Green Beam Technology with Traffic Analysis Using Deep Learning

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ABSTRACT: The street light plays a major role in both urban and rural cities. If there is a lack of street light or it may contain any fault, then it may lead to different types of crimes like robbery, snatching and there is no safety for people, especially children and women, and also it causes accidents. To prevent such crimes and also to make an analysis of traffic, the GTT is developed. Our street lights are essentially automated in accordance with the weather, and by using solar power, it consumes energy from it and uses it for the lights to save energy. If a fault arises, they automatically notify the electrician and send a complaint letter to the collector office within three days. In addition, there is a buzzer fixed in a street light pole at a particular height, which is very useful for people to press at any time for any help, and it directly notifies the police station. It also analyzes the traffic, and if there is a huge amount of people gathered or any other group of vehicles struck in that place, then the street light in the current place will give a notification as a mild red signal to the nearby street light at a particular distance, and by this alert message, people can understand that there is a crowd or there is traffic in that place, so we may choose another path to their destination. It was very useful to save time and avoid unnecessary traffic.

KEYWORDS: GTT-Green beam technology with traffic analysis, solar power, automated.

I. INTRODUCTION

A huge amount of the electricity used in our nation is used for street lighting, which is a basic necessity for residential areas. With our concept, all of the street lights will be automated, making street maintenance simple. An application on our phones will also instantly alert the electrician to any problems with the street lights. Street lights were manually operated in the past, requiring a greater number of workers. If a street light is damaged, it can only be fixed through public complaints; otherwise, it will take a long time to repair the damage and be difficult to maintain on national highways. To cut down on electricity use, LED bulbs are used in place of street lights. We created lights for our project that have two modes: bright and muted. Our technique maintains the lights in a dim mode until motion is detected; at that point, the lights automatically change to a bright mode. Compared to the bright mode, which contributes more to energy conservation, the dim mode uses only 10% of the energy. When sunlight falls below the portion of our vision that is visible, it automatically turns on the lights. This is accomplished with a light-dependent resistor (LDR) sensor, which functions similarly to human eyes in that it detects light. When sunlight reaches our eyes, it instantly turns off the lights. Cameras are added to analyze the traffic and give notification to reduce the traffic.

II. METHODOLOGY

Actually, GTT consists of two work phases: traffic analysis with an alerting system and defect detection and light maintenance. The combination of both software and hardware is called GTT. The initial stage involves IOT, whereas the subsequent stage relies on deep learning and CNN algorithms, mostly utilized for image identification. The convolutional neural network is what CNN is essentially. This algorithm is specifically recommended for the analysis of visual data in deep learning. It has four layers. They are shown in the figure.
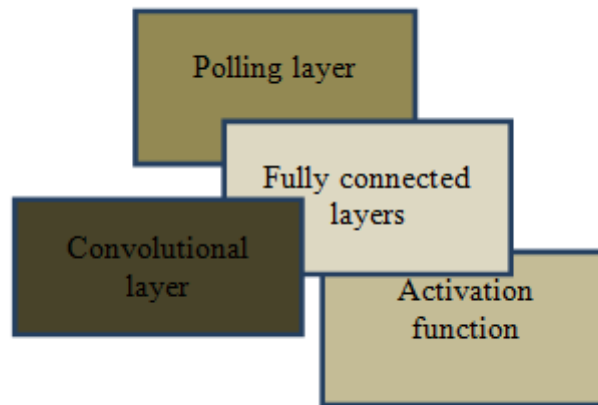
Our street lights are designed with the idea of the internet of things, which means they contain an Arduino Uno to control the entire system automatically with this mini processor. Thus, the Arduino Uno is designed with c-coding as per all our expectations. This street light consists of two advanced features: fault detection and power consumption and traffic analysis. The fault detection was done by using the Node MCU. By detecting the fault, any damage that happens with the light is immediately sent message to the Arduino Uno, and the related message or alert message with the street light number and the location where it was damaged is automatically sent to the appropriate electrician and also to the nearby electronic office. We also added the application for the electrician to make the maintenance easier. And the most important feature is power consumption by the dim and bright mood. The light remains off until any movement is captured by the moment sensor, called an ultrasonic sensor. If there is any moment, the lights will be switched on and the light will be maintained in dim mode. Only the lights get brighter, when the vehicle gets closer to the lights. The bright light sensors are connected with nearly three lights surrounded by them, and the dim light sensor is connected with nearly ten lights among them to give the driver clear vision on the road. And the dim mode only consists of 10% of the actual power it needs to glow when it is on, so it saves us electricity.

hese street lights consist of cloud storage. And also, we implemented a solar power system to make the lights glow from renewable energy sources. These street lights main objective is to save the environment, make it eco-friendly, and
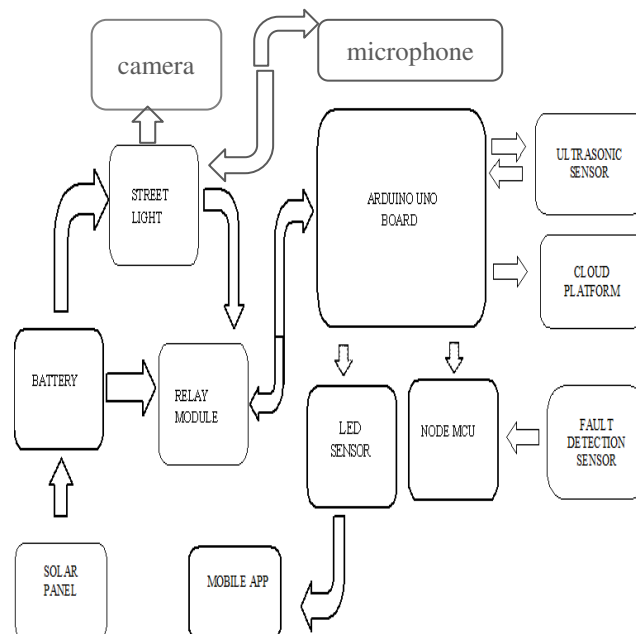
also to reduce the work of the power man to reduce their pressure so that they can easily check the street light conditions and also control them through a single application on their mobile so that they can monitor the expiration date of the street lights and make an alert message to them prior to the expiration date when it comes closer. The ultrasonic sensor is the reason to detect motion and make lights ON or OFF. The related information gathered by the sensor will then be sent to the Arduino on-board, which will then take a decision about what to do to the blub. The dim-bright mode is also controlled by this processor automatically by the corresponding coding that was implemented before. The main theme of this project is fault detection. When a fault occurs in the lights, it will be informed by the monitoring sensor at the head office, called Uno. which makes the message to the electrician with the corresponding light number and its location, and the message contains the reason for how it would happen by prediction. So that makes the electrician overcome the man-made errors in the lights to reduce the fault percentage. In order to analyze the traffic that occurs on the road, we will also be adding cameras. Since the area we will be covering will have fewer people moving through it, ongoing monitoring won't be necessary. If a huge amount of traffic takes place on a road, then for a particular distance, it can be notified to the people by the street light about the situation on that road. By knowing this, they can make another route or make decisions for their journey.With features like automatically alerting in the event of a malfunction and detecting traffic nearby, the GTS's second stage is to analyze the traffic. For this, we utilized the CNN technique for image processing.

III. MATERIALS USED

A. Solar Panel:
Solar panels are the best way to use renewable energy and ecofriendly devices. And these are help our world to reduce global warning. Our street lights are powered by solar panels, which gather solar energy and transform it into electricity. Using renewable energy sources helps reduce pollution. Therefore, we employed solar panels in our project to reduce the need for electricity and to improve the environment.

B. Battery:
This battery holds the energy that the solar panel has collected. which are beneficial during the rainy season, and the sun's energy, which is seen from dawn to dusk and stored in batteries to keep the lights ON all night.

C.LED:
The Tamil Nadu government used a significant amount of funding to convert the street lights to LED lights in order to reduce the amount of electricity used. LED lights are energy-efficient compared to other types of lights. Hence, we also made use of LED. They have two modes: moody and bright. In dim mode, power consumption is merely reduced.

D. Relay Module:
The primary source that helps the lights turn on and off automatically is a relay module that is connected to an Arduino board so that code can be written to adjust the brightness or switch the lights' mode from dim to bright in response to movement detected on the street.

E. Arduino UNO:
The Arduino Uno board is the primary IOT source. It is the brain of our project, which maintains all the control of our lumina guards as the brain controller. Enabling us to design our lights to operate automatically and to our specifications. All of this is done through code using the C programming language. This allows us to customize our system and add additional sources related to IoT upgrades. and the single Arduino is enough to control the entire street by passing by the sensors, which are connected at all the lights.

F.LED Sensor:
An LED is just a transparently packaged diode that has been properly doped for efficient light output. The LED will therefore function in the same way if it is inserted into a circuit in the same manner as a photodiode, which is basically the same thing.

G.NODE MCU:

A board used in Internet of Things applications, the Node MCU ESP8266 offers a flexible and affordable way to link objects to the internet. Its programming and Wi-Fi capabilities enable quick IoT solution deployment and development.

H. Ultrasonic sensor:

An ultrasonic sensor is to detect the ultrasonic sound waves and also calculate the distance among the sensor and the object and is used to receive and send the ultrasonic pulses.

I. Microphone:

It is employed to both receive and identify sound waves, whether they are generated by a shout or a regular voice. We can also determine if there is an emergency by listening to the voice. A high frequency of noise could be a sign of an emergency, and it would also notify the police to keep an eye on the area and determine whether an emergency is required.

J. Camera:

We installed the camera to keep an eye out for any accidents or criminal behavior. It continuously watches, taking a photo every 0.10 seconds and comparing it to the data that is fed in. The closest police station receives an automatic alert if any relevant activity is discovered. And we were fix the 360 degree cameras.

IV. RESULT AND DISCUSSION

In general, if any fault occurs in our street lights, they are only fixed in response to complaints from the public; otherwise, they remain as they are until an electrician is called to inspect them. This makes the area difficult for people to use at night without a light source and provides a platform for robberies. In order to make the management process easier, we invented the smart street light source, which eliminates the need for street lights in residential areas. A streetlight with an ultrasonic sensor is linked, and the streetlights automatically adjust their brightness in response to movement nearby. which recognize movement, both that of vehicles and that of humans, and it detects movement, it will intensify the light; otherwise, it will be in the dim mode. Driving at night without lights increases the danger of accidents because we are unable to see distant roads, making it difficult for drivers to maneuver. For a clear view of the front road, that one sensor is connected to almost three lamps. And also, we maintain the lights in dim mode and then keep them off. Which brightens the road? We may lower the amount of energy used by street lighting in regions where people are not present by using this technique.
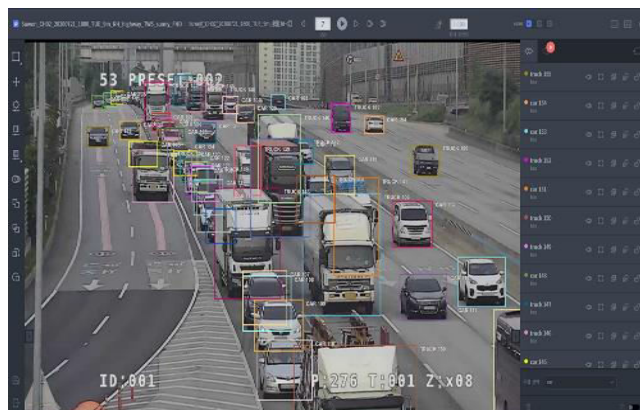

With the use of the deep learning technology, we are also able to analyze the traffic that happen by the side of the road and promptly save the time of those who are travelling on that particular area. Additionally, we may provide protection for women who support their families. This technology offers women in the community the opportunity to serve as the people's automated safety guards. Identification of Faults: The IoT system's identification of malfunctioning street lights has a high degree of accuracy when compared to the real ones, which saves human energy. How long it takes the system to find and notify a bug. More responsiveness is essential for effective maintenance. Examine the system's

dependability by keeping an eye on its performance over a long period of time and taking into account things like false positives and negatives. Examine the IoT devices' power usage to make sure they are efficient and to see whether it fits with the selected power source. The efficiency of data transfer guarantees that sensor data regularly reaches the cloud platform.

V. CONCLUSION
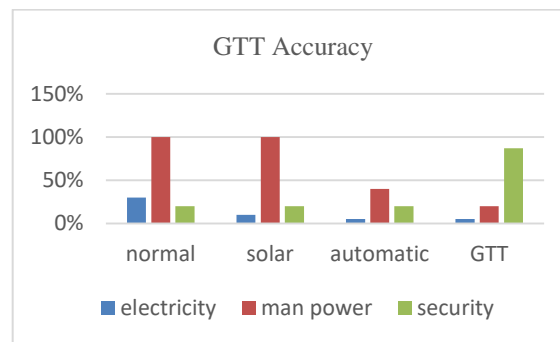
The proposed model seeks to develop an Automatic Arabic Short Answer Grading (AASAG) system by employing semantic similarity techniques. The model utilizes Latent Semantic Analysis (LSA) to gauge the semantic likeness between the Student Answer (SA) and Model Answer (MA). It incorporates two weighting methods, namely local weighting schema and hybrid local and global weighting schema, to fill the cell values .Several approaches have been suggested for automated grading of short answers. In one study the authors introduced AR-ASAG, an Arabic Dataset for Automatic Short Answer Grading Evaluation. They also presented an Automatic Short Answer Grading method based on the COALS (Correlated Occurrence Analogue to Lexical Semantic) algorithm, which demonstrated promising outcomes for Arabic language assessments. This method was tested on the AR-ASAG dataset, consisting of 2133 pairs of (Model Answer, Student Answer) in various formats. Another study introduced an Automatic Arabic Essay Scoring (AAES) system utilizing the Vector Space Model (VSM) and Latent Semantic Indexing (LSI). This approach, applied to a single question with four model answers and 30 student responses, involved information retrieval techniques followed by VSM and LSI to measure similarity between student and instructor essays. In a different study an automatic Arabic essay grading (AAEG) system was proposed using Support Vector Machine (SVM), which extracted features from student and model answers and identified related words using AWN (Arabic WordNet). This model, tested on multiple languages and a Kaggle dataset with 40 questions and 120 model answers, demonstrated improved accuracy with AWAN integration. Additionally, an automatic scoring system for short Arabic texts was proposed utilizing a sentence embedding approach and tested on various datasets including AraScore and AR- ASAG. Authors in another study proposed an automatic scoring system for Arabic short answers using Longest Common Subsequence (LCS) and Arabic WordNet (AWAN). This model achieved a Root Mean Square Error (RMSE) value of 0.81 and a Pearson correlation r value of 0.94 on a dataset with 330 student answers. Lastly, a study presented an automatic grading system for Arabic short answer questions using an optimized deep learning model, specifically a hybrid LSTM (Long Short-Term Memory) and GWO (Grey Wolf Optimizer) model. Tested on a dataset gathered from science subjects in various schools, this LSTM-GWO model outperformed other methods such as SVM, Ngram, Word2vec, and MaLSTM in accurStreet lights are our nighttime protectors, but in this fast-paced society, we don't have time to maintain them. With the help of our technology, street lights will become even more intelligent. GTT will take on the role of a nighttime street smart guard, saving labor costs. Since saving power is our goal, we totally constructed it using sustainable energy sources like solar energy, which also serves as the street watchman at night.

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