and also in the railway crossing areas inside city limit. The main reason for this traffic at railway crossing junctions due to the increased density of traffic from both directions of railway crossing. This causes delays that may lead to late arrival for employment, delay to schools and colleges, stressed motorcyclists and wear and tear of vehicles. Being exposed to the daily hassles of traffic can lead to higher chronic stress.To overcome this issue, flyovers or road over bridges were constructed in the mega cities but this type of congestion is still there in the small developing cities. Mega cities are well planned in transport system and also well-equipped, on other hand the developing cities are not so well planned. People travelling through railway crossings have to wait for several minutes to pass. Also, after opening the gate, they are facing more delay at crossing. Here, we propose a new approach to avoid traffic congestion and obtain an optimal route for vehicles in the smart city exploiting IOT devices.Thiscan be achieved by means of installing LCD panel boards at selected roads to indicate the moment of railway crossing to the travellers based on IOT and notifying them through mobile application online android IDE. Adapting this technology may lead to reduced air pollution, emergency vehicles may respond faster saving lives, and this helps the people who suffer a lot from traffic congestion. As a result of this method, we can achieve lesser traffic accumulation at the railway crossing points and vehicles can pass through the crossings at a faster rate when compared to the usual time. Sensors or devices help in collecting very minute data from the surrounding environment. All of this collected data can have various degrees of complexities. The sensors can be connected to the cloud through various mediums of communication. Once the data is collected and it gets to the cloud, the software performs processing on the acquired data. The information made available to the end-user in some way. This can achieve by notifying through mobile application and by LCD panel boards installed in that particular area

ADVANTAGES
- Easy to access IOT platform
- High speed dual core processor IOT module
- Low cost
- Very low power consumption (3.3V)
- High Security

III. SYSTEM IMPLEMENTATION

MODULES
- Smart Sensor Detection
- Data transmission
- Gate closure and message display
- App notification
- Gate opening and traffic clearance
- Traffic Diversion

Smart Sensor Detection:
 A sensor detects vibrations in the train with respect to the arrival and departure of trains using the Infrared system.The infrared system emits light that strikes the object and reflects signal back. The reflected light signal is then collected by

a lens and focused on a photodiode contained within a sensor unit. These sensors are placed in the railway track at a distance of 5 km from either side of the level crossing. The IR Sensors are placed on both the rails of the track for accurate detection. This detector works by sending out and detecting an invisible beam of infrared light. When an infrared detector finds that the beam has either been broken, in the case of arrival of train, it triggers an event and sends data to the microcontroller. This data will be sent only when both the sensors in the track is triggered. This helps in accurate handling of Gate opening and closure.

Data Transmission:

When the arrival of train is detected by the sensor, it sends data to the microcontroller which is associated with servo motors and Receivers. The purpose of data processing is to convert raw data to something useful. Something the end user can react to It can, however, also be used with many other development boards. The receiver receives the information and convert them into useful format.

Gate closure and message display:

The Information received by the servo motor helps in Automatic opening and closing of the railway level crossing gate. When the Sensor detects the arrival of train the information will be received by the servo motor. This helps in closing the railway gate on both sides automatically. Thus, traffic from both sides is stopped. The information is also received in the LCD IR Receiver.

The LCD Board is pre-programmed with the Gate closure and opening messages. Whenever the Sensor is triggered the LCD Board display "RAILWAY GATE CLOSED" and when the train crosses the railway gate completely the board displays "RAILWAY GATE OPEN". This helps the vehicle drivers to priorly know the gate is closed so that they can opt for alternative route rather than standing in the closed railway level crossing.

App Notification:

The data is transmitted to the Cloud server through Arduino uno. The data is processed and the sent to cloud. Arduino IoT Cloud is an application that helps makers build connected objects in a quick, easy and secure way. You can connect multiple devices to each other and allow them to exchange real-time data. Whenever the vehicle driver uses the application, the information about the level crossing at that particular location will be notified to the user by means of the mobile application "IOT_TRAIN". Whenever the Sensor is triggered, the application notifies "RAILWAY GATE CLOSED FOR PARTICULAR TIME WAIT OR IF EMERGENCY TAKE AN ALTERNATIVE ROUTE" and when the train crosses the railway gate completely the application notifies "RAILWAY GATE OPEN, HAPPY JOURNEY". This helps the vehicle drivers to priorly know the gate is closed so that they can opt for alternative route rather than standing in the closed railway level crossing.

Traffic Diversion:

Most of the traffic is diverted through alternative route rather than standing in the closed railway level crossing. This helps in reducing the traffic volume in that particular level crossing thereby decreasing delay to cross the level crossing, delay to schools, colleges and work, Emergency vehicles would respond faster and chose alternative route saving lives.

IV. CONCLUSION

Application of IOT technology at Railway crossings results in decreased traffic congestion by minimizing the traffic density during the time of rail crossings. Vehicles drivers will get notified of the closure of Railway gate by both Mobile application and LCD screens installed before a few meters away from exact railway crossing. So, the Vehicle drivers opt for alternative routes rather than standing in the congested traffic for hours. This automatically reduces the density of traffic accumulated at railway crossings thereby reducing delays to office, schools and colleges. Emergency vehicles respond faster by saving lives. This technology is cost effective that it can be applied at both developing and developed cities.

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