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Raspberry Pi Based Security System with Automatic Alert System in Roadways

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Abstract- *These days roads are monitored by CCTV cameras passively. There is very limited posting of traffic police staff at road crossings and highways. In many cases accidents are not reported due to negligence. Adding to this, even the majority of humans surrounding the accident spot/scene are busy clicking photos and videos unknown of the fact that their little negligence could cost a life. The footage is seen by the authorities only after a problem has occurred, so as to find the root cause of it. To overcome this, we propose an intelligent system that can make use of the existing CCTV cameras. The proposed system captures video stream, computes the input and the system alerts are generated in real time, which means no additional sensors would be required. Using camera itself, the plan is to detect accidents in real time and also send alerts to ambulances or medical services; so that appropriate resources needed for saving lives are available in time. By using technology at its best, the aim is to integrate various factors into one smart system. The project will benefit to reduce cost of road surveillance system and complete automation of road surveillance system.*

***Key Words*- Raspberry Pi, CCTV camera, GSM/GPRS**

1. INTRODUCTION

Video surveillance systems have decreased the need of human presence to monitor activities captured by video cameras. And also, one of the merits of visual surveillance systems is videos can be stored and analyzed for future reference. One of the important applications of video surveillance systems is traffic surveillance. Video traffic surveillance systems are used for vehicle detection, tracking, traffic flow estimation, vehicle speed detection, vehicle classification, etc. Vehicle classification is essential while computing the percentages of vehicle classes using state-aid streets and highways.

2. RELATED WORK

Many theories related to automated video surveillance were published of which some findings related to this paper are described:

[1] Accident Detection with Location and Victim Information Transmission Using Raspberry Pi by Badi Alekhya, S.Aarthi, and V.Glory. In this paper IoT is implemented in the existing accident alert system. An effective solution is formulated by embedding a series of sensors, GPS transceiver and a RFID receiver in Raspberry Pi. Initially, a centralized server has been set up with adequate medical information of people for easier retrieval in case of accidents. This system is configured with an auto-mailing module to send the necessary information in case of an accident.

[2] Smart Detection and Reporting of Potholes via Image-Processing using Raspberry Pi Microcontroller by Mae M. Garcillanosa, Jian Mikee L. Pacheco, Rowie E. Reyes, and Junelle Joy P. San Juan. In this paper a simple and robust design of a portable and affordable device that will be suitable for local cab drivers is suggested. The device can be installed in a moving vehicle to automatically detect and report potholes via image-processing of Raspberry Pi microcontroller. Integration of several Image-processing schemes has been used to produce an algorithm using Python Language from the OpenCV library that can detect and report potholes automatically from a moving vehicle.

[3] Event Detection on Roads Using Perceptual Video Summarization by Sinnu Susan Thomas and Sumana Gupta. In this paper a perceptual video summarization technique to enrich the speed of visualizing the accident content from a stack of videos is implemented. The problem of vehicle analysis is formulated as an optimization problem. With the camera in a surrounding

infrastructure and capturing a video, the properties of sub modularity are exploited to provide a relevant and condensed key frame summary.

3. PROPOSED SYSTEM

The proposed system uses a raspberry pi camera mounted on a pole or other tall structure, looking down on the traffic scene. It assumes that the video camera used to record the traffic image sequence is assumed to be parallel to the ground plane. It can be implemented for detecting and classifying vehicles across multiple lanes. Besides the camera parameters (focal length, height, pan angle and tilt angle) and direction of traffic, it requires no other initialization. The analysis on the traffic data collection is performed after the occurrence of the events i.e. false monitoring. The goal of this research is to develop an accident detection module at roadway intersections through video processing that and it sends the alert message to the ambulance service with the help of GSM/GPRS.

4. BLOCK DIAGRAM

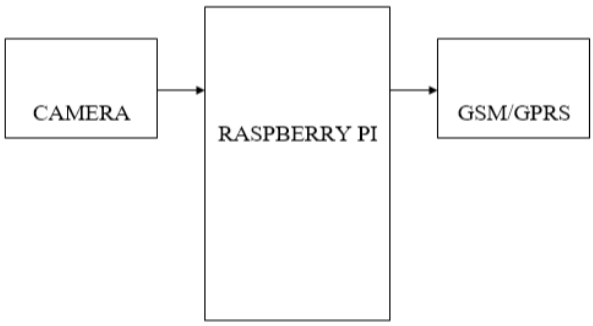

Fig -1: Block Diagram

4.1 RASPBERRY PI

Raspberry Pi is an ARM based credit card sized SBC (Single Board Computer) developed by Raspberry Pi Foundation. It plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It runs Debian based GNU/Linux OS (Operating System).

Fig -2: Raspberry Pi Model B+

Raspberry Pi 3 – Model B+ Technical Specifications

- Quad Core 1.4 GHz Broadcom BCM2837B0 Cortex-A53 64-bit SoC
- 1GB LPDDR2 SDRAM
- 4 × USB 2.0 ports
- Extended 40-pin GPIO header
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE Gigabit Ethernet over USB 2.0
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In this prototype we use Raspberry Pi because it has a better architecture that includes a Bluetooth Connection and a Wi-Fi module. It is also efficient enough to carry out multiple programs at a time.

4.2 USB CAMERA

Webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks travelling through systems such as the internet, and e-mailed as an attachment.

Fig -3: USB Camera

Specifications

- 3P high quality Lens
- CMOS Image Sensor
- 24 megapixels (Interpolated) high image resolution
- 320x240 30FPS, 640x480 15FPS video resolution
- Automatic white balance with LED light for night vision

4.3 GSM/GPRS MODEM – SIM 800C

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications.

Fig -4: SIM 800C

Specifications

- RS232 interface @ RMC Connector for direct communication with computer or MCU kit
- Quad-band 850/900/1800/1900 MHz
- Configurable baud rate
- SMA connector with GSM Antenna.
- SIM card holder
- GPRS mobile station class B
- Control via AT commands
- Supply voltage range 3.4V ~ 4.4V

5. ADVANTAGES

- It has a faster response time than passive CCTV observation.
- It gives alert to the ambulance service which reduces risk of negligence to a considerable extent.
- It is very cost effective.
- It avoids human negligence which may result in loss of critical time.

6. RESULTS AND OBSERVATION

The alert provided using the message signals is obtained as follows:

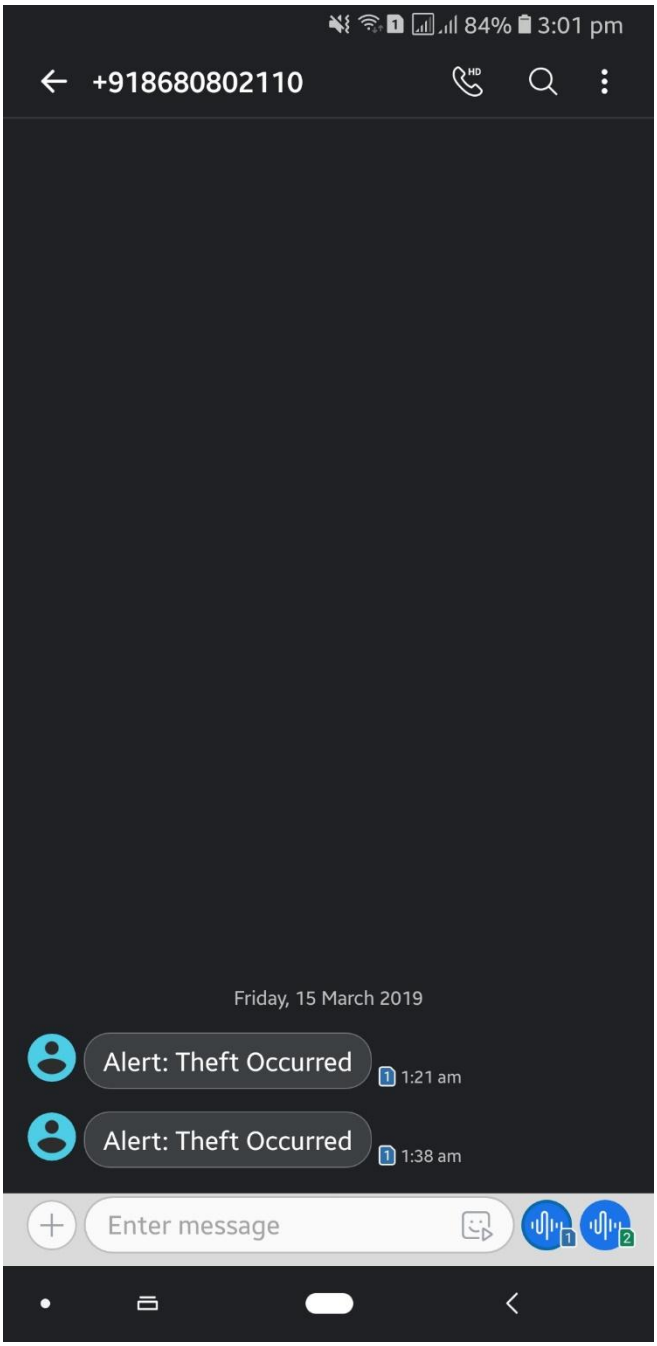

Fig -5: Screenshot of alert message

7. FUTURE SCOPE

- Since the model demonstrated is just a prototype to reduce accidents in roadways it can be improved by including other sensors that will provide data related to the extent of damage.
- The model can be programmed to detect not only accidents, but also other different kinds of scenarios such as murder, theft or vehicle tracking.
- A GPS module can be included in order to send the co-ordinates of the position along with the alert message.

8. CONCLUSION

In this model, we demonstrate event detection for road traffic surveillance videos. This model is tested at various stages of road accidents. Thus, by using this model we can provide a solution for multiple problems taking place in the existing methodology for roadway surveillance. The alert system can be quite beneficial for victims who are in dire need of assistance within the critical time.

9. REFERENCES

[1] Accident Detection with Location and Victim Information Transmission Using Raspberry Pi, Badi Alekhya, S.Aarthi and V.Glory, IJARBEST, March 2017.

[2] Smart Detection and Reporting of Potholes via Image-Processing using Raspberry Pi Microcontroller, Mae M. Garcillanosa, Jian Mikee L. Pacheco, Rowie E. Reyes and Junelle Joy P. San Juan, IEEE, 2018.

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