



SECURE WIRELESS CONTROLLER FOR HANDHELD REMOTE OPERATION OF TRAFFIC SIGNALS IN PEAK HOURS

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Abstract: This research paper proposes a wireless handheld remote control system for traffic lights. Traffic light control systems are widely used to regulate the inflow of vehicles and ensure smooth traffic flow. However, synchronizing multiple traffic light systems during peak traffic hours is a challenging task, as conventional systems do not handle variable flow approaching the junction. To address this issue, we propose a new system that allows traffic police officers to control the traffic lights and barriers manually using a secure remote. To ensure security, the remote features a biometric unlock mechanism. By pressing a button on the remote, the traffic lights and barriers can be adjusted accordingly, such that the barrier emerges automatically when the signal is red, descends when the signal is yellow, and stays beneath the road when the signal is green. This system is expected to reduce traffic congestion and prevent signal breaking/jumping at the junction. The remote can operate the signal from a distance of 50ft-60ft away from the signal junction.

KEY WORDS: Traffic lights, Remote, Biometric, Barrier.

Introduction

This research paper proposes a secure wireless remote-control system for handheld operations of traffic signals during peak hours. The conventional traffic signal systems do not handle variable flow approaching the junction, leading to traffic congestion and accidents. To address this issue, our proposed system allows traffic police officers to control the traffic lights and barriers manually using a secure remote. The remote features a biometric unlock mechanism for added security. By pressing a key in the remote, the traffic lights and barriers can be adjusted accordingly. The barriers automatically emerge when the signal is red, descend when the signal is yellow, and stay beneath the road when the signal is green.

Although several wireless remote traffic controllers have been introduced, that does not include barrier system which is proposed and are easily misused. Our

secure wireless system offers more protection to the remote includes a fingerprint system associated with stable barriers and signals to enhance security and prevents unauthorized use. The system allows for successful pre-emption of emergency vehicles and ensures traffic discipline to avoid accidents. The barrier system is motor-driven, with motors that push and pull the barriers according to the input signal from the remote.

The proposed system is expected to reduce traffic congestion and prevent signal breaking/jumping at the junction. The remote can operate the signal from a distance of 50-60 feet away from the signal junction. Overall, the secure wireless remote-control system for traffic signals during peak hours is an effective solution to regulate traffic flow and maintain safety.

Related Work

The Fingerprint is designed to the remote, Fingerprint turns on the receiver and operates the traffic signal along with the barriers with the help of remote, When the traffic police officer puts his fingerprint to take control of the signal by remote. The fingerprint activates the receiver and then input feed from the remote to the microcontroller and it changes the signal light and change the input signal to the motor driver to push/ pull the barrier with the help of motors and gears. When the signal is red the motor driver pushes up the barrier and if the signal is yellow, it pulls down the barrier and it is green it stays beneath the road. When opposite side are operated and free to go on the other hand barriers are up according to the signals, for prevention of congestions and accidents and signal jumping barriers will be raised from the road And also same process for closing of the barriers This signal automatically operates on its own at low traffic time (i.e night times) by automatic countdown timer (Existing methods) we provided separate key for enabling the automatic signal changing timer.

Methodology

In this report, we will discuss the mechanism of controlling traffic lights using fingerprint encrypted IR remote. The mechanism of controlling traffic lights using a fingerprint encrypted IR remote involves three main components, namely the fingerprint scanner, the IR transmitter, and the traffic light controller. The following is a detailed explanation of how each component works:

Fingerprint Scanner: The first component of the system is the fingerprint scanner. It is used to authenticate the user before they can control the

traffic lights. The fingerprint scanner works by scanning the unique fingerprint of the user and comparing it with the pre-registered fingerprints in the system. If the fingerprint matches, the user is granted access to control the traffic lights. If the fingerprint does not match, the user is denied access. This finger print is connected to the IR remote. After verifying the identity of the person this possess the unlocking of IR Receiver if the fingerprint is matched.

IR Transmitter/IR Remote: The second component of the system is the IR transmitter that is hand held remote. It is used to send signals to the IR Receiver that is present in the traffic light controller. The IR transmitter is built into the remote control and sends signals in the form of IR waves. The signals are encoded with the control commands, which are then transmitted to the traffic light controller and according to the key pressed in the remote the traffic light signals change accordingly.

Traffic Light Controller with IR Receiver: The third component of the system is the traffic light controller with IR receiver is one of the key components of the Traffic Light Controller with IR Receiver. It receives signals from the IR remote, which is used to program the traffic light control. The signals are decoded by the system and used to adjust the direction of the traffic lights. This makes it possible for traffic light controllers to be programmed and controlled from a distance, which can be very convenient. In addition to the IR receiver, the Traffic Light Controller with IR Receiver is also equipped with a microcontroller. The system is designed to be easy to use and can be programmed and controlled from a distance using an IR remote. It is a reliable and energy-efficient system that can be used to improve traffic flow and reduce congestion on the roads. The mechanism of controlling traffic lights using fingerprint encrypted IR remote is highly secure and prevents unauthorized access to the system. The use of fingerprint authentication ensures that only authorized personnel can control the traffic lights. The encrypted IR signals prevent the interception and decoding of the control commands by unauthorized users.

Reciprocating Mechanism:



Fig1: Reciprocating Mechanism

Barriers on roads are physical structures that prevent or restrict access to certain areas. These barriers are controlled using the reciprocating mechanism the help of L298N motor driver. A reciprocating mechanism at a traffic signal is a system that act as barrier to emerge and descends from the road and to the road respectively. The mechanism is designed to control the flow of traffic and enhance safety by preventing accidents caused by speeding or reckless driving. Fig1 will explain how the reproccating mechanism of a barrier at a traffic signal works, and the benefits of using this mechanism. A plastic gear and rack mechanism has been used as barrier at traffic signal with an Arduino in this model. The mechanism can be used to control the movement of a barrier arm to block or allow traffic flow. To control the movement of the barrier arm with an Arduino, a motor controller can be used to interface with the motor. The Arduino can then be programmed to send signals to the motor controller to control the direction and speed of the motor, and thus the movement of the barrier arm.

Result

The barriers are used to control the traffic and reduce the accidents on the road. The barriers are introduced on the four sides in the junction, and the barriers are controlled with the remote control, when there is a heavy traffic on the particular side with the help of remote, by controlling the barriers we can reduce the traffic and we can also increase the safety of the people by implementing the barrier system.

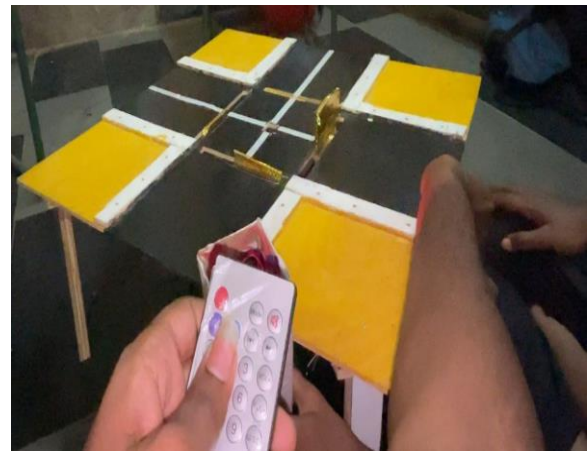


Fig2:Barrier lifting in direction one

This system makes the people not to allow vehicles when there is the red colour on the traffic lights and the barrier will comes up and the road will be closed. There will be no way for the vehicles to move, this red light will be changed by the policeman with the help of the remote and the light will be changed and the barrier will moves down in the figure we can see that the barrier come above the road ,this will be done when there is red colour on the traffic light.

When the colour of the traffic is changed into the green colour then the barrier will go down and the vehicles will move according to the traffic lights, the controlling of the traffic lights will be in the hand of the policeman.

The policeman will control the traffic according to the rules, when there is the emergency vehicles then the barrier system is very much helpful, and the controlling the barriers with the remote is also the advantage. The policeman can close the way for all the three sides in the junction and he make the only one barrier will be opened for giving the way to the emergency vehicles.



Fig3:Barrier lifting in direction two

In the Fig2&Fig3 we can see the barrier is came above the road on the other side, this is done with the help of the remote.

The vehicles can move according to the directions this will create the discipline and make the everyone to follow the traffic rules, there will be no violation of the rules and crossing the road at the traffic junctions and causing the road accidents, traffic jams. The barrier system is the main thing which will control the traffic, but the extra thing which adds the security for it and the control is the remote. The remote which we use is the secure remote this adds the security and gives no chance to operate by the other persons. Fingerprint sensor technology is used to authenticate users by analyzing their unique fingerprint patterns. It has become increasingly popular in recent years as a secure method of user authentication for smartphones, laptops, and other electronic devices. Fingerprint sensors can also be used to control access to physical spaces or devices, such as security systems or safes.

In addition to improving traffic flow, IR remote-controlled traffic signals can also improve safety on the roads. By providing a more precise and accurate way of controlling the lights, it is possible to reduce the risk of accidents and collisions. For example, if a driver runs a red light, the IR remote-controlled system can quickly switch the lights to stop the flow of traffic and prevent further accidents.

Another advantage of IR remote-controlled traffic signals is their flexibility. With a traditional traffic signal system, the timing of the lights is set and cannot be easily adjusted. However, with an IR remote-controlled system, the timings can be easily adjusted to suit changing traffic conditions. This means that the system can be tailored to the needs of specific areas, such as busy intersections or school zones. As cities become more connected and technology-driven, the use of IR remote controlled traffic signals can help integrate traffic flow management into a larger smart city infrastructure. For example, traffic data collected from the IR remote-controlled system can be used to analyze traffic patterns and optimize traffic flow.

This can help reduce congestion and improve safety on the roads. The use of IR remote-controlled traffic signals can also have a positive impact on the environment. By reducing traffic congestion, the system can help reduce emissions from vehicles, which can contribute to air pollution and climate change. Additionally, the system can be programmed to optimize traffic flow and reduce the amount of time

vehicles spend idling, further reducing emissions and improving air quality.

Conclusion

The traffic light control system using IR Remote with the introduction of emerging barriers respective to the traffic lights is an efficient and convenient solution to regulate traffic flow on roads. By integrating an IR remote control system, it allows for seamless operation and convenient access for traffic authorities to control the traffic. The implementation of the traffic light control system using IR remote has several benefits such as reducing traffic congestion, minimizing accidents, and enhancing road safety. The system is designed to improve traffic flow and reduce congestion, as it allows operators to quickly respond according to the traffic flow conditions and adjust signal patterns accordingly.

Additionally, the use of IR remote technology eliminates the need for additional wiring or communication infrastructure, making it a cost-effective solution for traffic management. However, the system also has its limitations.

The range of the IR remote control is limited, which means that operators must be within a certain distance of the controller to make changes. Additionally, the system may be susceptible to interference from other IR devices or obstacles that block the line of sight between the remote and the controller. It is a versatile and adaptable solution that can be applied in various traffic scenarios, from simple intersections to complex road networks. By constantly improving and refining the system, we can continue to enhance traffic management and reduce traffic violations, ensuring safer and more efficient roadways for everyone.

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