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SMART TRAFFIC MANAGEMENT WITH ADVANCED PAVEMENT SYSTEM

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Abstract:

Along with collision avoidance vehicles, Smart Traffic Management with Advanced Pavement System includes car parking assistance, traffic light control, automatic street lighting, and speed detection. Placing the system in one location and viewing the findings quickly without requiring human input allows for the detection of a vehicle's speed. Traffic lights are signalling equipment that is placed at intersections, pedestrian crossings, junctions, and other locations. They alternate who has to wait and who has to move in order of priority. The goal of smart parking is to make parking simple and hassle-free.Automatic street light control systems are not only the simplest but also the most intelligent systems. Here, LED lights are utilised to arrange the streets, while photo diodes and sensors are employed to detect when a car is approaching. In order to prevent accidents, collision avoidance vehicles halt when the distance exceeds the safe limit. As a result, the overall amount of energy used for lighting these days can be reduced. In addition, the development of cities and the rise in living standards necessitate the use of automatic and intelligent control techniques to handle the complicated traffic management system.

Keywords —Arduino, Traffic management;

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I. INTRODUCTION

Every person, whether they reside in cities or countryside, has a basic desire for travel. Due to how convenient driving is, cars are now the primary mode of transportation. We manually place these automobiles in parking spaces, which causes a mess because most of the time individuals do not follow the specific cue and occasionally cars dent one other, which is an issue. Here, we use automated parking systems that let the driver of the vehicle know when spaces are free, saving a tonne of time and money. The expanding number of automobiles on the roadways has raised the likelihood of vehicle accidents. In order to prevent this, a system of vehicles that can stop when the distance exceeds the safe limit has been devised. For efficient and secure traffic flow, a system is employed to manage the traffic lights. An Arduino-based traffic light controller system is created in this project. The traffic light system is implemented simply, but it can be upgraded to a real-time system with customizable timings, pedestrian lighting, etc. Authorities have outlined specific guidelines for operating vehicles on public roadways.In order to prevent this, a system of vehicles that can stop when the distance exceeds the safe limit has been devised. For efficient and secure traffic flow, a system is employed to manage the traffic lights. An Arduino-based traffic light controller system is created in this project. The traffic light system is implemented simply, but it can be upgraded to a real-time system with customizable timings, pedestrian lighting, etc. Authorities have outlined specific guidelines for operating vehicles on public roadways.In addition to being utilised for street lighting, photo diodes and sensors are also used to detect vehicle

movements. In addition, as cities grow and the level of living rises, automatic and sophisticated control techniques are needed to handle the intricate road management system.

II. PROPOSED SYSTEM

The smart road control project is given a dynamic control strategy. According to the suggested arrangement, all of the road lights constantly illuminate for a short period of time before turning off. When a car passes by, a block of street lights turns on, and as it moves forward, the next block of lights turns on while the lights in front turn off. Currently, HID lights are more expensive than LEDs. Because of this, light emitting diodes have taken the place of high intensity discharge lights.In the current field of using electrical devices and their improvements, power consumption and cost can be reduced. Modern technologies have been employed to regulate the intricate road lighting system, including infrared sensors that detect vehicle movement and turn on the lights. As the car moves past, the sensors turn off the road lights that were on (minimum light intensity) and turn on the lights that came before (maximum light intensity). Because we used LDR during the day, it will be turned off, but at night it will turn on.

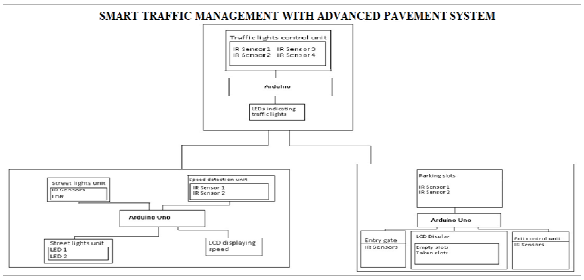

Fig.1: Block diagram

A. Arduino Uno R3

It is an ATmega328-based microcontroller board. The open-source prototyping platform Arduino is perfect for both professionals and enthusiasts to use because of its simplicity. The Arduino Uno contains a 16 MHz crystal oscillator, 6 analogue inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; to use it, just plug in a USB cable, an AC to DC adapter, or a battery to power it.

B. L298 Motor Driver

The 15-lead Multiwatt and PowerSO20 packages contain the integrated monolithic circuit known as the L298. It is a high voltage, high current twin full-bridge driver intended to drive inductive loads such relays, solenoids, DC motors, and stepping motors. It also accepts conventional TTL logic levels. To enable or disable the device independently of the input signals, there are two enable inputs available. Each bridge's bottom transistors have connected emitters, and an external sensing resistor can be connected to the corresponding external terminal using the appropriate wires. The logic operates at a lower voltage thanks to an additional supply input.

C. IR Sensors

An electrical gadget that produces infrared light to sense certain features of its environment is called a sensor. A pair of IR LEDs and photodiodes, sometimes known as a photo-coupler or an opto-coupler, are the basic components of an IR sensor.

The output of the sensor is determined by the photodiode's ability to detect and/or amplify IR radiation, which is emitted by the IR LED. The radiation may or may not be able to reach the photodiode in a variety of ways right now. In order to ensure that the photodiode receives practically all of the radiation generated by the IR LED, we can hold the IR LED right in front of it. The IR LED and the photodiode are separated by an invisible line of IR radiation as a result. The radiation won't reach the photodiode if an opaque object is placed in its way; instead, it will be reflected or absorbed by the obstruction. Both object counters and burglar alarms employ this method.

D. Liquid Crystal Display

Liquid crystal display is referred to as LCD. It is a particular type of electronic display module that is utilised in a wide array of circuits and gadgets, including TVs, computers, mobile phones, and calculators. These displays are mostly preferred for seven segments and multi-segment light-emitting diodes. The main advantages of adopting this module are its low cost, ease of programming, animations, and unlimited ability to display bespoke characters, unique animations, etc.

III. PROGRAM FLOWCHART

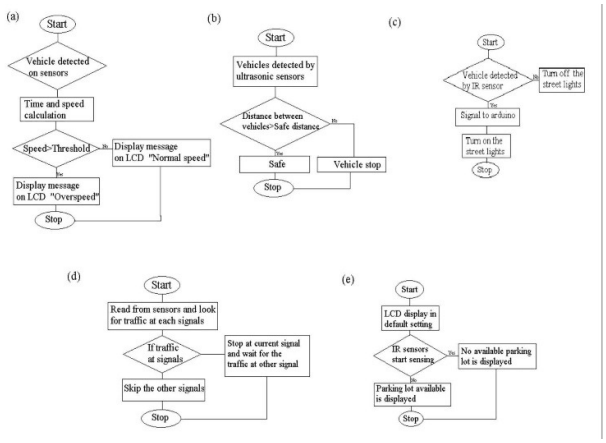

Fig. 2: Flow Chart of the program

Traffic signal control, vehicle speed monitoring, parking assistance, and a collision detection warning system for automobiles are all included in the Smart Traffic Management With Advanced Pavement System. The procedure of parking an automobile can be done more quickly and easily with an automated system than it can manually. The user will receive better services from the system. The parking lot's automobile count is tallied by the system, which also looks for open spaces. There is a route for entry and exit. The LCD display indicates the number of automobiles inside as a vehicle enters. The count is displayed and drops each time a vehicle leaves. The display will indicate if the parking lot is full by displaying a message to that effect. The utilisation of an LCD screen, an IR sensor, and an Arduino are all part of this procedure. Whether the vehicle is entering or exiting is determined by the IR sensors. The report then appeared on screen.

For the smart road control project, a dynamic control is provided. According to the suggested layout, all of the traffic lights would constantly illuminate for a brief period of time before turning off. Modern technologies have been employed to regulate the intricate road lighting system, including infrared sensors that detect vehicle movement and turn on the lights.The sensors, road lights that are currently on (minimum light intensity), and the lights that came before them will switch on (maximum light intensity), as the car moves away.The traffic light controller is an intricate piece of machinery. In this project, an Arduino UNO is used to construct a straightforward traffic light system for a four-way intersection. In that, the Lane 1's Green light is turned on first.As a result, the matching Red lights in all other lanes are turned on. The Green light in Lane 3 must turn on after a predetermined amount of time, and the Green light in Lane 1 must turn off. The yellow light in Lane 1 is tuned on to serve as a warning indicator that the red light is going to turn on. Similar to the yellow light in Lane 3, the green light in Lane 3 is similarly turned on as a signal. Following the activation of the red light in Lane 1 and the green light in Lane 3, the yellow lights in Lanes 1 and 3 are turned on for a brief period of time. The process continues to Lane 4, then Lane 2, until the green light in Lane 3 is likewise turned on for a set period of time. The above-mentioned process will subsequently be done once again as the system circles back to Lane 1. In this project, a standard traffic light and a pedestrian traffic signal cooperate. The pedestrian may also see when the lights will turn red once more on the display. The Arduino-based car speed detector project has a fairly straightforward operation. The system uses IR sensors to determine a moving

vehicle's speed, and the LCD display shows the appropriate speed. The IR Sensor inputs are read constantly by Arduino.
When a moving vehicle approaches the first IR sensor in the setup, Arduino alerts the user and records the time the vehicle passes the first IR sensor. When the vehicle reaches the second IR Sensor, a new time stamp is taken. After estimating the distance between the two IR Sensors, Arduino calculates the velocity and shows the result in kilometres per hour on the 16 x 2 LCD Display.

IV.RESULTS AND DISCUSSION

The vehicle speed detection system uses an assumption about the distance between the two IR sensors to determine the vehicle's velocity and then shows the result in kmph on the LCD Display. Here, the sensors serve as the input and an LCD screen serves as the output. With the use of an ultrasonic sensor, the intelligent vehicle can identify the vehicle in front of it and prevent collisions.

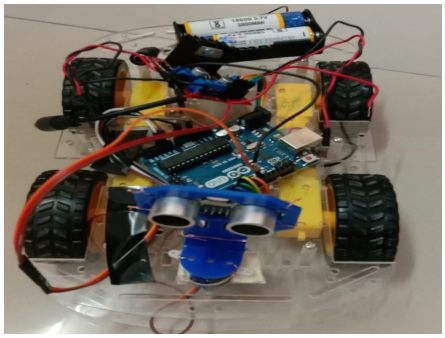

Fig.3: Smart vehicle for collision detection.

Fig.4: Car speed detection.

Sensors are used in the street lighting system to distinguish between moving vehicles and turn on the lights. Prior lights turn off as the vehicle passes by the sensors. IR Sensor and LDR are the sources of input for the Arduino. On the LEDs, you can see the output. If there are vehicles in a specific lane, the traffic light control system activates the red light.Red lights will be exchanged with other conditions if they are not.

Fig.5: Smart street light system

It uses sensors as input, and LED lights as output, acting as traffic lights. The parking assistance system counts the number of vehicles in the lot and determines whether any spaces are available. There is a path for entry and exit. If there are any

vehicles, the number and open slots are shown on the LCD. Additionally, a gate that is operated by servo motors is present.

Fig.6: Density based traffic lights.

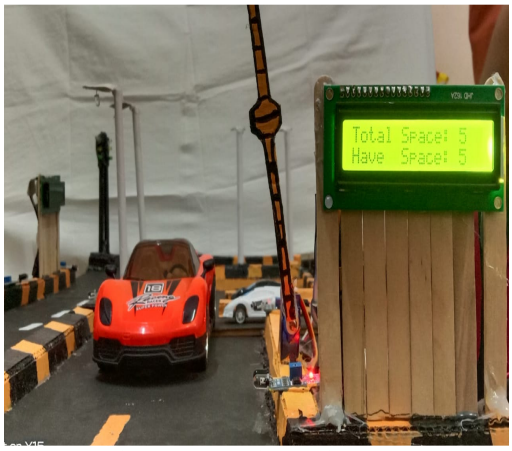

Fig.7: Car parking assistance.

V.CONCLUSION

Compared to speed bumps, a vehicle speed detection system offers much more safety, but it is also more expensive. It is very challenging to apply this approach when there are more vehicles travelling at various speeds. It offers real-time feedback to the drives, assisting them in changing from autopilot to alert mode. They aid in preventing accidents by lowering the vehicle's speed. Using the speed sign becomes challenging when there are more vehicles on the road. Despite the introduction of numerous accident detection technologies, a sizable percentage of fatalities continue to occur.

Although automatic street lighting systems are more expensive initially than traditional street lights, they are much more efficient and save on labour. One can save an excessive amount of electricity and energy by employing the Smart Street lighting system, which replaces sodium vapour lamps with Light emitting diodes and includes an extra security feature. It avoids needless energy waste brought on by manually turning off streetlights when it's not essential.Traffic can flow in the right direction thanks to traffic lights. They also assist people stay safe on the roadways by preventing traffic congestion, although they might not be very successful at slowing down traffic if there is no way to divert it.

A well-organized car parking system saves a lot of time and space, but it is expensive and needs to be maintained frequently.The cost of construction for each space is higher.

VI.FUTURE SCOPE

A street lighting system based on vehicle movement offers the possibility to realize enormous benefits for a very little investment for towns wishing to invest in smart technology. In its most basic form, networked LED lighting aims to reduce energy expenditures by utilizing IR sensors to only turn on the lights when necessary. Cost is the primary benefit of the collision detection system.Effective, assuring safety, speedy life-saving, minimal power usage, and lowering the likelihood of human error. Future developments will be very positive.We should consider intelligent and automatic ways of operating the system in order to manage the conventional transportation system with reference to traffic management. The number of automobiles grows along with the population. The use of clever solutions is required to manage the enormous number of automobiles. The usage of an image sensor or imager is possible in the future. A car parking system is automated by a parking management system. Parking space is optimised, and procedures are made effective. It

provides real-time information about car parking, including vehicle and slot counts, a display of available spaces, reserved parking, and a number of additional features.Cameras are used by speed detection systems to take pictures of moving vehicles while also measuring their motion and calculating their speed. In many cities and urban regions, video and image processing technology is typically employed for traffic surveillance, monitoring of traffic conditions, and analysis.

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