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Vehicle Automation Using Artificial Neural Network

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***Abstract*—Research on autonomous vehicles is now progressing at a high peak and many organizations have started doing research on it. The leading technology giants like Google & Tesla have done many researches successfully and succeeded in most of the scenarios. This project focus on reducing the number of complex hardware and making an RC Car to detect the obstacles, traffic sign board and traffic signals effectively using artificial neural network.**

***Keywords*—Artificial neural network, OpenCV, Object detection**

I.INTRODUCTION

Artificial neural network is similar to biological neural network which constitutes of neurons interconnected with each other. These neurons will receiveprocess and transmit information through its networked connection. The neural network will perform better when it is trained with more number of data gathered in several scenarios.

A. Existing System

The existing automation system consists of complex interconnected circuits made up of different microcontrollers, which leads to reduction in performance.

Drawbacks of existing system:

- More hardware requirement
- Low performance

B. Literature Survey

Umar Farooq, Muhammad Amar, Muhammad UsmanAsad, AtharHanif and Syed Omar Saleh proposed a framework which can be made smart with the assistance of two multilayer feed forward neural system controllers in particular Hurdle Avoidance Controller and Goal Reaching Controller with back blunder spread as the preparation algorithm.[1][2][3][4].The movement sign sheets are distinguished utilizing the framework created by

Hengliang Luo, Yi Yang, Bei Tong, Fuchao Wu and Bin Fan which comprise of three phases, activity sign districts of intrigue (ROIs) extraction, ROIs refinement and characterization, and post-processing[5][6] and movement lights identification by a self-ruling vehicle is an uncommon instance of recognition since it is imperative for the self-sufficient vehicle to take decision.Andr'es E. G'omez; Francisco A. R. Alencar; Paulo V. Prado; Fernando S. Os'orio; Denis F. Wolf proposes a technique which includes fake neural system strategy to perceive the movement light[7][8][9][10].

II PROPOSED SYSTEM

The proposed system make use of latest microprocessor based Raspberry Pi and the microcontroller based Arduino which will increase the performance. In this project we have implemented feed forward artificial neural network method to make a vehicle (RC Car) to detect obtacles & traffic signs and signals on its own

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based on trained data gathered using Raspberry pi, Arduino and ultrasonic distance sensor.

Fig. 1 Proposed System Architecture

A. Materials and methods

1)Raspberry Pi 3: The Raspberry Pi (Fig. 2) is a little single-board computer created by Raspberry Pi establishment. It comprise of Quad Core 1.2GHz Broadcom 64bit CPU, 1GB RAM, 40-stick expanded GPIO, CSI camera port for interfacing a Raspberry Pi camera, Wi-Fi, Bluetooth and other fundamental I/O ports which an ordinary PC gives.

Fig. 2 Raspberry Pi 3

2) Arduino: Arduino Uno (Fig. 3) is a microcontroller board in view of the ATmega328P. It has 14 computerized input/yield pins (of which 6 can be utilized as PWM yields), 6 simple information sources, a 16 zzMHz quartz precious stone, a USB association, a power jack, an ICSP header and a reset catch.

Fig. 3 Arduino Uno

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3) Ultrasonic sensor: A Ultrasonic sensor (Fig. 4) is a gadget that can gauge the separation to a protest by utilizing sound waves. It apportions separate by sending a sound wave at a particular recurrence and tuning in for that sound wave to bob back.

Fig. 4 Ultrasonic Sensor

4) Camera module: : It is a picture sensor coordinated with a focal point, control electronics. This is a great shading CMOS camera module (Fig. 5).

Fig. 5 Camera Module

5) Relay: Transfers (Fig. 6) are switches that open and close circuits electromechanically. Transfers control electrical circuit by opening and shutting contacts in circuits.

Fig. 6 Relay

III. SYSTEM DESIGN

The framework is isolated into three subsystems to be specific info unit (camera, ultrasonic sensors), preparing unit (Raspberry Pi and Arduino) and remote control (RC) auto control unit.

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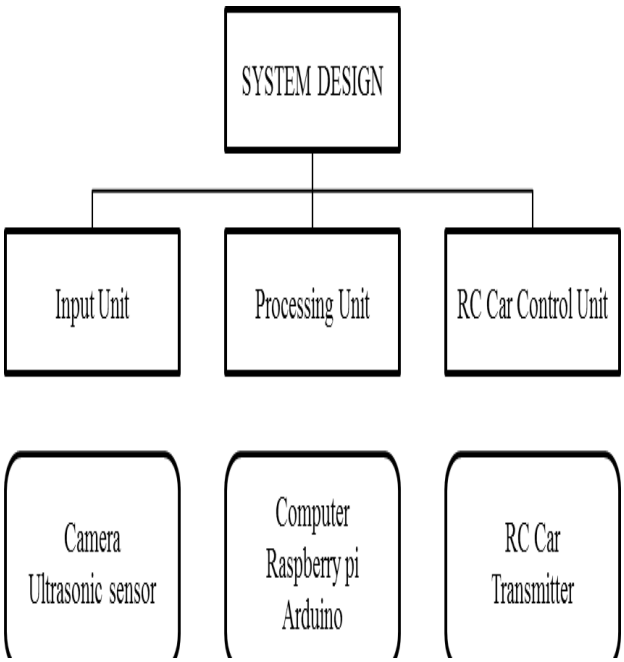

Fig.7 System Design

A. Input Unit

Raspberry Pi's camera module and ultrasonic sensors are connected with raspberry pi and arduino. Video feed from camera is coverted into series of images. Ultrasonic sensors will detect the obstacles on its path.

B. Processing Unit

Raspberry Pi will analyze the captured series of images with the trained image sets and arduino will check whether the distance from the obstacle is less than the specified safety distance. Both Raspberry Pi and arduino will control a relay, which is connected with RC car's remote.

Neural network:

A multithreaded python program keeps running on the Raspberry pi to get picture outlines from the camera module. Picture outlines are changed over to dim scale design and are decoded into numpy exhibits.

One preferred standpoint of utilizing neural system is that once we prepare the system, parameters are to be looked at thereafter, in this manner expectation can be quick. Just some piece of the picture input is utilized for preparing and forecast purposes. There are 36,300 (330×110) hubs in the info layer and 33 hubs in the hidden layer. The quantity of hubs in the mystery shrouded layer is picked genuinely discretionary. The output layer is used to provide the traffic signal/sign pattern. The neural network pattern is shown in Fig. 8, which has above mentioned layers and nodes.

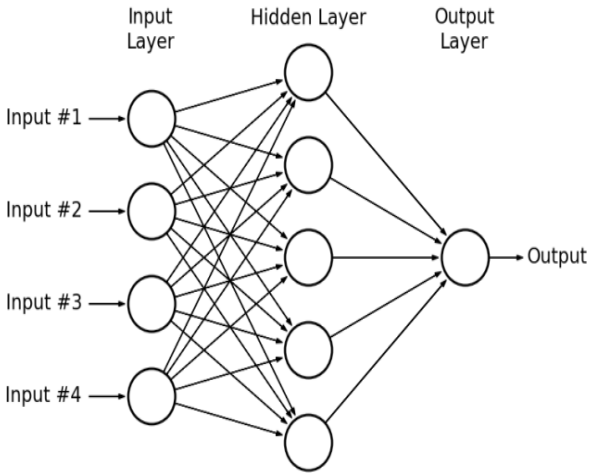

Fig. 8Neural Network Pattern

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The training image frames which are converted into numpy arrays are compared with the live input feed.The feed forward neural network is trained with OpenCV using back propagation as the training algorithm. After training, the weights are saved into a xml file.

Traffic sign and signal detection:

The traffic signal (Fig. 9) and sign (Fig. 10) is identified with the help of above mentioned neural network method which is combined with the image processing techniques. OpenCV act as trainer and also detector. True and false samples are equally loaded into the Raspberry Pi which is used to analyze the environment using neural network.

OpenCV:

OpenCV is a library of programming capacities primarily went for constant PC vision. OpenCV was intended for computational effectiveness and with a solid spotlight on continuous applications.

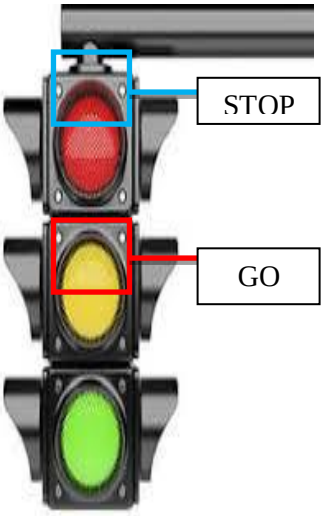

Fig.9 Sample Traffic Light

Fig.10 Sample Traffic Signs

Monocular vision:

Monocular vision (Fig. 11) is a type of computer vision technique using which we can achieve increased field of view. As the field of view is increased it is easy to capture the traffic signal and signs.

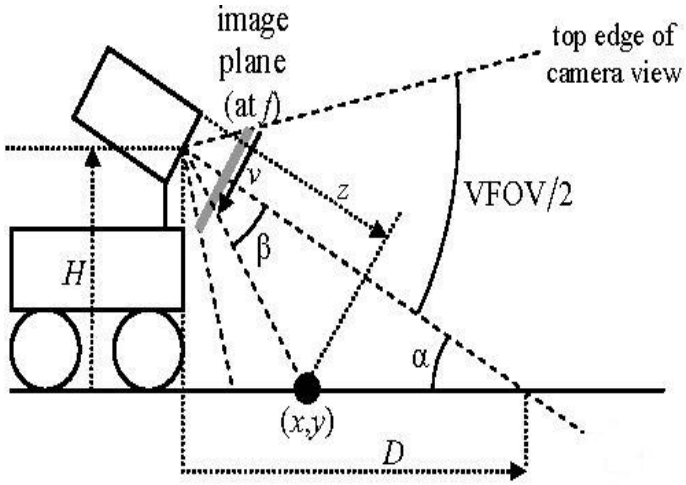

Fig.11 Monocular Vision

Obstacle Detection:

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The obstacles on the path are detected using the ultrasonic sensor. Trig pin emit sound waves, which will be reflected back from the obstacle and sensed by echo pin (Fig.12). Time taken for the sound wave to travel to and from the object will be used to calculate the distance of the object.

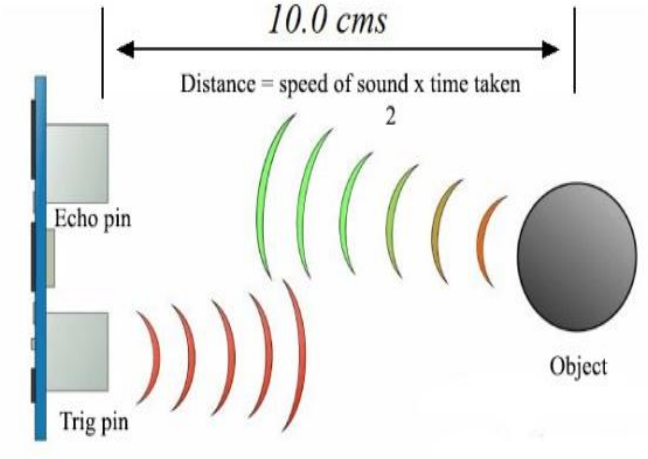

Fig.12 Obstacle Detection

C. RC Car Control Unit

RC car is controlled using a transmitter(remote) which is connected with relay.

IV. EXPERIMENTS AND RESULTS

1) Using the ultrasonic sensorthe obstacle on the RC car's path is detected.

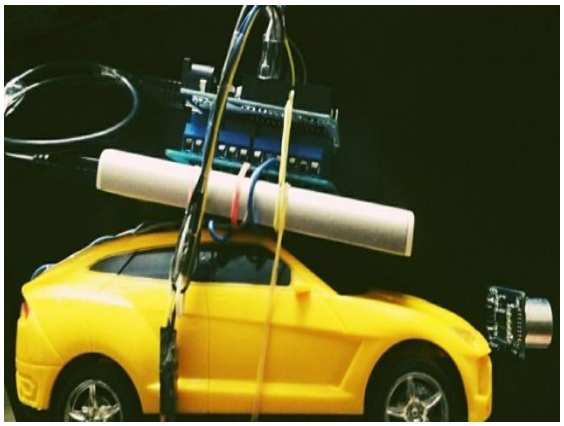

Fig. 13 Obstacle Detection Module Fitted In RC Car

*2)*Using the camera module the traffic signal and signs will be detected.

Fig. 14 Traffic Signal and Sign Detection Module Fitted In RC Car

V. CONCLUSION

Using this proposedsystem the vehicle will be able to detect the obstacles and traffic signal and signs automatically on its path and control it accordingly.

REFERENCES:

[1] Umar Farooq, Muhammad Amar, Muhammad UsmanAsad, AtharHanif, and Syed Omar Saleh - "Design and Implementation of Neural Network Based Controller for Mobile Robot Navigation in Unknown Environments" (IJCEE-2014)

[2]U.Farooq, M.Amar, E.ulHaq, M.U.Asad, and H.M.Atiq -"Microcontroller based neural network controlled low cost autonomous vehicle" (ICMlLC-2014)

[3]U.Farooq, M.Amar, K. M. Hasan, K.Akhtar, M.U.Asad, and A.Iqbal -"A low cost microcontroller implementation of neural network based hurdle avoidance controller for a car-like robot" (ICCAE-2015)

[4] D. Janglova -"Neural networks in mobile robot motion" (IJARS -2014)

[5] Hengliang Luo, Yi Yang, Bei Tong, Fuchao Wu, and Bin Fan -"Traffic Sign Recognition Using a Multi-Task Convolutional Neural Network" (IEEE-2016)

[6]Y. Yang, H. Luo, H. Xuand F. Wu - "Towards real-time traffic sign detection and classification" (IEEE-2016)

[7] Andr´es E. G´omez; Francisco A. R. Alencar; Paulo V. Prado; Fernando S. Os´orio; Denis F. Wolf -"Traffic Lights Detection and State Estimation Using Hidden Markov Models" (IEEE-2014)

[8]Ozguner U, Redmill K, Liu J - "A robust video based traffic light detection algorithm for intelligent vehicles" (IEEE -2015)

[9] Fairfield N, Urmson C - "Traffic light mapping and detection" (IEEE-2014)

[10] Omachi M -"Traffic light detection with color and edge information" (IEEE-2014)