

Autonomous Vehicle Control System Based On Dynamic Traffic Gesture Recognition

Leo Marshal S¹, Gokul R², Sreeharsha KJS³, Mrs. M. Geetha⁴

^{1,2,3}Department of ECE, KIT-Kalaignarkarunanidhi Institute of Technology (An Autonomous Institution) Coimbatore – 641 402, Anna University: Chennai 600 025

⁴Assistant professor, Department of ECE, KIT-Kalaignarkarunanidhi Institute of Technology (An Autonomous Institution) Coimbatore – 641 402, Anna University: Chennai 600 025

ABSTRACT

The only element that distinguishes Tesla from the competition is its fully automated self-driving capability. Even more intriguing than the term it is the technology behind it. In the current state of affairs, accidents involving automobile travel are commonplace for humans. The accidents also result in the loss of our lives and precious property. A microcontroller was included in the system design to prevent these issues. This paper proposes to develop a self-driving autonomous car model that is built on a minimalistic basis and that basically focuses on three key features: to operate in accordance with the surrounding environment depending on the direction of the road, to detect stop signs and halt for 5–10 seconds, and to detect obstacles. The vehicle uses an Arduino UNO micro-controller as its central processing unit and implements RTSP to enable one-way data communication from the camera to the PC. Using picture enhancement methods, to capture the road signs. The embedded system's compact computing platform investigates the properties of speed signs. The ability of the car to move in accordance with a predetermined traffic police gesture enhances the level of car automation and has some significance for advancing the auto automation sector.

INTRODUCTION

With focus on vision traffic TSR is a significant field for study that regularly draws the scientific community from the industry. Traffic signs help to control traffic, determine the aspect of the roadway, warn and guide both automobiles and users, and regulate traffic. Worldwide, there have been a lot more road tragedies recently. The main factor in the majority of accidents is disregard for the signboard. By alerting drivers in challenging conditions and those who are unaware due to a variety of psychological factors, TSR systems have a great deal of potential to lessen traffic accidents. Additionally, road signs notify both drivers and pedestrians of the condition of the street. Because each country has its own unique road sign design, it is not practicable to create a universal TSR system. Numerous studies in this area have been conducted for various nations. In order to establish a TSR system for Bangladesh's roads, significant study has not, in reality, been done to date. The majority of traffic signs in Bangladesh are categorised as warning signs and have a triangle design. Almost none of the signs are non-triangular. We set our sights on traffic signs those are triangular and have red rims and edges. The TSR system is broken down into 3 modules: recognition, shape check, and validation. Numerous algorithms were employed in order to detect traffic signals. The rgb, hsv, yiq, yuv, and L*a*b colour models were employed by the bulk of the segmentation algorithms [1][3] [6]. Road sign detection was done by Soumen and Kaushik using the ycbcr colour model [4]. Traffic signs most often have an unique form, such as a triangle, circle, or rectangle. The study presents fourier descriptor (FD), SVM, and Adaboost models, as well as distance to boundary vectors, to examine and classify form. The traffic sign recognition implementation offers a multitude of datasets from the segmented blob (HOG, SURF, LBP, and LSS) as well as cutting-edge machine learning techniques such as SVM, k-d tree branches, spontaneous vegetation, artificial neural network systems (ANN), and deep learning hypothesis are sources of destructive machine code. Zumra and Imran provided with the similarity score posterior probability classifier (KNN) as well as the function descriptors SIFT, SURF, and BRISK [1]. The ANN classifier was proposed by De La and Moreno [7]. In [5, 9, 10], SVM was utilised in the recognition module. In order to categorise traffic indicators, Huang and Hsieh applied Adaboost [6, 8]. The goal of our study is to develop a TSR system that takes

into account the distinctive colour characteristics of signals while also automatically extracting information and categorising them using deep CNN.

LITERATURE SURVEY

Traffic Sign Detection - A New Approach and Recognition Using Convolution Neural Network

AUTHORS: Prashengit Dhar 1, Md. Zainal Abedin 2, Tonoy Biswas 1, Anish Datta 3

This study proposes a new, effective method for vehicular segmentation and classification in attempt to develop a TSR policy to make of Bangladesh. CNN is used as a classifier for segmentation and is used to segment using colour information. It demonstrates invariance to affine translation of the image, making it a widely used technique as a classification tool. Convolution layer is utilised, which plays a crucial role in feature selection. Convolutions are a very powerful technique used by CNN for image processing, and they allow networks to have less weights. The red rim triangular Bangladeshi traffic sign is the subject of the proposed system. For four different sorts of indicators, the system is tested. They train pretty slowly because there isn't a strong GPU. We'll work to fix this issue in the future. We'll strive to identify signs in increasingly intricate situations and add more lessons. We'll give our best shot to consider more signage with vibrant colours and forms. Furthermore, we will like to produce this system in real time.

Traffic Sign Recognition Based on Convolutional Neural Network Model

AUTHORS: Zhilong, He

In this survey, we examine a lightweight cnn model for road sign recognition. The network achieves traffic signal identification, theoretically obtains the algorithm's performance of the classifier, and is evaluated with GTSRB dataset using simple transform and filtering operations. Another main feature of this service is its simple architecture and nice scalability. Its sequencing time is substantially shorter than that of previous analysis techniques. We plan to do tests using more benchmark datasets in the future as well as traffic sign recognition in inclement weather. We intend to use this model to detect traffic signs, of course.

“Real Time Self-Driving Car Navigation Using Deep Neural Network” in International Conference on Green Technology and Sustainable Development (GTSD), 2018

AUTHORS: Truong-Dong Do, Minh-Thien Duong, Quoc-Vu Dang and My-Ha Le

They documented an autonomous vehicle platform that serves this same softmax specification, that now limits its outcomes to every module ranges between '0 and 1', almost to sigmoid subroutine. In contrary to an actual soft - max, which does not fit as a sigmoid subroutine, the softmax subroutine fluctuates the outcome. Real-time output is facilitated by the use of neural networks. Prior to actually implementing it, they ran the model through the MATLAB simulator. Regardless of whether road markings are noticeable, the device only has been using one recording device for all input data and transports at a frequency of 5 to 6 km/h. This template only intercepts lane markings and turn signs. Without detecting signals or stop signs, it simply moves the automobile in one of those directions.

“Neural controller of autonomous driving mobile robot by an embedded camera” in International Conference on Advanced Technologies for Signal and Image Processing - ATSIP, 2018

AUTHORS: Hajer Omrane, Mohamed Slim Masmoudi and Mohamed Masmoudi

They have created an independent radio-controlled car (RC) that is controlled by an ANN. It clarifies the underlying premise of neural networks and autonomous vehicles. An L298N IC and a motor controller are applied to consider making a vehicle capable of being handled by something like a micro - controller and communicated out to the passenger vehicle. Using CNN aids in the detection of only grayscale elements while ignoring extraneous data. The system is incredibly underutilised but precise. neural network training using grayscale photos and an embedded Raspberry Pi camera. The technology only realises lane lines in each side; it has no other functionality.

“Driverless Car: Autonomous Driving Using Deep Reinforcement Learning in Urban Environment” in 15th International Conference on Ubiquitous Robots (UR) Hawaii Convention Center, Hawai'i, USA, June 27-30, 2018

AUTHORS: Abdur R. Fayjie, Sabir Hossain, Doukhi Oualid, and Deok-Jin Lee

In this review, they preferred Deep Q Network to have a more reinforcement-learning-based strategy for self travelling vehicles. Lidar sensors can measure targets at distant locations. The overall system was set up on a mechanism of practical routes and buzzing lanes. The integration of a cam and lidar enhances the level of knowledge of the outer world and feasible impediments. They have put into practise a concept that uses lidar, a laser sensor that is quite expensive and suitable for huge cars.

PROPOSED SYSTEM

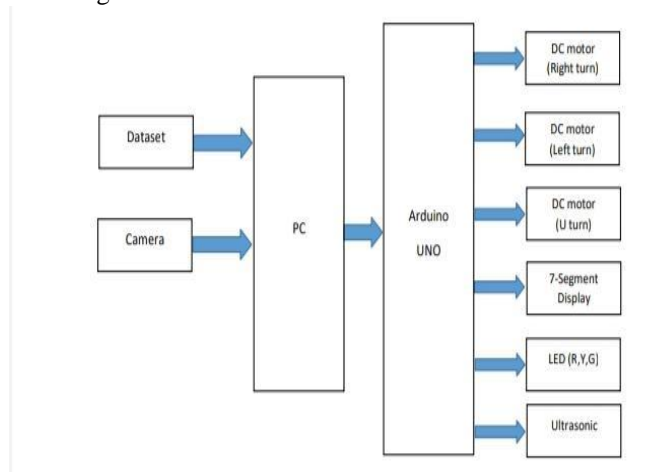
The proposed methodology's key stages are divided into three categories:

- 1) Initial processing
- 2) Identifying
- 3) Identification and classification.

The system accepts input from the World Wide Web in the form of static colour images.

The system outputs the name of the identified road sign. Numerous recognition techniques, such as normalised correlation-based pattern matching with a database of road signs, have been presented.

Support vector machine is another effective method that can identify our target. The most effective method for identifying and categorising traffic signs is neural networks.



Proposed Block Diagram

REQUIREMENTS

A. SOFTWARE:

C, an user - friendly programming language, is routinely shown to produce windows machine tools. Dennis Ritchie declared it computer software technology to implementos. Core qualities of the c programming technology exhibits very small amount of memory way in, an comparatively tiny core group of key terms, a clear attire, that makes it more suitable for computer programming such as compiler or os development process. It creates apps that are native platform-dependent, which means they can only be utilised on that console. Embedded C, a C language extension, is employed to develop apps for microcontrollers. Extensions with in embedded c technology contain Input/Output Hardware Addressing, fixed-point arithmetic operations, usage of address spacesome improvements to normal c programming technology. Five layers of basic structures are present in embedded C programmes. These are:

To help the user comprehend it better, this text has been converted into simple, readable code. The most common commenting formats are / and /* */.

A Pre-Processor mandates instruct its optimizer that scour certain files for defected signs over the programme.

A section comprising bit stream that governs the variables which are declared outside of the function and used anywhere in the programme.

A section comprising computer framework that embraces the variables which are declared and used inside the function. There is a main function in every C programme that controls the entire programme. It essentially consists of two parts: the execution part and the declaration part. Though deployment job exemplifies that scope about the software's deployment, this same invocation stage is how the attributes were indeed perceived. Python is a coding language which is popularly always seemed to design things and internet sites, optimize business processes, and interpret information. Python is an interpreted programming language something which could well been seen to build a variety of initiatives while not being suitable to another specific difficulties. It has become one of the most popular programming languages in use today due to its versatility and beginner-friendliness. In a poll undertaken by the industry report RedMonk, it was voted as the sec popular ones among coders. Python is supposed to build online platforms, standardise tedious activities, plus examine as well as present relevant information. Python is employed with multiple non-coders, as well as mathematicians and researchers, including a multitude of responsibilities, notably cash decisions, due to its ease accessibility. Cited Charles R. rift about Michigan State University or even the lecturer in the

coursera, "writing programmes is a really creative and fulfilling endeavour." Individuals could indeed open source software upon a plethora the impetus, apart from subsistence, mitigating a daunting content extrapolation daunting task, socialising, rather than aiding another person to resolve an real issue.

B. HARDWARE:

Arduino Uno Controller:

Having a Central Processing Unit, address location, and ready to be programmed I/O peripheral on all in one unified board, a mcu is a tiny computer. For us, it's crucial that a microcontroller has a CPU, memory, which is controllable I/O points.



Arduino UNO

The Arduino Uno board is what we'll be utilising. In order to make it simple for you to construct and debug your projects, which unites anmcuamidst adjunct. A UNO of the MCU circuit firm an ATmega328P. But it does have 6 serial data, 16 mhz crystal, a universal serial buffer, an UI, an in-circuit serial programming portion, plus a small rst switch. There'll be 6 pwm outcomes offered on each of the fourteen digital input/output pins that are present. This comprises everything that available to sustain a micro - controller; and will be began, easily connect along a USB cable, and AC-to-DC converter, or indeed a battery. So can perform together in the UNO no fear of the consequences; unless you did something wrong, simply could perhaps substitute a chip with just couple bucks or restart again. This Italian text "uno," the one that implies "one," been applied to obtain an Arduino Firmware Ide (IDE) 1.0 extension. A UNO controller, in conjunction with the Arduino Firmware (IDE) package 1.0, laid the basis of continual Arduino renditions. This UNO controller just a primary one of saga of Universal Serial Buffer Arduino controller, yet it reinforces either at console criterion. See the Arduino inventory to decks for a plethora for most pertaining, main, or outside strategies. Making circuits rapidly using this method is quite simple. For doing rapid experiments, breadboards are designed. They don't have a good reputation for maintaining circuits for a long period. Endeavor an intricate system, among other cables-encase, riveting, and perhaps fabricating use design system, when you are ready to create a project that you want to last for a while (PCB). All of the holes on the breadboard should be your initial point of observation. Each is broken down into two partitions of sections and first lined of rows. These entries a, b, c, d, e, f, g, h, I, & j reflect this same columns. tallied until about with 1-30, the rows were. (Follows from top to bottom). No letters or numbers are displayed in the columns along the edges. It is simple to supply ground and power thanks to the breadboard's internal connection of this same divisions upon its boundary , start - end. We'll be using +5 volts for this book. The holes inside the breadboard are connected to the board's centre break by a line running down each row of holes. As an illustration, a wire within the breadboard connects the following components: a1, b1, c1, d1, and e1. Once this is done, f1, g1, h1, i1, and j1 are all linked. Although a1 and f1 aren't interconnected. As we connect up circuits, this may initially seem perplexing, but it will soon make sense.

DC Motor:

Any member of the group of rotary electric motors known as DC motors transforms direct current (DC) electrical energy into mechanical energy. The much more usual types are based upon that pressure exerted by induced magnetism triggered by electricity carrying via coil. Often these models for DC motors already had an electro - mechanical rather than electronics technology that allows the electricity to be migrated among a particular segment within the motor on an irregular basis.

DC motors were the first to be widely used because they could be powered by the existing direct current illuminating electricity distribution systems. The speed of a direct current motor might well be changed over a diverse variety via modifying either domain winding power or either fields voltages of the electrical supply. Tools, games, and appliances all employ small DC motors. Currently, larger DC motors are employed for the drives of steel rolling mills, elevators, and electric vehicle propulsion.



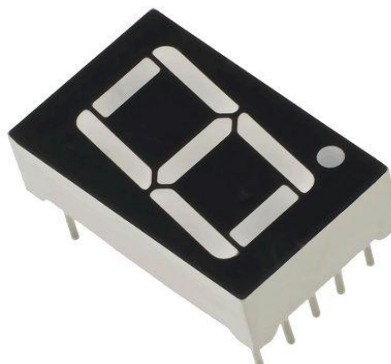
DC Motor

Seven Segment Display:

An Single precision optoelectronic overlay droid numbers, an as an adjunct instead some far intricate dot matrix exemplifies an 7--segment control. Numerous electronics devices that depict empirical data, such as electric timers, digitized timers, ordinary measuring devices, plus other gadgets, make employ of 7--segment control.

One or more of the following light-generating or light-controlling technologies may have been employed on 7--segment control: liquid crystal displays (LCDs), LEDs for each segment, electrochromic displays, cold cathode energyrelease (Panaplex), vacuum fluorescent (VFD), incandescent fragments (Numitron), or several. It's still usual practise to utilise vane controllers, that're yet to be build byelectromagnetified switched constituents in which it lead back, for fuel Cost of production attunements or any sizable wayfinding. As in mid-1950s, the cold-cathode, luminous nixie tube seems to have been a prelude with the 7--segment console. Beginning in 1970, RCA offered the Numitron, an incandescent filament-based seven—segment monitor. [12] A primary electric measyring gadget made in the USSR, the "Vega," debuted in 1964 and had a seven-segment electroluminescent display with 20 decimal digits.

To minimise certain counting in Input-Output ports necessarymanually prompt their reveal, multiplexed displays were employed in Leds symbolises with countless entries seen across miniature tools as well as other indistinguishable instruments. For instance, several of the cathode sidethere ought to be remnants for this numerallinked, as would anodes at all further A sorts to every numeral circumstance. This same centralising ic might well pick a digit, alter an cathode actuator withthat binary number, as well as the anode drivers for anything other than the modules of intrigue in that digit. Following a recent period of consolidation, one more numeral was often scooped, and successive fragments may get lighted chronologically. Its amount of drivers as well as IC ports usually needed forward to an eight—digit showcase including seven—segments or an obtained value may get impacted by the qualityto just eight cathode drivers and eight anode drivers. [15] Although tapping several keys simultaneously might result in strange results on the multiplexed display, it was common practise among portable electronics that inspect input keyboards using the digit drive lines.



Seven Segment Display

Ultrasonic:

Those HC-SR04 proximity sensors choose a yet another sonic transducer something which enable alternative sound wave transmission and receiving. This same system carries out sound waves who are reinforced or otherwise restored both to transducer. The HC-SR04 detectormethod based on will switch to receiving mode when it has finished emitting the sound waves. The measuring the time taken for an emission to be followed by a reception is affected by the item's distance from the sensor.

Product attributes:

Target Identification: Hard surfaces reflect sonic waves the best. Solids, liquids, grains, and powders are all possible targets. Ultrasonic sensors are typically used for item detection in places where optical principles would be unreliable.

Standard Target: From around 2 cm (0.8 inches) to 3 metres, an ultrasonic distance sensor delivers accurate, non-contact distance measurements (3.3 yards).

Measuring Methods: The 5 V TTL or 3.3 V CMOS microcontrollers can connect with the bidirectional Transistor-transistor logic pulse employ on the unique Input-Output pin.

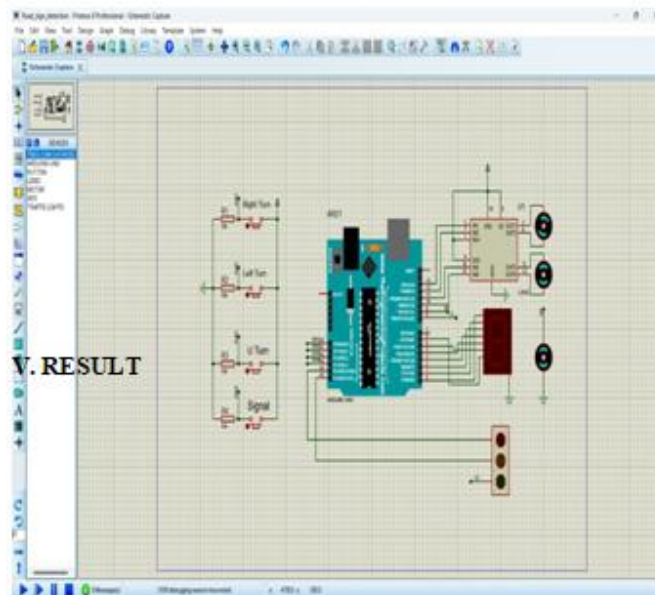
Positive TTL pulse, 2 μ s minimum, 5 μ s typical, input trigger.

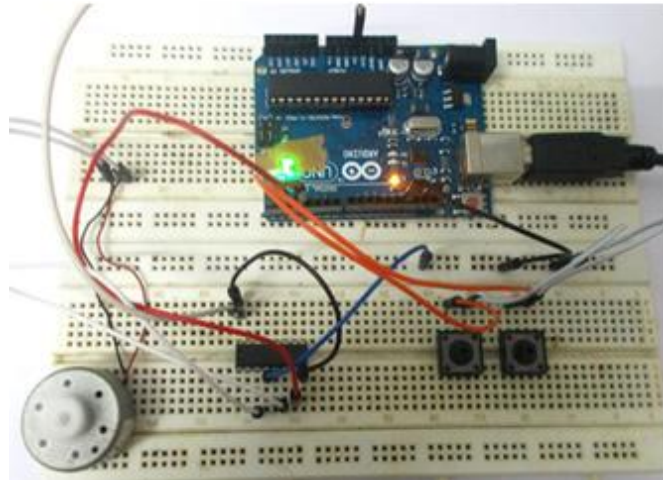
Positive TTL echo pulse, ranging from 115 μ s minimum to 18.5 ms maximum.



HC-SR04

RESULT





CONCLUSION

The suggested method is a road sign recognition system that is economical. that can recognise a road sign, after which a car will proceed automatically to follow the sign. The automobile in front of it will automatically stop if the front vehicle abruptly breaks out. Which aoperator may get updated by upcoming years after joining few extra sensors. But, it's suggested system makes use of the most recent technologies, like Node, Ruby, etc., to display data in a graphical way. This study describes the development of a low-cost system for recognising road signs. Wireless technology, on regards or be less affordable but also employing little energy than conventional connection approaches, takes up minimal space, is being installed where ever, and provides better versatility.

ACKNOWLEDGEMENT

We send our profound gratitude to God Almighty, who has enabled everything, since we really owe the highest.

We would like to express our sincere appreciation to our esteemed Founder Chairman ThiruPongalur N. Palanisamy, Vice Chairperson Mrs. P. Indhu Murugesan, Executive Trustee Mr. A. Suriya, and all other trust members for giving us the tools we needed to complete this project.

We appreciate the facilities offered for the completion of this project work by our Dean Academic Director Dr. K. Ramasamy, our cherished Principal Dr. N. Mohan Das Gandhi, and the department head Mr. R. Gowrishankar M.E. (Ph. D.).

For her unwavering support and inspiration, we would like to express our thanks to Mrs. M. Geetha M.E. (Ph. D.), Assistant Professor, Project Coordinator Department of Electronics and Communication Engineering.

We really appreciate the thoughts and ideas from the Department of Electronics and Communication Engineering's teaching and non-teaching staff members that helped make the project more beneficial. We express our gratitude to librarians for their unwavering support during our investigation. Finally, we express our gratitude to our dear Parents for their unwavering support and blessings.

REFERENCES

- [1]. Chaiyakhon, K., Hirunyanakul, A., Chanklan, R., Kerdprasop, K. and Kerdprasop, N., 2015. Traffic Sign Classification using Support Vector Machine and Image Segmentation.
- [2]. Aghdam, H.H., Heravi, E.J. and Puig, D., 2016. A practical approach for detection and classification of traffic signs using convolutional neural networks. Robotics and autonomous systems, 84, pp.97-112.
- [3]. Jin, J., Fu, K. and Zhang, C., 2014. Traffic sign recognition with hinge loss trained convolutional neural networks. IEEE Transactions on Intelligent Transportation Systems, 15(5), pp.1991-2000.
- [4]. Krizhevsky, A., Sutskever, I. and Hinton, G.E., 2012. ImageNet classification with deep convolutional neural networks. In Advances in neural information processing systems (pp. 1097-1105).
- [5]. Zhang, J., Jin, X., Sun, J., Wang, J. and Li, K., 2019. Dual model learning combined with multiple feature selection for accurate visual tracking. IEEE Access, 7, pp.43956-43969.



- [6]. Zhou, Y., Shi, J., Yang, X., Wang, C., Wei, S. and Zhang, X., 2019. Rotational objects recognition and angle estimation via kernel mapping CNN. *IEEE Access*, 7, pp.116505-116518.
- [7]. Luo, W., Li, Y., Urtasun, R. and Zemel, R., 2016. Understanding the effective receptive field in deep convolutional neural networks. In *Advances in neural information processing systems* (pp. 4898-4906).
- [8]. Berkaya, S.K., Gunduz, H., Ozsen, O., Akinlar, C. and Gunal, S., 2016. On circular traffic sign detection and recognition. *Expert Systems with Applications*, 48, pp.67-75.