

Accident Detection System Using Raspberry Pi with Photovoltaic Energy

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Abstract— According to modern survey it is stated that there is one loss of life each and every 4 minutes in India due to road accidents. Rash driving, drink and drive are primary motives for road accidents. In predominant incidents the lives can't be saved due to the fact they are no longer admitted in the medical institution at appropriate time. This is due to delay in understanding about the accident. If they are stated in time there is a hazard that their lives can be saved. Our proposed system benefits that purpose. It consists of a photo voltaic tree in which a digital camera is mounted. The setup is often saved in accident prone regions. The system constantly monitors and if any accident takes place it detects and sends the facts to nearby healthcare unit or ambulance. The data is handed out using GSM module in our system. Raspberry pi is used to do all the processing. The footage of accident is stored in a micro SD card which can be recommended in investigation. The system also serves the cause of a avenue light.

Keywords-Raspberry PI, GSM, Solar Panels, GSM, Image Processing, Camera

I. INTRODUCTION

In today's world there is a severe extend in the use of vehicles. Road accidents are one of the most important motives of mortality around the world and over 1,300,000 people are killed yearly in the avenue accidents. These accidents generally suggested by using humans who are close to the accident scene or by the visitors police are in the roads. This increases the time of accident reports and so will increase the time of positioning the accident scene by police and rescue. Now-a-days loads of accidents show up on highways due to amplify in visitors and also due to rash driving of the drivers. The Global repute file on avenue protection 2015 indicates that the complete variety of deaths brought on due to road accidents is at 1.25 million a year. One of the fundamental motives for fatalities from these accidents is a prolong in reporting the accidents to near-by emergency health centres and extend in an ambulance achieving the accident location. Such a

prolong can be decreased if there is computerized detection and reporting of the accidents to emergency assist centres. These task objectives at finding the occurrence of any accident and reporting the location of accident to the earlier coded numbers so that immediately assist can be supplied through ambulance or the relatives concerned. In our mission work we use photo voltaic panels as power supply for dc loads and to observe accidents using Raspberry PI in accident prone regions. The proposed design gives information using GSM module concerning automobile identity and video footage of accident. This data is accrued by the raspberry pi kit through using unique module and dispatches it to the nearby hospitals or ambulance and police stations. It stores the data in data base and displays it on graphical user interface (GUI)

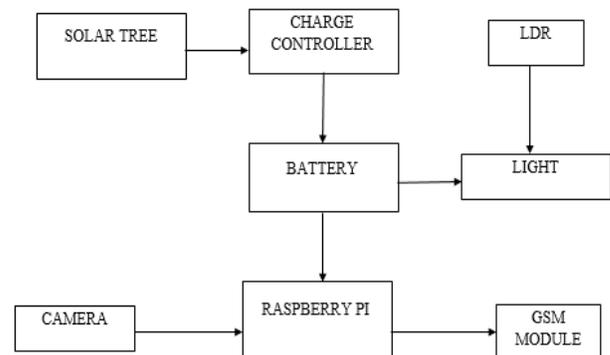


Fig.1. Block diagram proposed model

II. LITERATURE SURVEY

India witnessed 17 deaths and 55 road accident every hour in 2016, one of the highest in the world. According to World Bank estimate, road accidents cost India above 3% of its GDP every year. Almost 46.3% of the road fatalities victims in 2016 were in the age group of 18-35 years. The following table no.1 tells about the number of accidents happened in India in a certain interval.

Table No.1. Number of accidents happened in India.

States/ uts	Jan-sep 2016	Jan-sep 2017	Increase in accident	Increase in accident (%)
Bihar	3733	4111	378	10.1
Delhi	7375	8085	710	9.6
Gujarat	6165	5393	775	12.6
Karnataka	8371	7640	731	8.7
Maharashtra	9767	8960	807	8.3
Punjab	3607	3086	521	14.4
Tamil Nadu	7486	7328	161	2.1
Telangana	5458	4934	524	9.6
West Bengal	5225	4508	717	13.7

The Strawberry Tree, invented by the Serbian company Strawberry Energy is a variation of the Solar Tree in that it is specifically designed to recharge mobile devices. A number of sculptural structures which incorporate solar photovoltaic cells have been erected. CSIR's Solar Tree by Central Mechanical Engineering Research Institute (CMERI) is used to power street lights.

III.PROPOSED MODEL:

In urban areas and hill stations, due to geographical structure electricity cannot be provided in usual way. In those areas our project provides a huge help to the people. Our proposed work consists of a 7 feet pole on which a 5x5 feet iron frame is mounted. Solar panels are mounted over the iron frame with iron sheets in between them. The panels are connected in parallel for maximum efficiency. The power from panels is stored in a battery and is used to power up the street light and Raspberry Pi module. A camera is interfaced to the Pi module and monitoring is done 24x7. In case an accident occurs, Raspberry Pi detects it and sends a message to nearby ambulance and police station.

SOLAR PANEL:

Solar panel consists of multiple photovoltaic cells connected in series and parallel way. The ray from the sun closes the circuit in the PV cell and conduction takes place.

CHARGE CONTROLLER:

It is basically a voltage or current regulator to keep the batteries from overcharging. It regulates the voltage and current coming from solar panel going to the battery. The charge controller used here as voltage rating of 12/24V and current rating of 10A.

BATTERY:

Battery is used to store the power coming from solar panel which can be used in future for powering up electronic devices. The battery used here is a 12V battery with current rating of 28Amper per hour.

POLE:

The pole is made of iron which is about 7 metres high. At the top of the tower a square frame is kept which is movable. The frame supports the placement of solar panels.



Fig.2: Solar Tree

RASPBERRY PI:

Raspberry Pi 3 Model B. Single-board computer with wireless LAN and Bluetooth connectivity. The Model B is faster and more powerful than its predecessors. It has improved power management to support more powerful external USB devices. Now comes with built-in wireless and Bluetooth connectivity. The Raspberry Pi primarily uses Linux kernel-based operating systems. The ARM11 chip at the heart of the Pi is based on version 6 of the ARM. The current releases of several popular versions of Linux, including Ubuntu. Will not run on the ARM11. It is not possible to run Windows on the Raspberry Pi. Raspbian (recommended) Maintained independently of the Foundation; based on the ARM hard-float (armhf) Debian 7 'Wheezy' architecture port originally designed for ARMv7 and later processors (with Jazelle

RCT/ThumbEE,VFPv3, and NEON SIMD extensions), compiled for the more limited ARMv6 instruction set of the Raspberry Pi. A minimum size of 4 GB SD card is required. There is a Pi Store for exchanging programs. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, precompiled software bundled in a nice format for easy installation on your Raspberry Pi. The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2018. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible

GSM:

GSM (Global System for Mobile Communications) is the technology that underpins most of the world's mobile phone networks. The GSM platform is a hugely successful wireless technology and an unprecedented story of global achievement and cooperation's has become the world's fastest growing communication technology of all time and the leading global mobile standard, spanning 214 countries.

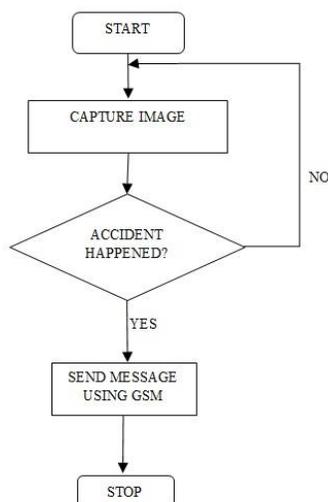


Fig.3.Flow Chart for Accident Detection

ALGORITHM USED:

Cascaded Classification Models is a joint classification model that shares information between tasks by linking components

in classifiers in order to leverage their relatedness. The process includes scene categorization, multiclass image segmentation, object detectors, reconstruction. Images are captured 3 frames per second and analyzed. Overlap of frames of two vehicles is presumed as accident and information is sent.

IV.WORKING OF PROPOSED SYSTEM

The study of various papers analyze the existing problem of vehicle tracking in real world, but it can be beneficial for future research work, try to apply tracking in real condition with noise removal problem. According to this problem better method and algorithm will be adapt for remove all the problem.The proposed system has three main processes. They are harvesting solar energy from solar panels, detecting accident and communicating the information.

Harvesting energy:

The solar panels are mounted on the diamond shaped iron sheets using screws. The panels are connected in a parallel to get maximum output power. The power from solar panels is given to charge controller. Charge controller is used to prevent the battery from overcharging and also to control the level of charging. The power from solar panels will not be constant all the time. If it is given directly to battery, the varying power may reduce the lifetime of battery. So charge controller is used. From charge controller it is given to battery. The stored power is given to LED Street light and Raspberry Pi.

Detecting accident:

A camera is interfaced with Raspberry Pi.The video is continuously analysed. The algorithm used to detect accident is cascade algorithm. In this algorithm it compares different images of an object and identifies them. Three frames are captured per second and it is analysed for occurrence of accident. The vehicle outline is given as an xml file and it takes that xml file as reference for detecting vehicle.

COMMUNICATING THE INFORMATION:

Once the accident has been detected it must be communicated to nearby healthcare unit so that help comes as soon as possible. Here we use GSM module for communicating the information. When accident occurs the Raspberry pi sends AT commands to GSM

module to initiate communication. Then it sends messages to the nearby ambulance and police station.

V CONCLUSION AND FUTUE SCOPE:

In this paper we proposed a standalone street light along with accident detection mechanism. It consists of a solar tree which provides energy to light and Raspberry Pi. The standalone system monitors continuously detecting accidents. In case of occurrence of accident it immediately sends alert to the nearby ambulance via GSM module. This system will be much more benefit in accident prone areas and also rural areas where means of finding help will take long time. In future we are planning to track solar ray so that we can increase the power output of the system. Nano wires can be used to increase efficiency of solar panels. And also we are planning to use IR enabled camera so it will be easy to monitor at night time. The excess energy can be used to illuminate road signs and warnings.

OUTPUT RESULT:

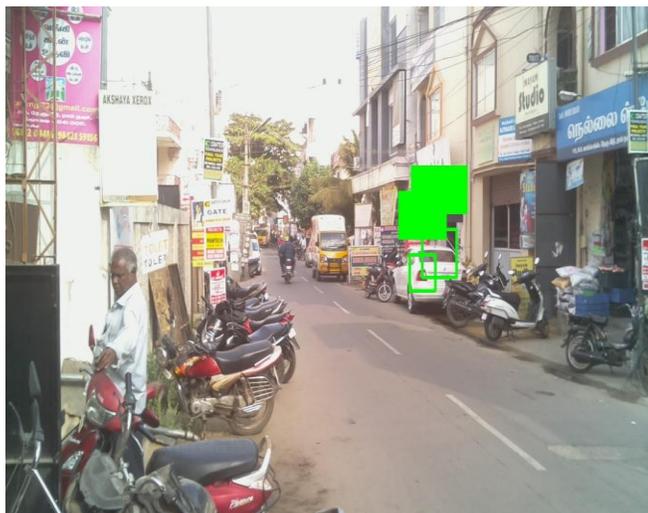


Fig.4. Vehicle Detection

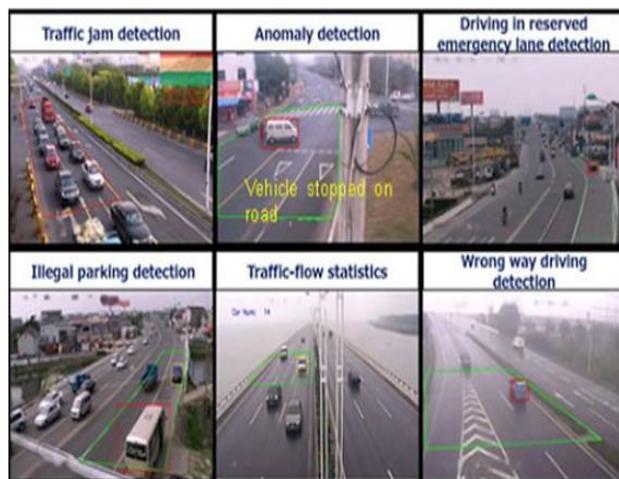


Fig.5. Various Vehicle Detection.

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