Traffic Light Detection System using ESP8266

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Abstract-This paper proposes a novel approach to detect traffic lights for cars using the TCS3200 color sensor. The proposed system uses the TCS3200 to detect the color of the traffic light and make the decision to stop or go. The system is implemented on a microcontroller and tested using a set of real-world scenarios. The results show that the proposed system can accurately detect traffic lights and control the car's movement accordingly. The system is also designed to be low-cost and can be easily implemented in existing cars without the need for major modifications. The proposed system can significantly improve the safety and efficiency of driving by reducing the risk of accidents caused by drivers missing traffic lights.

***KeyWords*:ESP8266, Colour sensor, Safety, Microcontroller**

INTRODUCTION

Traffic light detection for cars is an essential aspect of modern transportation, ensuring safe and efficient movement on roads. One of the significant challenges for drivers is to identify and respond to traffic lights accurately, especially in situations where visibility is poor or distractions are present. To address this issue, a traffic light detection system using TCS3200 colour sensors has been proposed.

This system can detect the colour of traffic lights and help drivers make informed decisions about stopping or proceeding through an intersection. In this system, the TCS3200 colour sensor is used to capture the colour information of the traffic light, which is then processed using a microcontroller. The system has the potential to significantly improve the safety and efficiency of driving, reduce the risk of accidents, and provide drivers with more precise information about traffic conditions. This paper aims to provide a basic understanding of the traffic light detection system for cars using TCS3200 colour sensors, highlighting its features, benefits, and potential applications...

PROBLEMDEFINATION

1. Inefficient traffic flow: Traffic lights can cause inefficiencies in traffic flow, leading to congestion and longer travel times for drivers. Poorly designed or timed traffic lights can cause unnecessary delays and backups.
2. Pedestrian safety: Traffic lights are essential for pedestrian safety at intersections, but they can also cause pedestrian accidents if not properly designed or maintained. Confusing signal phasing, obscured visibility, or malfunctioning signals can all contribute to pedestrian accidents.
3. Driver behavior: Drivers can sometimes disregard traffic lights, leading to accidents or violations. Driver behavior can be influenced by various factors, such as distractions, fatigue, or impaired driving, making it challenging to address.
4. Maintenance and repair: Traffic lights require regular maintenance and repair to function correctly. Failure to maintain or repair traffic signals can result in signal malfunctions, leading to accidents or violations.
5. Accessibility: Traffic lights may not be accessible to people with disabilities, such as visual impairments. Inadequate design or placement of traffic signals can make it challenging for people with disabilities to navigate intersections safely.

ADVANTAGESOFSYSTEM

1. It requires fewer components so its cost is low.
2. Small in size.
3. Light weight.
4. Flexible users.
5. Easy to operate.

LITERATURESURVEY:

1.Traffic light detection is an essential component of intelligent transportation systems that can significantly improve safety, efficiency, and accessibility in transportation. There is a growing body of literature on traffic light detection, with researchers exploring various approaches to improve accuracy, speed, and robustness of detection systems.

2. Colour-based detection: One of the most commonly used approaches for traffic light detection is colour-based detection, which relies on identifying the colour of the traffic signal. Researchers have explored various techniques for colour-based detection, including thresholding, template matching, and machine learning-based approaches.

3. Deep learning-based approaches: With the rise of deep learning, researchers have explored the use of convolutional neural networks (CNNs) for traffic light detection. These approaches have shown promising results in improving accuracy and robustness of traffic light detection systems.

4. Multi-modal detection: Some researchers have explored multi-modal approaches that combine colour-based detection with other modalities such as shape and motion information. These approaches can improve detection performance in challenging conditions such as occlusion or low visibility.

5.Hardware-based approaches: Researchers have also explored hardware-based approaches to traffic light detection, including using cameras, LIDAR, and radar sensors. These approaches can provide more reliable detection in adverse weather conditions and can also detect traffic signals that are not visible to the human eye.

6.Real-time detection: With the growing demand for real-time traffic light detection, researchers have explored various approaches to improve detection speed and reduce latency. These include using lightweight CNNs, parallel processing, and hardware acceleration.

7.In conclusion, the literature on traffic light detection is vast and diverse, with researchers exploring various approaches to improve detection accuracy, speed, and robustness. The future research direction in this field is likely to focus on developing more efficient and robust detection systems that can operate in challenging conditions and can integrate with other intelligent transportation systems.

SYSTEMARCHITECTURE

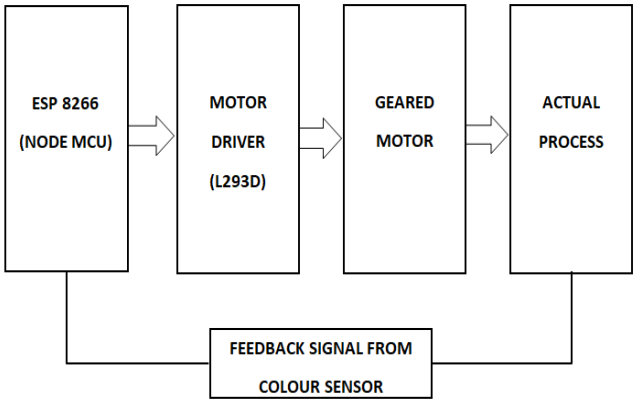
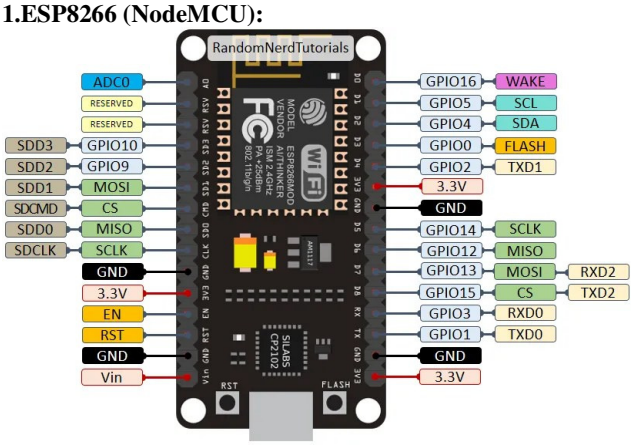


Fig-1:SystemArchitectureDiagram

1.ESP8266 (NodeMCU):



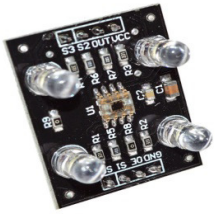
Features:

- Microcontroller: ESP-8266-32 Bit
- Operating Voltage: 3.3V - 5V
- Input Voltage (recommended): 3.3V-12V
- Input Voltage (limits): 5V-20V
- Digital I/O Pins: 11
- Analog Input Pins: 1
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used bybootloader
- SRAM: 2 KB
- Clock Speed: 80 MHz

Advantages Of NodeMCU

1-inexpensive
2-open source in hardware
3-don't need to external programmer (Burner)
4-programming ease
5-open source in software
6-IDE Software operate on any operating system

2.Color Sensor

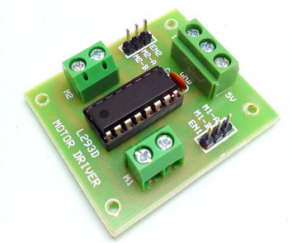


Those that detect the three primary colors of red, green, and blue are called color sensors. Color sensors detect RGB values by receiving ambient light using a photodiode.

Features OfColor Sensor:

•Operating voltage of this sensor ranges from 0V to 5V
• It can function on low-voltages.
• Power rating is 1 Watt for peak & 0.5Watt for continuous.
• Operating temperature ranges from -45ºC to +80ºC

L293D (Motor Driver):



Features OfL293D (Motor Driver):

- The operating voltage of this display ranges from 3V to 12V
- The module size is 60 x 55mm

Geared Motor :

Features Of Geared Motor :

•small size and light weight**.**
•low energy consumption, good and superior performance.
•DC motor is easy to adjust smoothly.

SYSTEMREQUIREMENTS

- **SoftwareUsed:**

1. Operating System: Windows 7 and laterversions
2. ProgrammingLanguage:Embedded C
3. Tool:Arduino IDE
4. WEBAPPLICATION: BlynkApplication

- **Hardware Used:**

1. Processor–i3orabove
2. HardDisk –500GB
3. Memory–4GB RAM

ALGORITHMS

1) Start
2) User data
3) Sensor Data
4) ESP8266 output
5) Signal Sent to L293D
6) Stop the car

CONCLUSION

We conclude that by using Traffic light detection for cars is an essential aspect of modern transportation, ensuring safe and efficient movement on roads. One of the significant challenges for drivers is to identify and respond to traffic lights accurately, especially in situations where visibility is poor or distractions are present. To address this issue, a traffic light detection system using TCS3200 colour sensors has been proposed. This system can detect the colour of traffic lights and help drivers make informed decisions about stopping or proceeding through an intersection. In this system, the TCS3200 colour sensor is used to capture the colour information of the traffic light, which is then processed using a microcontroller. The system has the potential to significantly improve the safety and efficiency of driving, reduce the risk of accidents, and provide drivers with more precise information about traffic conditions. This paper aims to provide a basic understanding of the traffic light detection system for cars using TCS3200 colour sensors, highlighting its features, benefits, and potential applications.

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