SMART STREET LIGHT WITH COLLISION DETECTION

SMART CITY

19CSE446-INTERNET OF THINGS-USE CASE

Submitted by

REG.NO:	NAME:
CB.EN.U4CSE19119	KAMALESHEN S
CB.EN.U4CSE19153	THUMMALA.KRISHNA CHAITHANYA
CB.EN.U4CSE19161	VUPPERLA TARSHIT

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

AMRITA SCHOOL OF ENGINEERING

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ABSTRACT

This paper aims for providing solution to design and execute the system for saving energy of street lights and controlling the collisions occurring on roads. Currently we have a manual system where the street lights will be switched ON in the evening before the sunsets and they are switched OFF in the next day morning after there is sufficient light outside and currently there is no such system in India that helps in monitoring or detecting collisions occurred on roads. This we can implement by sensing a vehicle using an Ultrasonic sensor/IR sensor and using some heat & sound sensors for sensing the collision if it occurs. On sensing the movement of a vehicle, the sensor transmits the data to the Raspberry Pi, which will switch ON the next three consecutive street lights in order to give the driver a visible track to drive in dark. Similarly, the Light gets switched OFF according to a timer that gets triggered as soon as the vehicle or an obstacle goes away from the sensor.

PROBLEM STATEMENT AND DELIVERABLE

- Proposed problem statement

  Now-a-days wastage of electricity due to continuously switched ON street lights and lots of accidents happen on roads and highways due to increase in traffic and also due to rash driving of the drivers. And in many situations the family members or the ambulance or the fire brigade and police authority is not informed in time. This result in delaying the help reached to the person suffered due to accident. Our project “System for monitoring & detecting collisions” is designed to avoid such situations.

- Deliverable

  ### a) Hardware

  As an end product we will deliver a street light that is embedded with Raspberry Pie, IR Sensor, Pi Camera, Heat Sensor, Sound Sensor, Ultrasonic Sensor and GSM Module

  ### b) Integration part

  To make the alerts generated by various sensors to reach their designated destination on time we are planning to use firebase as a dynamic database or a Google cloud storage that will help the alert messages to reach police

stations, fire stations and ambulance on time and also help in filing the temporary FIR to police station.

All other components like the IR sensor, Heat sensor, Sound sensor, Pi Camera and GSM modules are connected via network of jumper wires to Raspberry Pi. The code for the working of this system is written in python. The alarm (alert) is triggered when the sensors connected to each other detect a collision.

c) Analytics:

Picture taken by the pi cam will be stored in the Raspberry Pi their the analytics will be performed by using collision detection deep learning models and classify the collision as accident or not

CHAPTER 1

Introduction

As we all know that, in an extreme collisions the sound produced can be of higher intensity and if a vehicle catches fire then in that case the intensity of heat will also be more. This paper provides the solution by using some modern age technologies emerging in today's era like Internet of Things (IOT), Android, and Cloud Computing etc. So this can be done by sensing the value through various sensors and if the sensed value strikes above the sensor's threshold then the data will be transmitted to the Raspberry Pi which will further trigger the Pi Camera to click the image of the suspected collision and Raspberry Pi will send the data about the collision to the Dynamic Database or on Cloud. Then the data sent to the database will be fetched from there into the Customized Android App which can be used by the alert stations i.e. nearest police station, fire brigade and an ambulance driver so that they can reach the place where collision occurred with the minimum time for formalities i.e. filing a report, hospital needs the confirmation from police during police case etc. Also this App will provide the police stations to file temporary FIRs for the alerts received on the App with the mandatory data required for filing FIR and also any user can keep track of the investigation of the collision cases for which alerts they have received.

Important findings

In smart system based collision detection, peoples are getting help very efficiently and easily. Yasaku Fuzzi Says in his paper that street light system, in which lights on when needed and light-off when not needed. Currently, in the whole world, enormous electric energy is consumed by the street lamps, which are automatically turn on when it becomes dark and automatically turn off when it becomes bright. This is the huge waste of energy in the whole world and should be changed. This article publishes in ACM digital library .

In the paper the researcher proposed a system that provide a solution for energy saving. This is achieved by sensing and approaching a vehicle using an IR transmitter and IR Receiver couple. They used the RFID concept that wants to improve.

Further Investigation

More research need to be done in choosing an proper collision detection algorithm and power efficient hardware.

Aim

“Smart Street Light & Collision Detection System” is a cost effective, practical and reliable. It clearly tackles the two problems that our country is facing today that are roadside accidents and electric power wastage, very efficiently.

Objective

The main objective behind this project on “Smart Street Light & Collision Detection System “based on IOT is the need to explore different trending dimensions of IT Industries. Also this project represents the need of a system in our country India that can reduce the consequences of accidents occurs on roadsides daily.

Existing Solution

Currently there is no such system in India that help in monitoring or detecting collisions occurring on roads. This proposed paper gives the solution for Traffic manipulation and also the very first system that helps in detecting collisions and controlling the consequences of collisions.

Scope of Study

Here in this paper we are mainly concentrating on inter connected street lights and collision detection systems using IOT technology.

Hardware Design:

List of Hardware

1. Raspberry Pi:- The Raspberry Pi is a series of small single-board computers. It is a capable little computer, which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, programming, browsing the internet etc.

2. IR Sensor:- An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared

radiation. It is also capable of measuring heat of an object and detecting motion.

3. Pi Camera:- It can be used to take high-definition video, as well as stills photographs. It supports 1080p30, 720p60, and VGA90 video modes, as well as still capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.

4.Heat Sensor:- Heat sensor is used to sense temperature/humidity within the range of the sensor. Its single-bus operation, extremely small size and low consumption enable it to be used in HVAC, automotive, weather stations, dehumidifier and other applications.

5. Sound Sensor:- The sound sensor provides an easy way to detect sound and is generally used for detecting sound intensity. This can be used for security, switch, and monitoring applications. Its accuracy can be easily adjusted for the convenience of usage.

6. Ultrasonic Sensor:- This sensor module has a transmitter, a receiver and a control circuit in one single pack. It has very handy and compact construction. It offers excellent range accuracy and stable readings in an easy-to-use package.

7. GSM Module:- GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate.

Software Interfaces

Since we are dealing with Hardware mostly in IOT based project. But still few software interface required are Raspbian Operating System to use Raspberry pi's functionalities and Android Studio for developing Android Application.

Communications Interfaces

To make the alerts generated by various sensors to reach their designated destination on time we are planning to use firebase as a dynamic database or a Google cloud storage that will help the alert messages to reach police stations, fire stations and ambulance on time and also help in filing the temporary FIR to police station.

CHAPTER-2

LITERATURE SURVEY

Papper1 name: IOT BASED SMART STREET LIGHTNING SYSTEM

1. A description of the publication;

Street Lightning system has multifunctional features as two are used which are Light Dependent Resistor (LDR) sensor to point a day/night time and also the passive infrared sensor (PIR) to detect the movement of auto on the road. The ARDUINO UNO (ATMEGA328T) is employed as brain to regulate the road light system, where ARDUINO programming is used. The smoke sensor used also will detect the extend of pollution caused by the gases For over-speeding motion sensor is used as if vehicle on the road crosses the speed limits to avoid the accident on the road side areas and specially the highways. Upon sensing the movements the sensor transmits the info to the microcontroller which instructs the sunshine to change ON. Similarly as soon as vehicle or an obstacle goes away the light intensity decreases.This was to scale back the side effects of this street lightning system, and find an answer to save lots of power.

2. A summary of the publication's main points;

- ✓ It aims at designing & executing the advanced development in embedded systems for energy saving of street lights and their maintenance at reduced cost with modern development.
- ✓ Street Lightning system has the features as two sensors are used which are Light Dependent Resistor (LDR) to point a day/night time and therefore the passive infrared sensor (PIR) to detect the movement on the road.
- ✓ The ARDUINO UNO (ATMEGA328T) is employed as brain to manage the road light system, where the programming language used for developing the software to the microcontroller is ARDUINO program .

- ✓ The smoke sensor used also will detect the amount of pollution caused by the gases and specially the system for the over-speeding of the vehicle, if the vehicle on the road

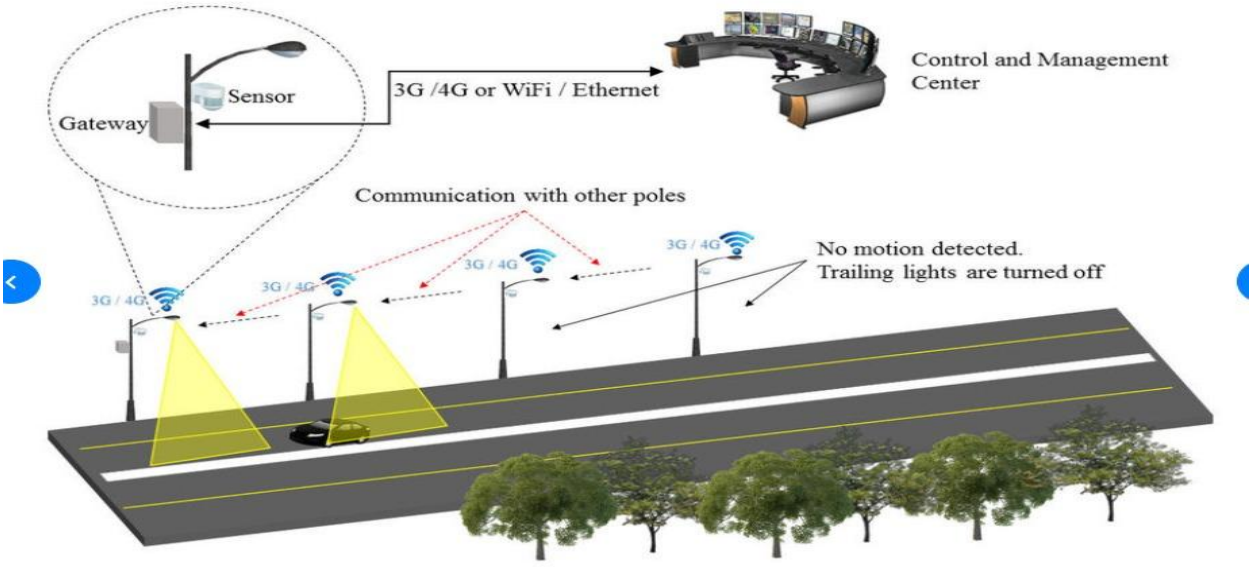
3. A discussion of Advantages in research;

- ✓ Major advantages of street lightning include prevention of the accidents and increase in the safety.
- ✓ Several decades ago when automobile crushes were way more common, street lightning was found to cut back pedestrian crashes by approximately 50%.
- ✓ Lightning system also reduces crime say murder, theft and plenty of more to a great- extend.

4. An evaluation of the publication's contribution to the topic

The project aims were to scale back the side effects of this street lightning system, and find an answer to avoid wasting power. During this project the primary thing to try and do, is to organize the inputs and outputs of the system to regulate the lights of the road. This project could be a cost effective, practical, eco-friendly and also the safest thanks to save energy and this method the sunshine status information is accessed from anytime and anywhere. It clearly tackles the two problems that world is facing today saving of energy and also disposal of incandescent lamps, very efficiently.

5. Literature survey work proposed prototype model



Papper 2name: Internet of Things based Accident Prevention and Detection System

1. Description of the publication;

Internet of Things based accident prevention and detection system is proposed to deduce accidents and save human life. The vehicle performance has been continuously monitored for safety purposes. This technique is annoying to maintain speed balance to avoid accident
and provide safety to the driver. Hence, a novel approach is proposed to avoid accidents and save the victims while accidents occur.Sensors are exploited to give alarm 'ON' when distance between two vehicles is too short. If accident happens, then the camera is automatically turned on and captures the images around 180 degree angles. This emergency alert information including the location is transferred to nearest police station, ambulance service and relatives through GSM modem

2.Summary of the publication's main points;

*.The external devices such as mobile, GSM modules are connected to the board. Coding is executed in Arduino board with Embeded C.
*.This methodology uses Ultrasonic sensor and Bump sensor to provide distance alert the driver to avoid accident and sending GPRS location and accident message these are the
outcomes of the this project.
*.It also used to monitor the over speed of a vehicle in restriction area.

3. an evaluation of the publication's contribution to the topic

It reduce the maximum accident rate
• It help to find the location of accident
• It capture the images at the time of accident
• It help to convey the message to particular representatives
• It make our journey safe

4.Literature survey work proposed prototype model

CIRCUIT DIAGRAM OF THE CONCEPT

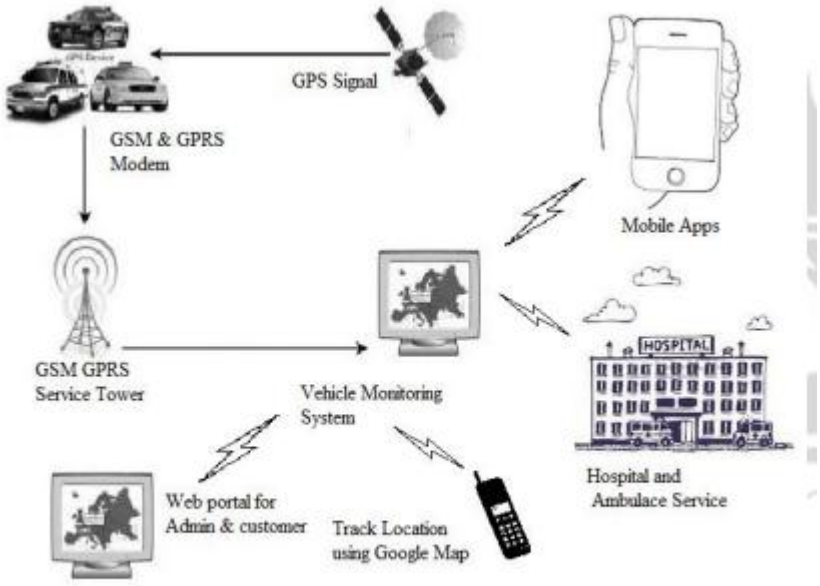


Figure 1: Architectural Design for VMS

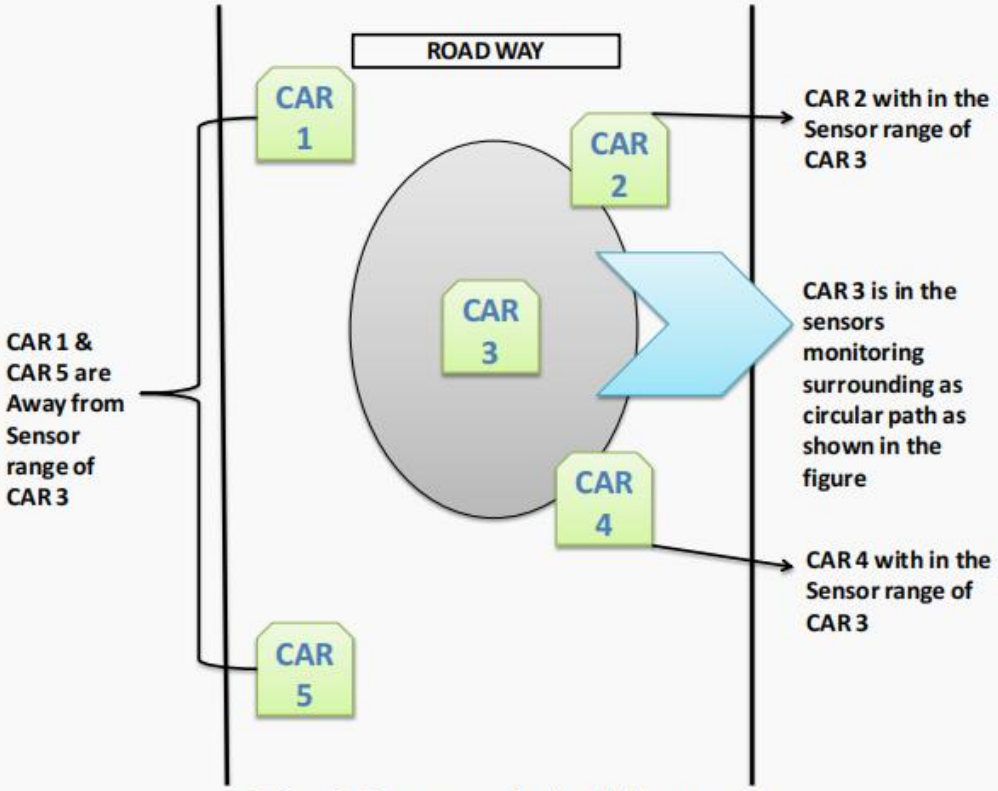


Fig.1 Proposed Architecture

Papper3 name: Design and Performance analysis of IoT based

Smart Street Light & Collision Detection System

1. description of the publication;

Streetlights play an important role in cities which means to avoid accidents, secure roads and provide better vision since evening to morning. As the world is ready to accept the technology, we need to upgrade that street light system which will reduce the energy consumptions and save energy. Also one of the major problems happens in cities is accidents, so we are applying IR mechanism to avoid the accidents that usually happens in u-turns. As our goal is to save energy, so we are using LEDs which is directional light source it can emit light in a specific direction thereby optimizing the efficiency of streetlights. The IR sensors detect the objects and set the intensity of LEDs to high for some time. The work has achieved better performance and reduces energy consumption as compared to the current system.

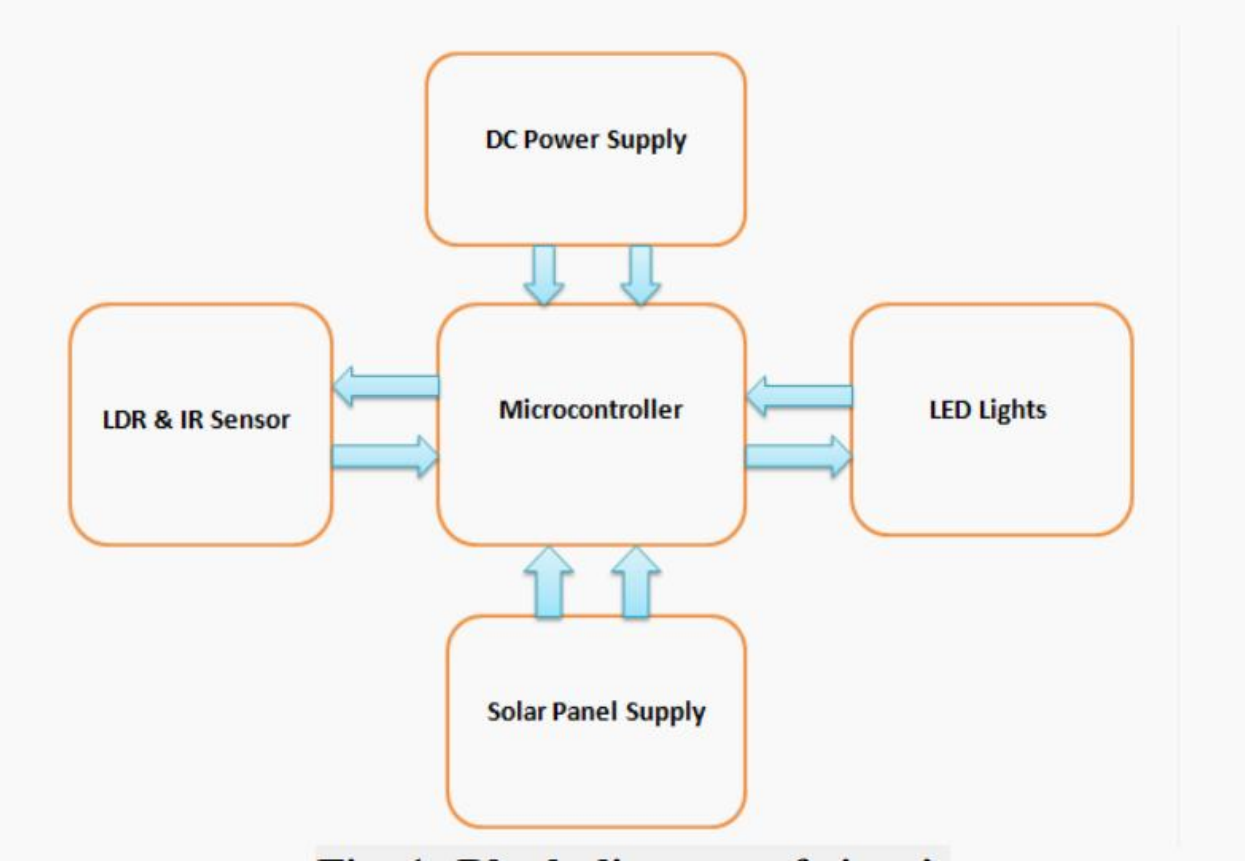
2.summary of the publication's main points:

- we use four IR sensors and four LEDs of two red colour and two yellow colors which are connected to IR
- The first IR sensor is placed 100 meters away from the u-turn which is connected to the yellow LED which is on the opposite side of the u-turn and another IR is placed 50 meters away from the uturn which is connected to the red LED of the opposite side.
- The same system is set up on another side of the u-turn with two IR sensors and this all is connected with Arduino board.
- As the object is detected by the fir IR sensor which is placed at 100 meters it blows the yellow LED for a few seconds which is on the opposite side and when this same object comes in contact with the second IR sensor it blows up the red LED for a few seconds which shows the object is near and the object coming from another side of the u-turn is alert.
- So this system is usedfor avoiding the accidents which usually happens in u-turns and may be updated according to the time.

3. an evaluation of the publication's contribution to the topic

It reduce the maximum accident rate
• It help to find the location of accident
• It capture the images at the time of accident
• It help to convey the message to particular representatives
• It make our journey safe

4.Literature survey work proposed prototype model



6.Table to summarize survey paper

S.No	Hardware	Sensors used	Integration part (cloud, etc..)	Analytics	If any remarks
Paper1: **IOT BASED SMART STREET LIGHTNING SYSTEM**	1.Light Dependent Resistor 2.WI-FI Module 3.Voltage Regulator 4.Arduino NANO 5.ARDUINO UNO 6.Transformer	1. MOTION 2.PIR SENSOR 3.SMOKE SENSOR	Cloud	ARDUINO UNO and ARDUINO NANO	NO remarks by assuming that every roads and highways consist of street lights working properly
Paper2: **Internet of Things based Accident Prevention and Detection System**	1.Arduino 2.LCD interface, 3.Camera, 4.GPRS 5..Ultra Sonic sensor 6.Bump sensor (BS) 7.Buzzer	1.Heat Sensor 2.Sound Sensor 3.Ultrasonic Sensor 4.Bump sensor	cloud	Arduino	NO remarks by assuming that every roads and highways consist of street lights working properly
Paper3: **Design and Performance analysis of IoT based Smart Street Light & Collision Detection System**	1.Microcontroller 2.Light Dependent Resistor 3.IR proximity sensor 4.Light Emitting Diode (LED) 5.Sound Sensor	1.IR proximity sensor 2.Sound Sensor	cloud	Zigbee ,LDR sensor	NO remarks by assuming that every roads and highways consist of street lights working properly

THANK YOU