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Smart traffic management system using machine learning

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Abstract: *India is a developing country. Increase in personal vehicles comes with the development of a country parallel. This has led to rise in congestion in large cities. So, we need a better traffic management system. The purpose of this project is to create a traffic system which is adaptive to the present traffic scenario in a lane. Usually, we have fixed average waiting time for all lanes. This project suggests changing the average waiting time by monitoring the number of vehicles in a lane. The data will be sent to central system through internet, which will decide the timing for signal according to the dumped program. This project also, suggests implementing congestion lights at previous intersections, so that drivers can change lanes at the situation of congestion. The system is useful in emergencies and it also, helps in reducing pollution and traffic congestion. Congestion is costly as well as annoying. India is the second largest road network in the world. Out of the total stretch of 5.4 million km of road network, almost 97,991 km is covered by national highways. The major cause leading to traffic congestion is the high number of vehicle which was caused by the population and the development of economy .Typical urban residents spend more than ten hours a week driving of which (one to three hours) occurs in congested situation. In smart city roads would be equipped with the sensors for analyzing the traffic flow and also there are few traffic analysis / prediction methods use neural network and other prediction models which are not so efficient and suitable for much real world application.*
Keywords –

I. INTRODUCTION

India is a developing and emerging country. The GDP annual growth rate of India has increased from 6.9% in

2013 to 7.3% in 2014 according to the World Bank Data. This proves that the economy of India has improved and raised the standard of living of people. Increase in personal vehicles comes with the development of a country, in parallel. This has led to rise in congestion, in large cities. So, we need a better traffic management system. Manual control of traffic, by traffic officers or using predefined timers has been proven not an effective solution, but they are still being used in many places. One of the major issues with Indian cities is that we cannot expand the existing infrastructure more, so we have only one option available is better management of the traffic. The present traffic control system uses fixed average waiting time concept for controlling the traffic. But, in large cities it is still difficult to handle the traffic using this concept. Sometimes, we observe that though there is no vehicle in a lane and heavy traffic on other lane, still the traffic light is green for latter lane and red for other lane. This leads to traffic congestion. City transport & traffic management system will be better choice than the manual traffic based system.

The purpose of this project is to create a traffic system which is adaptive to present traffic scenario in a lane using IoT. Internet of Things (IoT) is an environment and a platform that connects people, devices and computers by letting them share data with each other by having machine to machine or machine to human interaction. The system can lead to zero average waiting time situation. Delay of few minutes can lead to risks of human lives and financial losses. Many times it is seen that due to heavy traffic ambulance has to wait for long time to cross the traffic signal but, by using density count we can improve this problem. This system is useful in such emergencies. Now, we will further see in detail the implementation of this project and the components used. India gloats of being the second-biggest street organize on earth. The complete stretch of the Indian street systems remains at an astounding 5.4 million km! Thus, it shapes a gigantic final proposal for the Indian Government to give impeccable streets at each progression. For any Indian, be it normal or millennial, passing through the Indian lanes is absolutely an issue that no might want to experience. As request moves toward the limit of a street (or of the convergences along the street), outrageous traffic blockage sets in.

At the point when vehicles are completely halted for timeframes, this is known as a traffic jam or (casually) a traffic growl up. Traffic blockage can prompt drivers getting baffled and participating in street rage.A smart city is an urban area that uses different types of electronic data collection sensors to supply

information which is used to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services. The traffic analysis in the smart cities is very often fully automated. So the traffic information has to be provided accurately on the internet for the user purposes. So, smart traffic analysis will play a very major role in the major cities of India and also other countries. There is no definitive explanation of a smart city because of the breadth of the Technologies that can be incorporated into a city in order for it to be considered a smart · The application of a wide variety of digital and electronic technologies to the city and its communities. · The application of ICT top lift life and the working environments in the region · The embedding of such ICT with in government systems ·

The territorialization of practices that bring the people and ICT together in order to foster innovation and enhance the knowledge that they offer. Smart traffic analysis will help the users in finding the shortest path to the destination without any loss of time. The system that is being developed will help in time of travel of a person and also would help in the safety of that person by avoiding the accident prone regions. Numerically, clog is normally taken a gander at as the quantity of vehicles that go through a point in a window of time, or a stream. A portion of the standard traffic issues incorporate Poor street quality because of over the top traffic- The outrageous clog of urban streets because of intensely utilized private vehicles prompts the corruption of the nature of the streets. This prompts ceaseless traffic issues more often than not. Noise and Air pollution especially in urban areas- The sheer magnitude of traffic problems also gives rise to other health-damaging issues such as the air and sound pollution. So, we propose a solution which controls the traffic dynamically based on various important factors like time of day, climate, condition of roads etc.
The system enables to distribute the traffic congestion evently throught out the area.

II. LITERATURE SURVEY

Name of Research Paper	Authors Name and date of published	Work
Obstacle avoidance with ultrasonic sensors	Johann Borenstein Yoram koren May-1988	To avoid collision with unexpected obstacles, the mobile robot uses ultrasonic range finders for detectionand mapping.
Design and Implementation of Autonomous Car using raspberry Pi	Gurjashan pannu , Mohammad Dawud Ansari, Pritha Gupta. March-2015	The car is capable of reaching the given destination safely and intelligently thus avoiding the risk of human errors.
Design and implementation of auto car driving system with collision avoidance	AbdulKaderJoukhadar, Hazen Issa, Yaman Kalaji Jun-2018	This paper presents designing and manufacturing the hardware and software of a low-cost robotic system.
Design and implementation of self- driving car	Mahmoud Fathy, Nada Ashraf, Omar Ismail , Sarah Fouad January-2020	a self-driving car prototype is proposed which integrates between different technologies including some algorithms which are Road lane detection algorithm, disparity map algorithm to detect the distance between the car and other vehicles.

Table 2.1 literature survey

III. METHODOLOGY

In design methodology of the proposed system include different algorithmic path and system program flow which shows sequential behavior.

SYSTEM DESIGN

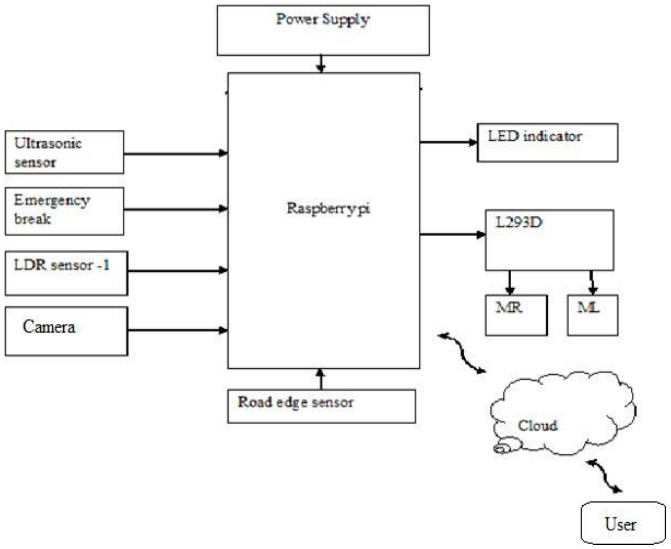

Fig 1:- Block Diagram of smart traffic management system using machine learning.

In this proposed system, aim is to achieve low average waiting time or low traffic congestion. The priority will be given depending on the present situation. This will be implemented for two lanes. Road edge sensors and controller boards Raspberry pi will play major roles. The camera sensor will capture the details from the lane with live streaming and pass it on to first controller board. This board will differentiate all the vehicles from obtained data by using LDR Sensor and maintain the count of vehicles in a particular lane. This count will be passed on to another controller board. Ultrasonic sensor used for the distance between vehicle as well as signal. This project intends to design system which uses deep neural network algorithm which is a subset of artificial intelligence, which will provide intelligence to the current traffic control system present at a four-way junction. Emergency break is also available for the stop.This system is mainly aimed to replace the timer of traffic control system with artificial intelligence system. According to the data of each lane changes into the light phase of the green signal. This system mainly aims to increase the traffic efficiency by increasing vehicle flow which will reduce waiting time for the vehicles. Showing the indication using LED indicator system. Nowadays most cities are equipped with CCTV cameras on the roads and the junctions, the basic idea is to collect the live video from the CCTV cameras and detect the number of vehicles on each lane and feed the data into another machine learning algorithm. According to the data of each lane changes into the light phase of the green signal. This system mainly aims to increase the traffic efficiency by increasing vehicle flow which will reduce waiting time for the vehicles.

IV. BACKGROUND WORK

4.1 hardware detail

I. RASPBERRY PI 3

Fig 2:- Raspberry Pi 3

Raspberry Pi3 is on board minicomputer. The Raspberry Pi3 runs Linux based operating systems and there is a specialized version of Linux based kernel known as Raspbian which can run almost all programs which are Linux compatible. Hence in this project we have used python. As shown in figure Raspberry pi3 model has 1 GB RAM. It has 900MHzquad-core ARM Cortex-A7 CPU. Raspberry PI 3 model has four USB ports. These USB ports are used for interfacing of camera, keyboard and Wi-Fi dongle. It provides one LAN port for communication. It has 40 GPIO pins for input and outputs. It has one HDMI port. It can play 1080p resolution videos without lagging. It has a low price relatively as compared to machines in the market.

II. LDR

Fig 3:- LDR

An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. Variation in resistance with changing light intensity.

III. Ultrasonic Sensor

Fig 4:- ULTRASONIC SENSORS

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.

An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The working principle of this module is simple. It sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

IV. LED INDICATOR

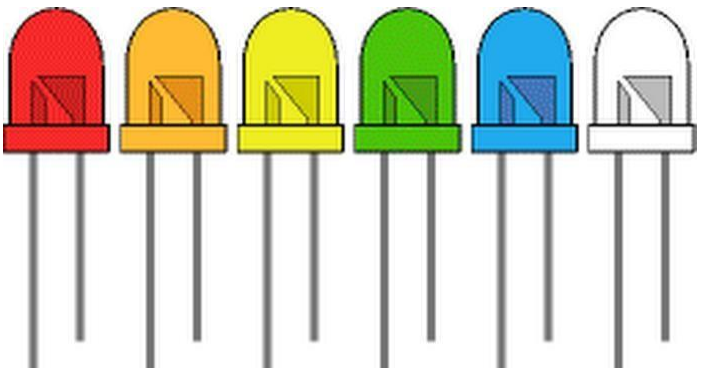

Fig 5:- LED INDICATOR

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light- emitting phosphor on the semiconductor device.

V. Webcamera

Fig 6:- WEBCAMERA

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.

Webcam software enables users to record a video or stream the video on the Internet. As video streaming over the Internet requires much bandwidth, such streams usually use compressed formats. The maximum resolution of a webcam is also lower than most handheld video cameras, as higher resolutions would be reduced during transmission. The lower resolution enables webcams to be relatively inexpensive compared to most video cameras, but the effect is adequate for video chat sessions.

III. DC Motor drive

Fig 7:- DC MOTOR DRIVER (L293D)

L293D has quadruple high current half-H drivers. Wide Supply-Voltage Range: 4.5 V to 36 V
High-Noise-Immunity Inputs Output Current 600mA per Channel
Peak Output Current 1.2A per Channel.

Working of L293D
There are 4 input pins for l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.
In simple you need to provide Logic 0 or 1 across the input pins for rotating the moto

VI. CONCLUSION

In this study, we have analyses different domains and how they are used for developing adaptive traffic management. We have compared them, identified the advantages and disadvantages in them. The cost analysis and technology analysis is performed in this study. The proposed system will provide better traffic management which will decrease the average waiting time, low congestion, and low pollution and will help in giving priority to emergency vehicles.

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