Driverless Car Using Machine Learning – A Review

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Abstract- *Autonomous driving has been a big fuss among companies because of the entanglement of the problem which has endless applications. Companies like Google, Tesla and Uber have applied algorithms to commercial cars and had some success. These algorithms varies from traditional control to machine learning. In this paper we will use one of the Machine learning techniques SVM (Support Vector Machines) with the goal of navigating the driverless car with maintaining traffic rules and avoiding accident. This technique mainly detects sign boards, classifies it and takes decision accordingly. This paper mainly includes object recognition and zone based control using different types of sensors. It also has live video streaming which is used for monitoring purposes.*

Keywords- Driverless car, machine learning,support vector machines (SVMs), ultrasonic sensors, automation

I. INTRODUCTION

In the presentgrowing world, technology is emerging day by day and it has become a hot topic in the development of automated vehicles. The already proposed automated vehicles has certain restrictions applicable only to specific areas which have well-built roads with lane markings and road signs which leads to a huge development cost. This automated vehicle is implemented using stereoscopic vision. This model can be used as a reference to overcome the issues of existing systems, by improving the accuracy and efficiency of autonomous vehicle for better safety.

The smart automobile/ the autonomous car is one step towards smart city and is applicable for all the handicap people especially blind people and is suitable for all day to day transport activities. The motive behind the whole concept of the driverless car was to avoid accidents that take place now days in large numbers. According to the statistics of 2014, the death rate of people due to accidents in the US was around 32,000 each year. In India itself, the count was around 13,976. Use of these Smart Automobiles on the roads could reduce at least half of these accidents, it could save up to 16,000 lives each year.

Also, the handicapped and older public can avail to long distance transport without relying on a third person say, a driver.

This project also has an aim to control the speed of any vehicles automatically in cities and also in restricted areas such schools, parks, hospitals and in speed limited areas etc. Nowadays in an exceedingly fast paced world all the peoples don't seem to be have self-control. Such peoples square measure driving vehicles in an exceedingly high speed so the police don't seem to be able to monitor all those things. This paper provides how for the way to manage the speed while not harming others. In this project we have a tendency to mistreatment RF for indicating the regulation areas it's placed front and back of the restricted zones. RF receiver is placed inside the vehicle. Speed is nonheritable by the assistance of speed indicator within the vehicle.

We present a narrative followed by a review of various themes. The paper is divided into the following sections. Section I gives an introduction about driverless car. Section II gives the literature survey on Ultrasonic sensor. Section III gives the literature survey on Driverless car. Section IV gives the literature survey on Machine learning. Section V gives the conclusion of the paper.

II. LITERATURE SURVEY ON ULTRASONIC SENSOR

Kunal Khade, Harshal Patil, Vinod Gadget and Shrikant Velankar et al proposed autonomous electric vehicle using Ultrasonic sensor [1]. In this paper the autonomous vehicle is designed such a way that it can easily move around in the environment. This task is accomplished by using various electronic sensors such as Ultrasonic sensor. The main aim of these vehicles is avoidance of static or dynamic obstacles while travelling. Depending on the logic and control system of the vehicle, the further movement is decided. The vehicle will decide the travel path using GPS system based on the final point defined by the user.

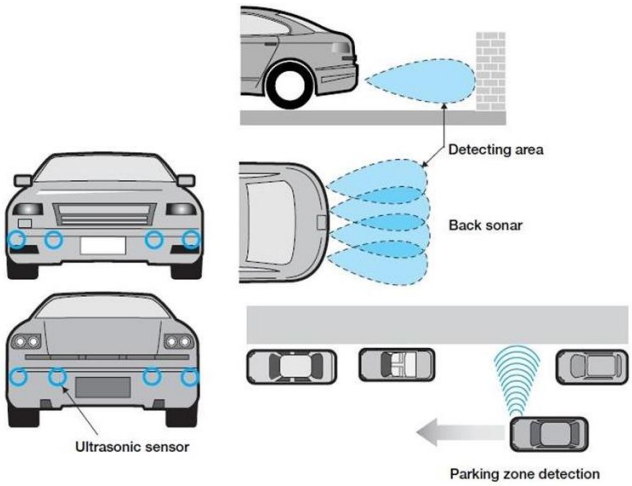

Figure 1:Ultrasonic sensors to detect obstacles

Prabu Krishnan*et al* proposed the collision detection System for smart car using Li-Fi and Ultrasonic Sensor [2]. In this paper the author has proposed a smart car based on the arduino platform for the detection of collision using Li-Fi and Ultrasonic sensor. Ultrasonic Sensors is used to determine the distance between the vehicles and the data is then processed by the arduino to take decisions accordingly. Li-Fi transmitter and receiver circuit is used for the secure transmission if the data between the vehicles. The transmitter circuit will be mounted on the tail lights of the car ahead and the receiver circuit is mounted on the front side of the car following it. The transmitter circuit will transmit the speed calculated and the receiver receives the information and processes it. Based on processed information the receiver will change the speed of the second car which prevents the collision.

Alessio Carullo and Marco Parvis proposed the distance measurement in automotive using Ultrasonic sensor [3]. This paper mainly based on the automotive car using Ultrasonic sensors which calculates the distance from the ground of selected points of the motor vehicle. Threshold comparator detects the reflected pulses by using constrained optimization technique. This technique is mainly based on the frequency response of the Ultrasonic transducers which is used to obtain sub-wavelength detection. The experiment conducted with 40kHz piezoelectric-transducer based sensor resulted in 1mm at low speeds. This sensor practically works at a speed of 30m/s. The sensor is less expensive, thus being used for first car equipment in many applications and it is self adaptable to different conditions.

III. LITERATURE SURVEY ON DRIVERLESS CAR

Nicolas Gallardo, Nicholas Gamez, Paul Rad, and Mo Jamshidi*et al* proposeddecision making for driverless car [4]. This paper mainly focuses on navigating a driverless car through an Urban environment using deep learning techniques. The use of deep learning versus traditional methods leads to easy implementation of real time autonomous operation. This uses AlexNet's model to identify driving indicators, implementing them in real time system and also determines unforeseen drawbacks to these techniques and how it can be minimized and overcome.

Figure 2: Driverless car sensing the environment

Xin Zhang, Maolin Chen, Xingqun Zhan *et al* proposed Behavioral cloning for driverless cars using transfer learning [5]. This paper mainly proposes a machine learning algorithm for decision making in autonomous navigation. The current problem of driverless cars is solved by using existing proved convolution neural networks. Compared to the traditional algorithms, this transfer learning method tends to minimize the steps leading to better performance and also in maintaining high performance-to-cost ratio. there are two ways of benefits from this approach.

(1) It gives the quality of the simulator which is capable of taking decisions in data preparation which inturn trains the CNN's, in the setting of driverless car.
(2) Compared to computer graphic based approach this approach combines several steps into a whole leading to faster prototyping in certain conditions.

Seong-Woo Kim, Gi-PoongGwon, Woo-Sol Hur andDaejin Hyeon*et al* proposed Autonomous Campus Mobility Services Using Driverless Taxi [6]. This paper proposes a driverless taxi system which provides mobility services for autonomous campuses. Based on the Unique mobility requirements of college campuses in terms of layout, population, demands and patterns, it is recommended to reduce the number of private automobiles on campuses due to research and teaching disturbances, visual degradation form parking lot,

negative health effects and environmental pollution. Instead of using private automobiles shared mobility systems have been recommended for both campus and urban transportation.
Mohammed HayyanAlsibai and Sulastri Abdul Manapl*et al* proposed driver fatiguenotification system [7]. This paper uses in vehicle video camera for driver safety assistance. Using vision sensors this system detects passengers and driver fatigue conditions in real time. The system is capable of providing a safe driving and notifies the driver for any dangerous situations. Embedded vehicle controlling system perform the safety actions.

Kamalpreet Kaur*et al* proposed drowsiness detection systems using different feature extraction algorithms [8]. This paper mainly focuses on detecting drowsiness of the driver in real time by developing a portable wireless system. Drowsiness occurs when the signal is transmitted through the wireless communication which in turn generates an alarm. This method mainly uses computer vision to detect drowsiness based on closing and opening of the eyelid that can be performed by an algorithm called SVM which is mainly used for nonlinear classification using kernel method that comes under artificial neural network. This method has a gain in performance.

ViktóriaIlkováand Adrian Ilka proposed Legal aspects of autonomous vehicles [9]. In this paper, it provides the current information about legal regulations of driverless cars in Europe and United States. This information is very much useful for technical professionals which gives them a comprehensive approach to this problem. In order to discuss the possibility of different legal issues regarding AV's, technical professionals should the information about legal regulations. The main concern of this article is to provide a brief information about legal aspects to the most significant legal challenges which the AV's address to lawmakers, consumers, insurance companies and car manufacturers.

Sheikh Azid, Krishneel Kumar, Darrel Lal and Bibhya Sharma*et al* proposed Lyapunovbased driverless vehicle [10]. In this paper, Lyapunov based control scheme is used which consists of Arduino microcontroller, ultrasonic sensors and stepper motors. This new scheme is mainly used for designing, simulation, implementation and verification of an autonomous vehicle system. Combining Lyapunov method with Runge-kutta method leads to discretion of Lyapunov algorithm which gives the coordinates to the vehicle for path and target location.

Akhil Soinand Manisha Chahande*et al* proposed moving vehicle detection using deep neural network [11]. This paper mainly focuses on detection of real time moving vehicles on road for driverless car assistance system. This can be achieved by using deep learning neural network (DNN's).

Accuracy rate is sufficiently improved by using transfer learning for this system. Many experiments have been conducted yielding good results. In addition to the above, a reformative fine tuned CNN structureis used to enhance recognition accuracy.

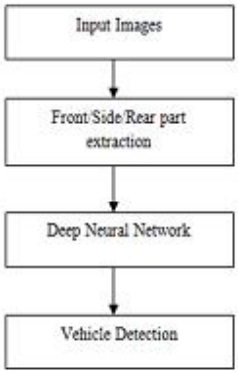

Figure 3:Flow chart of the approach

SumitAher*et al*proposed a prototype of autonomous vehicle using Stereoscopic Vision [12]. The present autonomous vehicles have drawbacks that limits their application to particular area which has well built roads with lane marking and sign boards. This paper mainly focuses on developing a system which overcomes the above existing issues by improving the accuracy and efficiency of AV's to provide better safety. Stereoscopic sensor is used to obtain information from environment on which the image processing techniques are implemented to get the improved time response for autonomous vehicle.

IV. LITERATURE SURVEY ON MACHINE LEARNING

Rasmus Pedersen and Martin Schoeberl*et al* proposed an Embedded Support Vector Machine [13]. This paper mainly provides information about the FPGA technology that enables to focus on the balance between programming the machine learning algorithm in high level languages such as Java and programming it in the hardware languages such as VHDL. In this paper, a statistical learning theory is used to represent a field characterized by both mathematical adversity and approach to practical problems like embedded machine learning. SVM is one such algorithm described in this paper which is the non linear binary classifier. Based on this algorithm, it is easy to analyze the subsequent research into other areas like regression, ranking,

clustering, novelty detection and corresponding on-line variants.

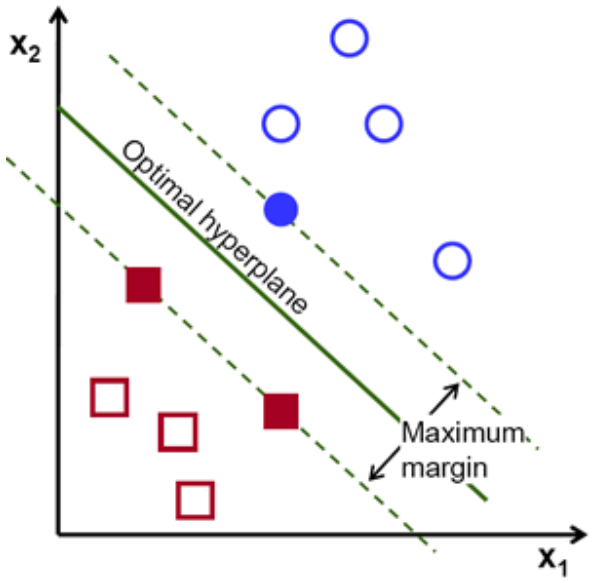

Figure 4:Support Vector Machine

Paolo Gastaldo, Giovanni Parodi, Sergio Decherchi and Rodolfo Zunino*et al* proposed the implementation of SVM training on embedded electronic systems [14]. This paper proposes a general approach to the systematic i0mplementation of support vector machine training on Digital signal processing (DSP) devices. This methodology conducts efficiency by adjusting effective Keerthi's optimization algorithm for larger data set. This paper results the training problem of SVM's by involving real world benchmarks.
Alistair Shilton, M. Palaniswami*et al* proposed an Incremental Training of Support Vector Machines [15]. This paper proposes a new algorithm for incremental training based on SVM's that is suitable for problems like fast constraint parameter variation and sequentially arriving data. This method involves warm start algorithm for training of SVM's in which it allows us to take advantage of natural incremental properties. Incremental properties or training involves quick retraining of SVM after adding small number of additional training vector to the existing training set.

Yinggang Zhao, Qinming He*et al* proposed An Unbalanced Dataset Classification Approach Based on ν - Support Vector Machine [16]. This paper mainly focuses of the v-SVM. In some cases the classification ability of SVM was bad and was not acceptable. To overcome this v-SVM is used which is a new formulation of regular SVM where the parameter v has intuitive meanings compared to c. This paper gives the relation between v and c.

V. CONCLUSION

As described throughout the paper, many technologies exist to detect obstacles and classify between objects for a driverlesscar. This paper tries to look at theemerging technologies and determine the best approachesfor accident avoidance by following traffic rules. The reason for a driverless car is, compared to human eyes sensor data are more accurate. In this paper SVM (Support Vector Machine) based driverless car has been established simulated and the implementation of the autonomous vehicle has been done. Using machine learning technique sign boards on the road has been classified and hence it follows the traffic rules which mainly avoids accidents. This autonomous vehicle successfully detects the obstacles and overcomes it using the sensor like Ultrasonic sensor.

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