

Real-time Traffic Sign Detection, Collision Detection and Vehicle Tracking using GPS/GPRS for Smart Automotives

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Abstract— In this project we develop an efficient traffic sign detection, collision detection with GPS facility for tracking the smart automotives. Traffic sign recognition (TSR) is a technology by which vehicle able to recognize the traffic sign put on the road, for example: speed limit or turn ahead. Traffic Sign Recognition tells the driver if he has to stop or if he is speeding. Alternatively, a system is used to detect the accident rate by taking either passive or active measures to deal with upcoming collisions. Collision Detection refers to the computation problem of detecting the intersection of two or more objects. In addition to determine whether two objects have collided, collision detection system calculates the time of impact and report a set of intersecting points. Global positioning system(GPS) tracking is a method of working out exactly something is GPS tracking uses global navigation satellite system(GNSS) network. This network incorporates a range of satellite that uses microwave signal that are transmitted to GPS devices to give the information on location, vehicle speed time and direction.

Keywords— Background Separation Algorithm, General Packet Radio Service, Global Positioning System, Global System for Mobile Communication, Real Time Traffic Sign Detection.

I. INTRODUCTION

Traffic symbols have several distinguishing features that may be used for their detection and identification. They are designed in specific colours and shapes, with the text or symbol in high contrast to the background. Because traffic signs are generally oriented upright and facing the camera, the amount of rotational and geometric distortion is limited.

The concept described in this project report is aimed to detect exact position of collided vehicle by which concern departments or concern persons can rush to the spot for rescue operations. If any accident took place at high ways it is very much essential to pass the information immediately to the concern departments like police department, hospital and ambulance service. If these services are available in time, life of the victims can be saved and hence it is recommended to install this kind of electronic device in each and every vehicle, especially in cars, busses and other public transport vehicles. The integration of GSM & GPS units working together can acquire the vehicle location and information will be passed to the concern mobile phones whose numbers are stored in to the main processing unit designed with Atmel 89C52 microcontroller.

To detect the collided vehicle GPS (Global Positioning System) is used, it is the function of GPS to acquire its global

position through satellites. As this instrument is interfaced with microcontroller at its input side, information in the form longitude and latitude values are transmitted through GSM (Global System for Mobile communications) unit to the concern mobile phones. As the microcontroller is programmed to gather information from GPS and transmit the same to the mobile through GSM, it is called central processing unit. Based on the information gathered from GPS, the controller reads the data and it will be updated, means wherever the vehicle goes its present position data remains the ROM and previous data will be erased. If the processor gets collision signal immediately fresh data stored in the processor will be passed to the cell phone through GSM. The information contains the position of vehicle where accident occurred.

Problem statement for the present work has been derived from the following prospects:

The problem is split into two parts: collision detection and traffic sign detection.

- The car should be capable of reaching the given destination safely and intelligently thus avoiding the risk of human errors.
- Road signs are designed to be easily identified by human drivers and differ based on their shape, colour, icons and text. However, traffic sign classification is made difficult for computers by varying illumination and weather condition, occlusion, and subsets of signs that are similar to each other.

The above aspects make the problem taken up for investigation both stimulating and ambitious.

II. METHODOLOGY

The methodology used for detecting traffic signs is Background Subtraction Algorithm. Background subtraction, also known as foreground detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include image denoising, post processing like morphology etc.) object localization is required which may make use of this technique.

The basic block diagram of object detection procedure is explain in the figure 8.1. The real time image is captured through camera and then using background subtraction algorithm by having a reference background, we can achieve

noisy foreground. This noise can be reduced by applying filtering operation, generally Morphological Operation is carried out in this phase. After obtain connecting region, we can able to find foreground mask and ultimately by applying this mask we can detect and track our object. For real time processing Background subtraction algorithm is well suited.

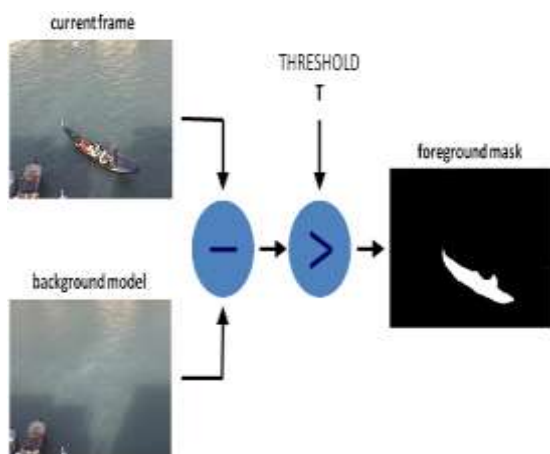


Fig. 1 Example for background subtraction algorithm

As the name suggests, BS calculates the foreground mask performing a subtraction between the current frame and a background model, containing the static part of the scene or, more in general, everything that can be considered as background given the characteristics of the observed scene. Background modeling consists of two main steps:

1. Background Initialization;
2. Background Update.

In the first step, an initial model of the background is computed, while in the second step that model is updated in order to adapt to possible changes in the scene as shown in figure 1.

III. IMPLEMENTATION

The design and implementation of the proposed system is done in three steps and is described in the figure 4.1

1. Traffic Sign detection module
2. Collision detection module
3. Vehicle tracking using GSM/GPRS and GPS module

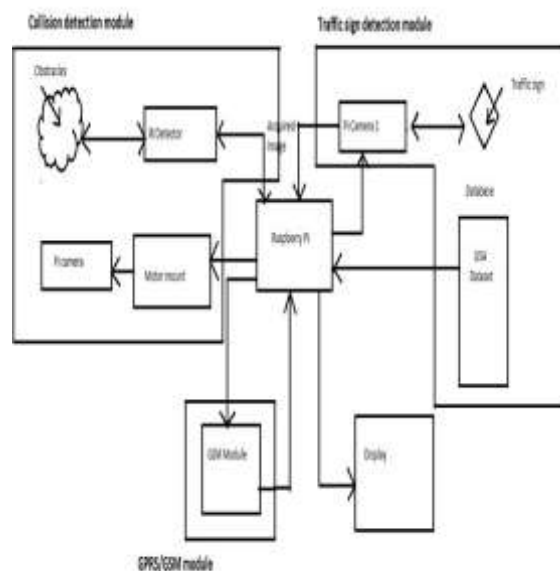


Fig. 2 Proposed System

A. Traffic Sign Detection Module:

Pi camera1: The raspberry pi camera module can be used to take high definition video, as well as stills photographs. It easy to use for beginners, but has plenty to offer advanced users, If you are looking to expand your knowledge, you will want to know that the module has a five megapixels fixed-focus supports 1080p30, 720p60 & VGA90 video modes, as well as still capture mode.

Database (LISA dataset): The dataset is in the large amount that would become unmanageable in spreadsheet, and we want to maintain records for ongoing use. It is subjected to many changes and the report is generated based on the information. Database is a collection of data that is related to a particular topic or purpose. LISA dataset will include all the traffic sign that are present, and then it will get compared to the captured image.

B. Collision detection Module:

IR DETECTOR: it is a detector that reacts to infrared(IR) radiation. The main types of detectors are thermal and photonic. The thermal effects of the many temperature dependant phenomena Borometer and microbrometers are based on changes in resistance.

MOTOR MOUNT: Motor mount acts like a rotator motor which will rotate at 360⁰ and will indicate if there is an obstacle or if there are any chances of collision components are not implemented by platform-specific code. Instead, they are written entirely in Java and therefore are platform-independent.

C. Text Font of Entire Document Vehicle Tracking using GSM/GPRS Module:

It is used to establish communication between a computer and a GSM-GPRS system GSM architecture used for mobile communication in most of the country. GPRS is an extension of GSM that enables higher transmission rate.GSM/GPRS

module consists of GSM/GPRS modem assembled together with proper supply circuit and communication interface.



Fig. 3 Implementation of Proposed System

IV. RESULTS

Vehicle tracking using GSM/GPRS and GPS module Results for traffic sign detection using background subtraction algorithm. Original image captured from the Pi Camera and the Background subtracted and extracted image is shown in the below figure 4.



Fig. 4 Image Extracted

Result for collision detection is that the message is sent to the user about where of the accident occurred. This can be shown in the below figure.

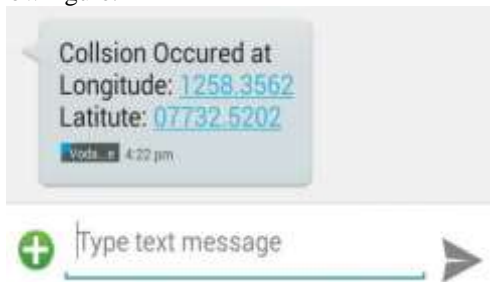


Fig. 5 Testing of collision detection and Vehicle Tracking

V. CONCLUSION

The proposed system plays an important role in real time tracking and monitoring of vehicle and also provides safety and secure solution to the traveller using sensors. Whenever

there is vehicle theft situation or vehicle's accident situation occurs, the proposed system provides the vehicle's current location, speed to the vehicle owner's mobile. Hence this benefits to track the vehicle as early as possible. In certain situations as per student's safety concern the proposed system given a provision of alert message on student parent's mobile which also plays an important role.

We also developed a driver assistant system, to detect the obstacles in the path using IR sensor and alert the driver to prevent accident. In this work, the in-vehicle device is composed of a microcontroller and GPS/GSM/GPRS module to acquire the vehicle's location information and transmit it to user or emergency help-centers through GSM for intimating immediate medication for the accident victims.

More over this is an integrated system where Traffic Sign Detection and Collision Detection and vehicle tracking using GSM/GPRS module both are combined into single system on Raspberry Pi which makes it more advantageous over other systems.

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