A WIRELESS NETWORK BASED LANE DEPARTURE WARNING AND SELF AUTOMATED SYSTEM USING IMAGE PROCESSING

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Abstract : Life of human is very valuable. But now a day's without their faults, most of them losing their life due to accidents that occur in highways. In India, the rate of occurrence of accidents are increasing day by day. It can be due to environmental conditions, driver carelessness or due to fatigue. This might be a serious problem and care should be taken to overcome accidents. Therefore, this work represents a technique based on video and image processing that is mainly used to detect lanes and to reduce accidents that mainly occur due to lane departure. For lane detection, here Hough Transform algorithm is used. If the vehicle moves out of the lane then warning will be sent to the driver and also to the AVR Microcontroller via ZIG Bee Transceiver. If the driver doesn't take any action at that instant, then Microcontroller control system will take action immediately. So that we can save the driver.

***IndexTerms* – Lane Departure, Arduino, Hough Transform, Image processing**

I. INTRODUCTION

1.1Lane Departure Warning System

Crossing the lane causes about 50% of all accidents in the high ways and most of these accidents and crashes occurs only due to careless of a Human. Road Transport report says that, each minute India is facing at least one road accident which demand for one life in each 3.7 minutes. Driver assisting systems are one which are mainly designed to find in advance these dangerous situations and also inform the driver about the condition and even if the driver won't take action immediately, then the system will take a correct decision at that time. Lane Departure Warning System (LDWS) is one such latest technology used now a days and it is mainly used for warning the driver when he crosses the lane. A Lane is a part or line in the road ways which is mainly designed for movement of a single vehicle as shown in figure 1. In a road there will be two lines with different colors to differentiate the vehicles. When driver crosses a particular lane due to driver inattention, drowsiness or any hardware system problems, then this Lane Departure Warning System will alert the driver giving alarm or a Beep sound. If the driver won't take the correct actions at that instant of time, then the system will take actions immediately. So that occurrence of accidents can be minimized. Compared to Other technologies the proposed system will be the better solution to avoid accidents due to low cost and also high reliability.

Fig.1 Different pattern of lines on road

1.2Obstacle Detection

Most of the time accidents occurs due to crashes also. That is vehicle moving in the same route can hit the other vehicle. Therefore there should be a driver assisting system to control the speed of the vehicle, if necessary. And also if a human being

unnecessarily crosses the road, then there will be a situation that vehicle can hit that person. Ultrasonic Transceivers are used for all this obstacle detection. This system run on a single board which can be easily placed on the vehicle with left, right, back and front detection. This can be implemented using Arduino and Ultrasonic Sensors. The main purpose of all these systems is to alert the driver and also to avoid traffic collisions.

1.3Device Implementation

Lane Departure Warning System is implemented using MATLAB software running through prerecorded video with a monitoring window displayed in PC. A dedicated computer system which is designed to perform a specific task is called as an Embedded Systems. The Embedded systems are not like general purpose computers, which is embedded to manage a wide range of processing tasks. In Industrial Automation, Home appliances, Aeronautics, Automobiles etc. technology used will be Embedded System. System implementation is embedded in to a single on chip board called a AVR Microcontrollers. The AVR microcontroller is heart of the project. It is 10 times speed is faster than 8051 microcontroller & 4-times faster than PIC microcontroller. Lane departure is detected when vehicle position with respect to lane position is calculated.

II. LITERATURE SURVEY

This section details the research made into the subject matter of the project. It gives a brief description of some of the various technologies used in current systems of road vehicles. It also lists some of the more advanced technologies that may have an application in these systems. Similar systems already implemented in consumer vehicles vary from the relatively simple, like a system by Citroen, to the complex, as in Mercedes system. Many other automobile manufactures have similar systems on the market or in development. Since the technology is still in the early stages of implementation, many of these systems are rather expensive. Because of these, manufacturers have only utilized these systems in their higher-end vehicle models. This is the case with nearly any new automotive technology when it comes on the consumer market for the first time. Previously, satellite navigation, air bags, seatbelt pre-tensioners, and various other technologies were only available to consumers who bought the highest-end model of vehicle. Now that these technologies have matured somewhat, the cost has dropped considerably. Nearly every manufacturer has these as standard in the most basic of models or as an affordable extra. Once thee technologies start to become mass-produced, competition drives down the cost considerably. Therefore, it is reasonable to assume that “driver assistance” systems will be available in most consumer vehicles in only a few years’ time.

Warning system can be implemented using image and video processing. Lane detection unit and Decision making warning unit are the two components considered in this paper. Here, Hough Transform algorithm is considered to take a decision. From the center of the images, system will measure the distance of both the lanes. The distance measured will be compared with the predefined threshold value. If the measured distance is greater than threshold value, then Lane departure was occurred. Once the lane was detected, the system will inform the driver by displaying a warning message. MATLAB is used to test the algorithm[1].

In [2], system with image processing is used to assist the driver. Algorithm used is the Region Of Interest (ROI).The desired object in particular area is selected by ROI. Then to find the Lane marks, Edge detection technique is used. Lane positions can be calculated by Hough Transform. Image processing is efficient to detect left or right lane departures and MATLAB is used for simulation process.

III. PROPOSED METHODOLOGY

This Chapter gives the details of various system associated in Lane departure warning and obstacle detection system with relevant block diagrams and working of the system. This system consists of mainly two section one is lane departure detection section and another one is vehicle section.

3.1Block Diagram Of Lane Departure Warning And Obstacle Detection System

The proposed work consists of motor driver circuit, zig bee transceiver, buzzer, ultrasonic sensor and microcontroller and system interface block diagram is shown in fig 2.

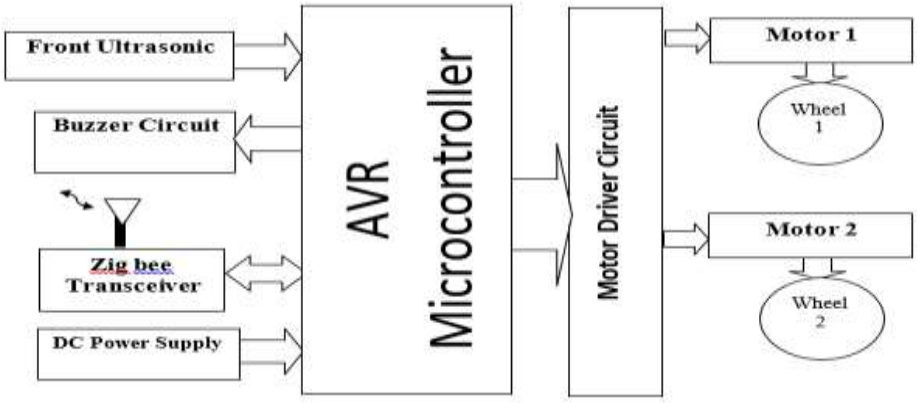

Fig.2 Block diagram of vehicle section

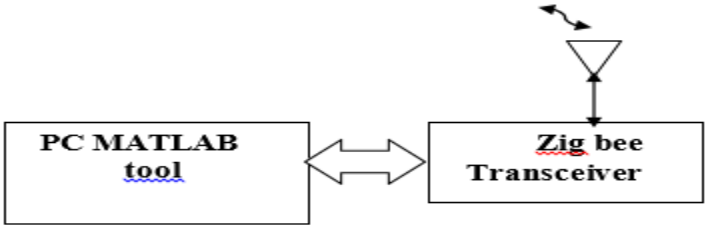

Fig.3 Block diagram of Lane Departure Detection section

Basic design diagram of Lane departure Detection section is shown in the figure 3.2. It consists of PC and Zig bee wireless transceiver module. In PC, MATLAB tool is used to detect lane departure. MATLAB read the data from video of lane departure. When lane departure is detect, MATLAB send the warning command to zig bee wireless transceiver module and this warning message is received at vehicle section where zig bee transceiver is placed for vehicle warning alert purpose. Also in front of the vehicle the ultrasonic obstacle detection is interfaced which detects all vehicles or obstacles & send that alert message to the microcontroller which is placed in vehicle near to driver place. After receiving the message from ultrasonic the buzzer will produces beep sound.

A transducer which converts ultrasound waves to electrical signals is called Ultrasonic transducer. Since it performs both transmission and reception of the signal, it is also called as Ultrasonic Transceiver. These devices works as RADAR and Sonar systems. Front side objects can be detected by using Front side Ultrasonic Transceivers.

AVR Microcontroller is heart of the project. Embedded C language is used to do the programming. AVR stands for Advanced Virtual RISC machine. In 1996, Atmel developed 8 bit Harvard architecture based AVR Microcontroller. At that time all other microcontrollers are using one- time programmable ROM, EPROM, EEPROM techniques for program storage. But AVR was the first where on-chip flash memory is used for storage of program.

In AVR microcontrollers, execution of instructions will be done in single cycle. AVR's are 4 times faster than PICs and it is operated in different power saving modes and it is very efficient due to consumption of less power.

A wireless technology which is specially designed for sensors and control devices are called ZigBee Technology. This technology was mainly developed to achieve low-cost, low-power wireless Machine 2 Machine, IOT networks. ZigBee technology is based on IEEE standard 802.15.4 and it is unlicensed one & it performs in 2.4GHz ISM band (Industrial, Scientific, and Medical).

Motor switching and Driver circuits are used to drive the motor. Switching circuit used provides efficient switching and relay board is used to run the motor. An electrically operated switch is called a Relay. Electromagnet is the heart of a relay and it is nothing but a coil of wire that becomes a temporary magnet when current is passed through it.

An electrical device such as a Door bell that is used to make a buzzing sound is called a Buzzer. It is also called a Beeper. Buzzers can be of 3 different types namely Electromechanical, Mechanical and Piezoelectric. This Buzzer is mainly used as alarm to alert human being.

An electrical device which carries electric power to an electrical load is called a Power supply. Sometimes power supply is also called as Electric power converters because it mainly converts one form of energy to another one. Normally 5V and 12V power supplies are used.

3.2Flow Diagram To Detect Lane Departure

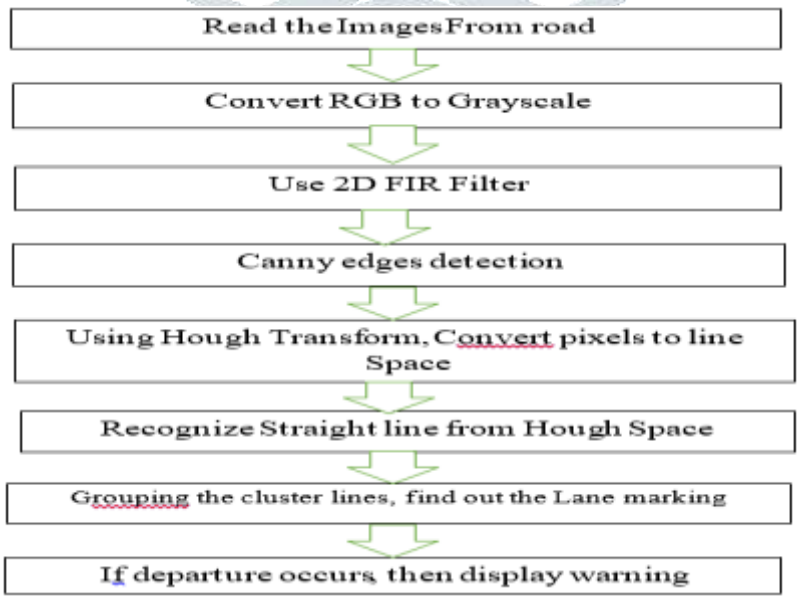

Fig.4 Lane departure detection Flow diagram

Step 1: Image conversion from RGB to Grayscale:

Initially the image taken from the road is converted from RGB to Grayscale by removing the shades. It can be done by generating the weighted sum of three intensity(R, G and B) values:

$$Y=0.299*R+0.587*G+0.114*B$$

Step 2: Process of Filtering:

After conversion, the step is to eliminate the noise within the image. The image is passed through the 2-D FIR filter to remove noise.

Step 3: Selection of ROI:

ROI (Region of Interest) is used to detect the selected areas and then it is processed in the next level. These selected ROI images are used by proposed algorithm for detection of lanes. ROI reduces the frames processing time.

Step 4: Detection of Edges:

In this work, the important features to be detected will be the Edges. There are so many edge identification algorithms namely Canny, Sobel, Robert, Prewitt etc. In this, canny edge detection algorithm is used. Edge detection is used to generate a binary image that provides information about segmentation of the original image.

Step 4: Hough Transform:

Hough Transform is an incredible tool that is mainly used to identify lines. It is a feature extraction technique used in digital image processing. The following steps are used in an algorithm for detecting straight line:

- Initially detect the edges using Canny Edge Detector.
- Next match the edge points in to the Hough space and stored in an accumulator.
- Interpretation of accumulator is done by thresholding to yield lines of infinite length.
- Finally convert infinite to finite lines.

Step 5: Lane Departure Warning:

Hough transform detects many straight lines, out of which longest one in the Hough Space was selected and then lane marking will be done and if the vehicle moves out of this lane then Lane departure warning will be given to the driver.

IV. RESULTS

Fig.5 Images captured using MATLAB

VI. CONCLUSION

The design and implementation of Lane Departure Warning (LDW) is responsible for detecting involuntary lane departures by monitoring the lane lines. This lane detection is implemented on MATLAB image processing with zig bee wireless data transmission to the Arduino Microcontroller development board with driver monitoring section. This component gives audio alerts or produces beep sound on detection of abnormal lane departures. Hence, accidents can be minimized by controlling the speed of

the vehicle. In Arduino Microcontroller development board ATMEGA-328 IC is used it is reprogrammable in the future we enhance it for more number of applications.

REFERENCES

[1] K. Sravanthi, and Mrs. Ch. Padmashree, 2016, Vol. No. 12, Issue No. I, July-Lane departure warning system for vehicle safety
[2] Sujai T George Jacob1 and C Senthil Singh, International Journal of Emerging Trends in Engineering and Development, Issue 4, Vol.2 (March 2014) - Novel Vision based Lane Departure Warning System for Vehicle Safety
[3] HamdiYalınYalıç, Ali SeydiKeçeli, and Aydın Kaya, International Journal of Electrical Energy, Vol. 1, No. 3, September 2013 - On-Board Driver Assistance System for Lane Departure Warning and Vehicle Detection
[4] Pravin T. Mandlik and Prof A. B. Deshmukh, International Journal of Engineering Research & Technology (IJERT), Vol. 5 Issue 06, June-2016- Raspberry-Pi Based Real Time Lane Departure Warning System using Image Processing