AN ADVANCED METHOD FOR DETECTING ROAD TRAFFIC SIGNS USING IOT DEVICES.

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ABSTRACT

Usually there are many symbols related to driving on the roads. In that few of them are important and few of them are negligible. By considering this factor we are going to propose a novel approach to detect traffic signs or signal in real-time basis. Generally to recognize a symbol beside road using a digital process we have to consider two major things which are vehicle speed and sign distance. The proposed novel approach is going to use the PIR sensor to detect the traffic signs which are present at long distance. The output is going to generate an intelligent voice command to enlarge or to give an alert to the person who is driving the vehicle. This novel approach focuses on gathering and analyzing the traffic signs to generate an appropriate alert message to the driver by processing the directions of the symbols and indications. To do this the image processing techniques like Canny edge detection and Gaussian filter will help with analysis of the signs which are gathered by photographic cameras.

Keywords: *PIR sensor, Long distance, Traffic sign, alert message.*

I. INTRODUCTION

The implementation of an advanced driving system by detecting traffic symbols will always help to improve the efficiency of smart driving. This detection process will always try to give the best performance of driving by reducing the man made mistakes in a frequent manner. Usually the traffic symbols in India have lots of symbols on both national and regional roadways. In that few of them are easily understandable by the human to take quick decisions, this process changing their driving attitude. Apart from this most of the traffic symbols are very hard to detect and analyze by a layman. This is the one of the reason the accident rate has been drastically increased from the past two decades.

Traffic symbols and signals are one of the most important indications on the roads. Every person who drives the vehicles on the road they must require the knowledge on road safety and conditions methods and road signal indicating symbols. This traffic symbols has provided the information about

road condition a heady. The road condition like major crossroads, prediction crossing area, school zone, direction of the road and junctions warn and guide the driver and make sure smooth driving on road & traffic. If drivers of unaware of this road signs it can lead to the loss of their valuable life's and properties. A person is supposed to get the knowledge about road traffic symbols and signs before getting the driving license (LLR/ Driving Test) in India. Hence, to avoid this kind of problems and improve smart driving for take quick decision with any mistake. There is many types of traffic symbols, every symbol, ithas some specified indication of the road condition a head. When a vehicle driver is in driving mode he/she which are following this all road signs to avoid the accidents.

ABOUT TRAFFIC SIGNS:

Tab1: List of Road Traffic Symbols

ROAD TRAFFIC SYMBOL	SYMBOL DETAILS
	STOP This Sign is used on roadways where traffic is required to stop before entering a major road.
	GIVE WAY This Sign is used to assign right- of – way to traffic on certain roadways.
	PROHIBITED SIGNS A sign marks with that particular red line are called prohibited signs.
	ONE WAY One- Way sign specifies that the traffic moves in a single direction and you may not go this way.
	HORN PROHIBITED The sounding of the horn is not allowed, near hospitals and in silence zones.
	NO RIGHT TURN Vehicles are not allowed to make a turn to the right.
	NO LEFT TURN Vehicles are not allowed to make a turn to the left.
	OVERTAKING PROHIBITED Sight distance is restricted and overtaking will be dangerous.

		ALL MOTOR VEHICLES PROHIBITED This sign is used at places where entry to all types of motor vehicles is prohibited.
		COMPULSORY AHEAD This sign indicates that the vehicle is only permitted to proceed ahead.
		RIGHT/LEFT HAND CURVE The sign is used where the direction of alignment changes. The sign forewarns the driver to reduce the speed and proceed cautiously along the road.
		NARROW ROAD The sign is normally found in rural areas where a sudden reaction in width of pavement causes a danger to traffic.
		NARROW BRIDGE This sign is erected on roads in advance of bridges where the clear width between curbs or wheel guards is less than normal width of the carriageway.
		CROSS ROAD The sign is displayed in advance of cross road where sufficiently large volume of crossing or entering traffic with restricted sight distance is likely to constitute a hazard.
		SPEED LIMIT The sign is erected at the beginning of the area covered by speed restriction, with numerals indicating the speed in kilometer per hour.
		COMPULSORY KEEP LEFT This sign indicates that the vehicles are obliged to keep left only.
		ROUND ABOUT This sign is used where it is necessary to indicate the approach to a roundabout.

To avoid the problems in the human analytics of the traffic symbols, the proposed method provides an automated and efficient traffic symbol detection and analysis system by using the latest technology called Internet of Things (IoT).

The above diagram shows various kinds of road symbols their giving specified indication and functionality.

II. LITERATURE SURVEY

Lot of research work focuses on ideogram-based road signs recognitions in real time scenario. In the paper[1], the authors proposed a multiple wireless vehicle sensor network for identification, classification and direction of vehicle travel on two lane road. Higher prediction results are achieved based on software-based classifier. Each vehicle make use of multiple sensors like magnetometer, accelerometer, infrared and acoustic microphone with a two-node structure for cooperative monitoring.

The authors[2] proposed a system for an effective detection and recognition of traffic symbols. Candidate regions are detected as MSERs. This detection method is significantly insensitive to variations in illumination and lighting conditions. Traffic symbols are recognized using HOG features and a cascade of linear SVM classifiers. The system produces an accurate results under suitable weather conditions and at nominal speed limit of vehicles. The system runs approximately 20 frames per second and able to identify all classes of traffic symbols present on a sign database.

J. Mathias et al[3] proposed a novel method for wide-baseline matching. Three novelties

such as MSERS, matching of local features and usage of multiple scaled measurement regions. Are used as a robust similarity measure for establishing tentative correspondences.

The authors in paper[4] developed a road sign recognition method. Based on relative location against camera, climatic conditions of weather and day time it alters its shape and color using Scale Invariant Feature Transform (SIFT). In this paper, to reduce the SIFT cost detection extraction of region is done and for traffic recognition the Bags of Features method is applied. Also authors used support vector machine (SVM) approach for recognition phase.

The authors[5] proposed a system for automatic detection of road signs detection and recognition of unmanned vehicles for urban survivellance and rescue. It is a multi-layered hierarchical scheme composed of 3 parts: road sign color segmentation, shape recognition, and classification based on the Principle Component Analysis. This paper majorly focuses on red and yellow road signs of USA. The authors combine the PCA with other classifier methods for sign recognition and to improve the classification accuracy.

III. METHODOLOGY

Raspberry Pi compared to Arduino is more powerful in terms of the computation and processing. Additionally, it has the better memory capacity. Also, it can integrate different types of sensors and actuators and this port is more attractive when compared to similar kind of feature inArduino.

***Fig1:** Raspberry Pi Motherboard*

There are two different types of sensor integration in Raspberry Pi and due to this feature it can process more when compared to Arduino.It has better processing and more features and so on. This is particularly attractive for sensors which require more processing, for example, imaging sensors, multimedia sensors, these sorts of devices are more useful.

In the same way Arduino based out node here also using Raspberry Pi *has shown*

Fig1 can be used in this design. Raspberry Pi inbuilt IoT node will be ideal. Additionally, it is better, but more costly. The cost of purchasing Raspberry Pi is more than the cost of Arduino in general, so there is a tradeoffapproach.

- The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse.

- It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

- It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

- What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infrared cameras.

- Raspberry Pi is being, used by kids all over the world to learn to program and understand how computers work.

Specification:

Key Features	Raspberry Pi 3	Raspberry Pi 2	Raspberry Pi 0
RAM	1 GB SD RAM	1 GB SD RAM	512 MB
CPU	Quad cortex A53@1.2 GHZ	Quad cortex A53@900 MHZ	ARM 11 @ 1 GHZ
GPU	400 MHZ Video core IV	250 MHz Video core IV	250 MHz Video core IV
Ethernet	10/100	10/100	None
Wireless	802.11/ Bluetooth 4.0	802.11/ Bluetooth 4.0	802.11/ Bluetooth 4.0
Video input	HDMI/COMPOSITE	HDMI/COMPOSITE	HDMI/COMPOSITE
GPIO	40	40	40

Fig2: Raspberry Pi Specifications

3.1 Raspberry Pi Installation

First of all a keyboard and mouse with a LAN cable is made available with connections to the Ethernet port. A small monitor with power supply through HDMI cable Raspberry Pi in the HDMI port one all required. Plug-in the power supply *Fig3* for the Raspberry Pi and check for memory card.Pay attention to the screen booting, start. Once it is booted GUI base interface may get one terminal. Start menu option and access various programming languages, internet options and setup VNC server. Once the Ethernet cable is plugged it is shares one IP. This IP will be required to remotely access PC. Best practices, go to terminal. The default name **Raspberry Pi**distribution is Pi & PWD: **Raspberry.**On giving a command IP Config appear various interfaces can be located.

Fig3: Breadboard Connection

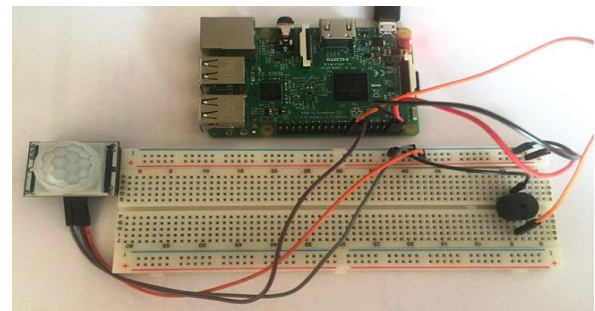### 3.2 PIR Sensor

It has the capability to detect the symbols and signs. PIR shown in *figure 4* is a very important module used to build many methods of detecting symbols or signs. It is called passive because it receives infrared, not release. Normally PIR sensor detects any change; its output PIN becomes high. They are also referred as pyroelectric or IP motion sensors.

Fig.4. PIR Senor

There are two types of infrared (IR) detectors; they are the active and passive type detectors.

Active infrared sensors operate by transmitting energy from either a light emitting diode (LED) or a laser diode. A passive infrared system detects energy emitted by objects in the field of view and may use signal processing algorithms to extract the desired information. All objects emit some form of energy, which is in the form of heat or thermal radiation, this radiation most often falls in the infrared spectrum. This radiation cannot be seen by the naked eye, but can be detected by an infrared sensor that accepts and interprets it. An experimental infrared optical system has been designed to detect and monitor vehicle road traffic.

It has been identified every object emits some amount of infrared when identifies the symbol. PIR sensors can detect small amount of variation in infrared. Whenever an object goes through the sensor range, it produces infrared because of the friction between air and Object, and gets detected by PIR.

The main component of PIR sensor is Pyroelectric sensor same register, capacitors and other components used to build a PIR Sensor. Pyroelectric sensor comprises two halves when there is no motion, both halves remain in the same state, means both sensors the same level of infrared. As soon as some symbols are identifying first half, the infrared level of one half becomes greater than another, and this causes PIR Sensors to react and makes the output pin high.

PIR takes some time to stable itself according to surrounding conditions, so symbols and signs can be randomly found between 10-30 seconds. This PIR sensor connects to the Raspberry Pi through 3 female to female jumper wires in PIR sensor connection one is VCC, second one is OUT, third one GND it is connected Raspberry Pi board.
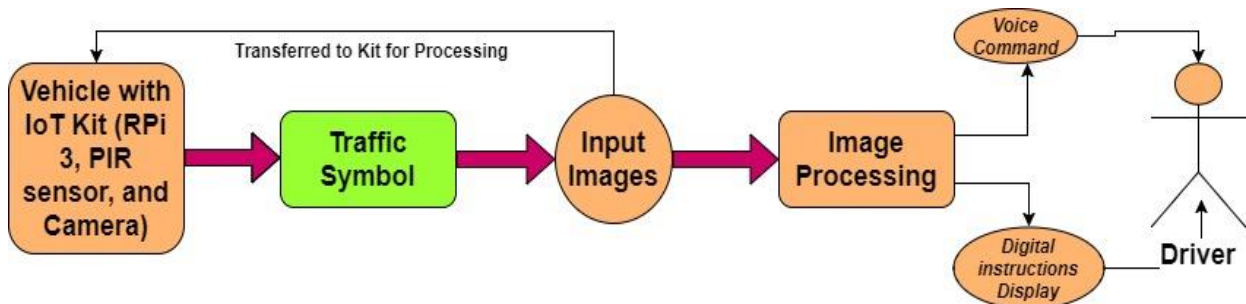
IV. IMPLEMENTATION PROCEDURE

Fig5: *Systematic approach for road traffic Symbol detection.*

Every vehicle which we need to equip with the tracking system should contain the Raspberry Pi board, a digital camera and PIR sensor detect the physical objects *represent Fig5*. Once an object has been detected by the PIR sensor, immediately it will send the signals to activate the camera which were equipped in the moving vehicle the camera gets activated after the initiation of the PIR sensor and it will take the image of the symbols which showing the direction (or) indication.

That image can be given to an image processing system or algorithm called OpenCV to categorize the type of symbol. Once we got the output from the image processing system, then we transfer that into an analytical Display/ Navigation screen display device or an audio device to give the immediate instruction to the user.After getting the output from either the voice device or a display device, the driver or use can take the action against the instruction. This complete procedure by reducing the complexity in analyzing the traffic signs by the peoples and increase the decision taking capacity of the driver.

Few problems are still to be addressed in this approach are the distance between the road traffic sign and vehicle and speed of the vehicle by taking these two into consideration we have to work on the existing approach to improve accuracy.

V. CONCLUSION

Humans are unable to recognize or read the traffic symbols or signals manually due to their speed and distance parameters and also unable to focus much on the traffic symbols. Hence, to avoid these problems we proposed a novel approach for automated detection of traffic symbols on a 4-wheeler navigation screen.

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