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Railway Gate System: Railway Gate Status Detection

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Abstract*:Since 1991,their hase been a ample growth in the transport system from 21 million to 142 million,so does the two wheeler private transport.the two wheeler transport had a growth from 14 million to 120 million.This constitutes a significant safety and environment concern. The Railway Crossing Gate Status Detection System is a simple but very useful project which detects whether the railway gate is open or closed at all times. Instead of being caught unaware whenever a railway gate is closed, this paper proposes a method of displaying the status of the gate, as it is at that time, on the cloud, thereby reducing the amount of traffic near the gates and the number of potential accidents that can occur.

Keywords: Railway crossing, Railway Gate, IoT, Cloud Computing

I. INTRODUCTION

India's one of the most used modes of transport is railway. But traffic jams caused by them are one of the important real-life points at issue. In general when the train leaves from the station the station incharge will deliver the message to the nearest gatekeeper to get the gate in closed state . In situations where the train gets delayed and the gates remain closed for long time creating heavy traffic at the level crossing. The blockage at the railway level crossing concludes in a traffic management problem that affects traffic flow performance and traffic safety as well. This traffic generated at the gates also lasts for several minutes after the gate is open due to the accumulates traffic. The recurrent traffic at the gates causes reduced functionality of highway services[2], waste of fuel energy and the level of CO2 increase at the intersections. These blockages also generate delays which are more apparent in urban areas where trains running at low-speed result into the chaos in the railway level crossing. The inaccurate information about the train, running time and the time of crossing the railroad leads to wastage of time because the crossing remains blocked for several minutes. This traffic also makes people unruly resulting in crossing the gate while it is closed, in the sequel causing fatal accidents. The impact of railway level crossings on traffic flow can be best tackled with our railway crossing status detection system.

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Many measures are taken by using computer algorithms to calculate the duration of railway crossing blockage and the time of arrival and some other measures like using traffic lights and variable message sign boards. Based on this, propose an Arduino system which uploads the status of the gate and duration of the gate (in the closed state) in a cloud [8, 9] platform and also triggers an alarm when crossed at a time of closed gates. This system aims at reducing the traffic at railway crossing gates, by allowing the drivers to decide on a path with less traffic. The Section 2 of this paper gives an summary of the literature survey. Section 3 talks about the proposed system and Section 4 on the experimental setup.Section 5 gives ideas for further development from the proposed system.

II. PROCEDURE FOR PAPER SUBMISSION

A. Review Stage

The railway level gate status is projected using various methods. Francis Thomas in his article "How variable message signs can reduce the traffic congestion at the railroad crossing?" briefs about how railroad crossing causes traffic management problems affecting the freeway exits and service roads, their safety concerns and how variable message sign boards can help overcome this issues.The present railway system and technologies[2]. Authors also discussed the pitfalls of warnings at level crossings and manually activated railway signals and how they led to accidents. He also gives a detailed data regarding the different warning signs, devices, and technologies used in level crossings by Indian railways to reduce accidents. Using an infrared approach to detect the cracks in the rail track in track monitoring [7], came up with a smart railway crossing control system for multiple tracks using a controller that receives messages from incoming and outgoing trains by sensors. Based on these messages controller decides to open or close the railroad crossing gate. But this approach has a high maintenance cost. Traffic control at crossroad [6]. The proposed a system using traffic lights to control the congestion caused by railway crossing at crossroads intersection. This research was conducted by Prof. M. Yamin streets with Gaharu streets in Medan on the intersection, During the closed gate situation the vehicles from the both direction are held at the running position causing constant emission of gases and causing the occurrence of congestion. This also does decrease the function of the road and loss of fuel and vehicles life . It also leads to the increase in the carbon emission Traffic simulation of Beijing west railway station north area[5] studied the traffic flow from a survey to build a traffic simulation model with VISSIM software.

It can reflect the reality of the problem more accurately by using using psycho-physical driving algorithm. After that, they set out to build road network in proportion for Beijing west railway station road. (Kiruthiga.M et al., 1993)Railway Signal Automation At Unmanned Level[1] propose a system using micro-controller at a unmanned railway gate is for the server to monitor the status and sensors to find any obstacles at the gate if any obstacle is present then a message is sent to stop the train at a safe distance. If no obstacle is found then the gate is closed with an alarm on till the train is crossed the crossing

(M.D.Anil et al., 2016)[4], gives a brief introduction about Indian railway system and goes on to talk about various important components used in advanced railway accident prevention system and its implementation.

(M.Aguado et al., 2005)[3], describes the trends in the railway industry on the technology used in the rail system in indian railways and some market trends .train control communication systems evolution in to signaling systems .which we intend to suggest in this pape. identifies the new standards for wireless communications technologies. The last section talks about the most innovative projects in this area are enumerated.

B. Final Stage

To avoid traffic jams near the railway crossing our proposal is a simple system which updates the status of the gate in a public website with a timestamp for the people to calculate and take an ideal route, thus reducing the congestion. And our system also try to prevent any unauthorized crossing of the gate while it's closed by a loud alarm. Proposed system is achieved by using Arduino UNO, ultrasonic sensor (HCSR-04), wifi-module(ESP8266), an alarm(buzzer), a switch, a battery(12 volts).

The gate is open by default, and the circuit is open. When the gate is closed, the circuit is complete and the ultrasonic sensor starts monitoring a small area around it for any incoming towards the gate. If it senses any incoming in its perimeter, an alarm is triggered indicated the unauthorized entry. Meanwhile, the wifi-module sends data of the closed gate with timestamp onto the cloud(fig 1.1), from where information is retrieved and displayed on a public website.

C. Figures

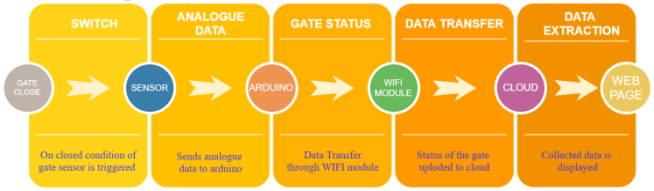

Figure.1.1 work system

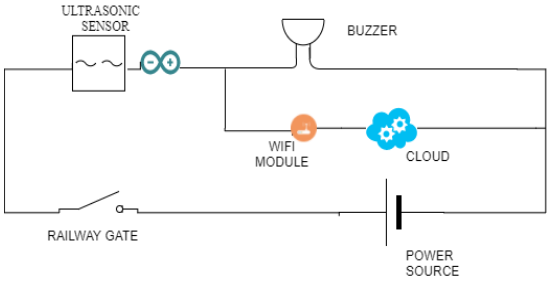

Figure 1.2: Experimental setup

III. EXPERIMENTAL SETUP

A switch will be placed at the connection junction of the railway gate with the holder placed on the ground. It acts as a triggering switch for the whole circuit. When the gate is open the switch is open. When the gate is closed the switch is closed, thus completing the circuit. The switch is connected with an Arduino UNO board which is equipped with an ultrasonic sensor(HCSR-04) and a WiFi module(ESP8266) connected with an hotspot to transmit data to the cloud(fig 1.2).

While the gate is closed the ultrasonic sensor starts to transmit the data about the distance of the object in it's line of sight. Based on the data, a virtual perimeter is set and the ultrasonic sensor monitors for any object near the gate. Once an object/person enters this virtual perimeter, the buzzer starts a alarm to warn the entry.

The Arduino decides using the programmer defined conditions to display the status (open or closed) of the gate. This result along with the timestamp will be uploaded in the cloud platform-thingspeak.com, using the wifi-module connected to the Arduino. Retrieving information from cloud, it is posted in an open source website.

IV. FUTURE ENHANCEMENTS

This device has fulfilled the basic purpose of it's creation by avoiding traffic congestion and accidents at the railroad crossings. But it can be further enhanced by finding alternate sources for the power supply and Wifi connection. Thus, making it available to use in remote areas where there is no enough power or signal strength for data connectivity.

Some alternate ideas to charge the battery can be using mini wind turbine or solar cells. Enhancement can also be done in the end user interface by extending it into a mobile application. Using this project model, improvement in the safety system of the railroad crossing is also achieved. This model can also be adapted into any security system, Vehicle reverse/parking system, perimeter break-in alarm system, etc. with appropriate hardware. Sensors can also be used to detect the arrival/departure of train eliminating the need of a person to control the gate and making the system fully automatic. This system can also be enhanced with a camera and message system to identity the person trying to breach the closed gate and send an sms alert to concerned authorities.

Thus making the system foolproof against any human error and available to use in areas where there is no station master or gatekeeper available.

V. RESULTS AND ANALYSIS

In the present system, there is no centralized platform available, to know the status of the gate. Using this system users can decide their travel path before reaching anywhere near the railway crossing. This results in the decreased density of traffic at the gate which in turn reduced the traffic (waiting) time after the gate is opened since more vehicles are not accumulated near the gate. With less number of vehicles, the rate of carbon-dioxide and heat in the air decrease drastically. The system reduces the vehicle fuel waste and improves the function of roads making the traffic flow even

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