Smart Traffic Light Controller

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***Abstract*— Using a wireless remote control, we offer a new method for wireless traffic light controllers that enables traffic police officers to conveniently and effectively manage a road junction. By simply pressing the button corresponding to the street direction to generate a green light signal, the traffic policeman can manually alter the traffic light using this technology. The traffic light controller board will then receive the control signal. The proposed system enables the policeman to independently regulate the intersection and adjust the traffic flow's parameters on the fly.**

Keywords—Traffic light system, Heltec Wifi Lora 32, Arduino nano, LED

I. INTRODUCTION

Since 1912, traffic lights have been used as signaling tools to regulate traffic flows at road intersections, crosswalk, rail trains, and other locations. Three universally recognised colours are used in traffic signals: green, blue, and red. The green signal permits traffic to move forward in the directionindicated, while the blue signal alerts drivers to a brief stop.

These days, traffic congestion is a major concern in many nations, seriously imparing city transit systems. The optimisation of the huge ttaffic jam is still a significant problem to be confronted, especially wigth several junction nodes, even through automatic traffic system have taken the place of traffic police and flagmen. There aren't adequate infrastuctures with enough resources to keep up with the rapidly rising number of cars and the steadily increasing number of road users. By building additional highways, executing flyovers and bypass roads, building rings and undertaking roads rehabilitation, partial answers were provided.

For the smooth control of traffic, especially during peak traffic times, there is a significant need for the traffic signals to be perfectly coordinated. Some issues associated to the poorly planned city growth include congestion, environmental pollution, noise pollution, and increasing health issues. Smart traffic lights can assist move traffic through the city more effectively to shorten commute times, ease congestion, cut carbon emissions, and increase safety for drivers and pedestrians by dynamically adapting to real-time conditions. Vehicle traffic on the route is managed by traffic lights. The traffic signal has three lights, each of which conveys a different message to the cars. Traffic lights have shown to be an incredibly effective means to prevent vehicle collisions, manage traffic congestion, and direct traffic in smooth lanes. A variety of electronic components are used to implement the circuit of the smart light traffic management system. We will construct a model of a three-color traffic light using a straightforward circuit. Green, blue, and red lights will make up the circuit. Having a unique message for the drivers, each. Vehicles must stop while the light is red, slow down when the light is blue, and then proceed when the light is green. A variety of electronic components are used to implement the circuit of the smart light traffic management system. Based on the data gathered, traffic control systems conduct the best traffic signal control in accordance with the continuously changing road traffic situation and provide helpful traffic information to drivers. Traffic control systems gather and analyse driving data from nearby vehicles.

II. TRAFFIC CONTROL SYSTEM

The widest definition of road traffic control is the design of streets to accommodate different types of travel requirements within an area. High-speed through traffic is transported on highways or expressways, whereas metropolitan areas are traversed by arterial routes, which offer low-speed transit but access to a variety of nearby locations. The base upon which traffic control issues develop is a hierarchy of roadways that operate at various speeds and offer various levels of access. Inadequate road planning, which results in not enough roadways to meet travel needs, frequently leads to lengthy delays and frequent accidents. Although traffic control may be beneficial, it cannot replace the need for sufficient transportation supply.

III. HELTEC WIFI LORA 32

WiFi The LoRa 32 is a traditional IoT development board created and manufactured by Heltec Automation(TM). It is

a highly integrated device based on the ESP32 and SX127x, and it has Wi-Fi, BLE, and LoRa functionalities in addition to a Li-Po battery management system and a 0.96″OLED. The ideal option for IoT makers, smart farms, smart homes, and smart cities. Two LoRa-enabled devices communicate with one another utilising RF waves in point-to-point communication. For instance, this can be used to transfer data between two ESP32 boards with LoRa transceiver chips that are situated in an area lacking Wi-Fi service or that are quite far from one another. Two LoRa devices with the right antenna may share data over a great distance, unlike Wi-Fi or Bluetooth which can only communicate over short distances. To securely broadcast and receive data at a distance of more than 200 meters, you can quickly setup your ESP32 with a LoRa chip. (you can get better results depending on your environment and LoRa settings). Other LoRa options are also available, and they can easily reach distances of over 30 kilometres.

IV. ARDUINO NANO

his Arduino Nano is a small, complete, breadboard friendly board. It is an ATmega328P-based breadboard-compatible board created in Italy by representatives of Arduino. It comes in a different packaging but has roughly the same capabilities as the Arduino Duemilanove. It only loses a DC power jack and utilises a Mini-B USB cable as opposed to a conventional one. Surface mount breadboard embedded version with USB is the original Arduino Nano. The only one that is comprehensive, compact, and breadboard-friendly. It is essentially identical to the Diecimila/Duemilanove but has more analogue input pins and an inbuilt +5V AREF jumper. A key word here is physical power. There is no need for the power select jumper because the Nano automatically detects and switches to the higher potential source of power. Users have additional breadboard space because to Nano's ability to be breadboarded, which is comparable to that of the Board Arduino and the Mini+USB but with a smaller footprint. With the Mini or the Basic Stamp, it has a pin configuration that is functional. (TX, RX, ATN, GND on one top, power and ground on the other). The ATMEGA328 used in this updated version 3.0 offers additional memory for data and programming. It has two levels. Because of this, it is less expensive and simpler to hack.

V. STUDY OF EXISTING METHODS

A traffic light control system designed by Levi L. Rose [1] is only used by emergency vehicles. Each emergency vehicle in this system has a sensor mounted on it that transmits a signal to a receiver at each traffic light intersection. Once the emergency vehicle has reached the intersection with the traffic lights, the receiver will be sent the signal code. The receiver demodulates the code, turning on the intersection's red traffic light. Therefore, emergency vehicles will take a different route to their destination than regular vehicles.

The traffic light control system developed by R. Smith et al. [2] included a display system that displayed which lane the emergency vehicle was travelling in as it approached the intersection. The junction has an IsR receiver and an IsR transmitter on each of the emergency vehicles. A master controller oversaw the flow of traffic and processed signals. The emergency vehicle's departure was also observed by the master controller, who indicated it on the display system.

A traffic light control system designed by N. M. Z. Hashim [3] uses a PIC 16S877A microcontroller to construct the emergency sequence mode of the traffic light. After determining whether an emergency vehicle is nearby, the message is wirelessly broadcast via radio waves. The controller recognises the RF signals and changes the emergency signal code back to normal after the emergency vehicle has left the intersection.

VI. PROPOSED SYSTEM

We propose a system for controlling the traffic light by WiFi LORA 32. In this project we bring an idea of traffic control system using Heltec WiFi LORA 32 by fixing it into the street poles. In this paper, the proposed system replaces the traffic light signals,The suggested system comprises two phases of operation. The first step focuses on finding the most vehicles, and the second part is all about acting on that information. An efficient traffic control system is implemented which provides a good traffic mechanism without time wastage. By providing delay to the green LED, we can change the timer for it, which control traffic in case there is more traffic in particular lane. This control system contribute to the improvement of the urban traffic problem. The traffic control unit uses data from sensors and peripherals to help determine when there is traffic congestion. The system makes independent decisions and executes a traffic-reducing operation based on the detection. This system consists of transmitter and receiver.

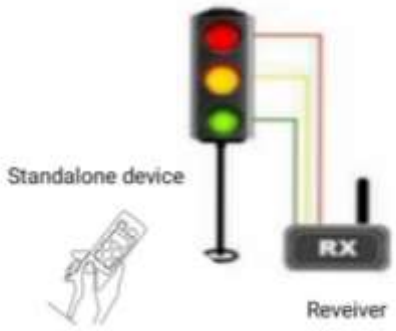
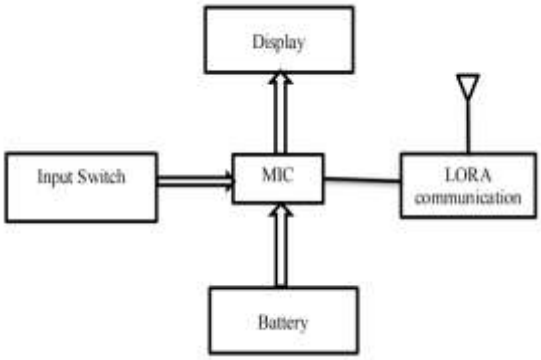


Fig 1. Traffic light Control System

Fig 2. Implementation of Traffic Control System

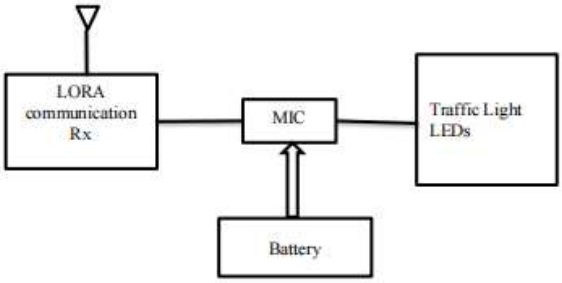
VII. Block Diagram:

a. Transmitter:



The traffic light circuit receives the input from the transmitter. Transmitter consists of input switches, microcontroller, battery, display and LORA communication. Battery is connected to glow the LEDs properly. The displays are used when traffic needs to be directed. The necessary information can be conveyed quickly and the traffic flow maintained by the traffic displays.A microcontroller is used to automatically change a signal at predetermined interval of time. This LEDs helps to manage the traffic and to maintain proper traffic management. The systems indicate to the driver by using different colours of light. At transmitter side, transmitter send the information related to traffic to particular lane. Also send the direction to the receiver. After sending data to the receiver, receiver will take action according to input and send back data to the transmitter.

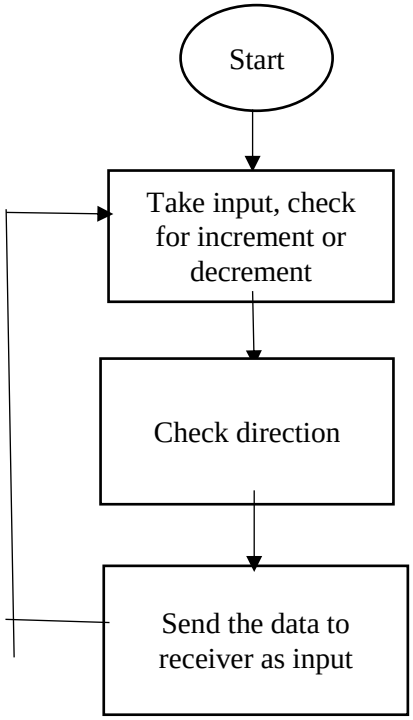
b. Receiver:



Three LEDs, a microcontroller, and LORA communication are all features of the receiver. (Red, Green and Blue). LORA, or long range, is a method of communication. LORA features a low power requirement, bidirectional communication, and a wide range of applications. The fundamental element of an antenna is a network of conductors. A communication system's transmission and reception systems are connected by this piece of hardware. A receiver's antenna converts electromagnetic radiation into radio frequency electrical impulses by absorbing it.

VIII. FLOW CHART

Transmitter:



Receiver:

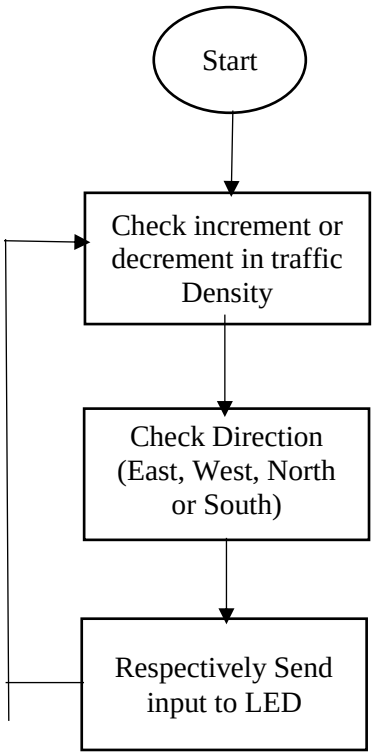


Fig 3 Traffic Light Control System Flowchart

IX. ADVANTAGES OF TRAFFIC CONTROL SYSTEM

- Smart traffic signal control is superior to time-based traffic control in many ways.
- Reduction in pollution: Due to the good management of traffic flow, pollution can be reduced.
- People can conserve fuel, which lowers pollution because fewer fuels are used.
- It saves a significant amount of time.
- It prevents the needless occurrence of traffic congestion, which is inconvenient for everyone.
- shorter emergency response times and safer transportation.
- Improve traffic flow and traffic advice.

X. CONCLUSION AND FUTURE WORKS

The technology is intended to address the crucial problem of emergency vehicles getting held up in slow moving traffic or remaining stationed for an extended period of time. This method assists in promoting a smooth flow of traffic and helps traffic controllers work more efficiently. The system may eventually be improved by creating a dynamic web or mobile application as an interface that allows for more intelligent automatic and manual control of the system. A system of automated messages that can be utilised to inform the driver of the next open lane from an intersection that leads to the desired location may also be incorporated. In densely crowded locations, decision support systems may establish communication to alert approaching junctions to take prompt action.

XI. REFERENCES

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