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SELF DRIVING CAR USING LIDAR

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ABSTRACT: One advancing technology that has been impossible to ignore lately has been the work with self-driving vehicles. These vehicles have gone from scientific curiosity to mainstream within a few short years and soon we'll be seeing them as regular traffic on our streets. A very distinctive component in a self-driving vehicle is the spinning LIDAR sensor mounted on the top of the vehicle. This is one of the principal components in self-driving vehicles as it collects data regarding the surrounding area to allow the navigation systems to guide the vehicle safely. One advancing technology that has been impossible to ignore lately has been the work with self-driving vehicles. These vehicles have gone from scientific curiosity to mainstream within a few short years and soon we will be seeing them as regular traffic on our streets. since 94% of the accidents are due to human error. Autonomous vehicles do not drink alcohol nor take drugs, they are never tired or sick, they never take medicines, they never lose their concentration or talk by phone, they know how to drive since the first moment and don't need to learn, they never act recklessly when driving. On the other hand, they will drive much more smoothly, they will pollute less and, if they have an accident, they will ask for help autonomously.

KEYWORDS: LiDAR, Arduino UNO, Easy navigation, Robotic movements, Autonomously, Robot, Power Supply, Battery, Switches.

I. INTRODUCTION

Lidar is sensor technology used in self-driving car, which gives three-dimensional information about the surrounding environment and also provides higher resolution. LiDAR can make out the position of people and attempts to stop around the vehicle and put value on the speed and way at which they are moving. Taking assistance of this news given, on-board knowledge processing machine system can come to a decision about

the best and safest way for a self-driving vehicle to private road to its destination. To accomplish this LiDAR technology use lidar sensor. Lidar sensor consist of main four parts: Lasers, Scanners, Photo detector receivers, GPS positioning/navigation systems. The optical pulse is emitted through leaser and transmitted towards the object. The scanner scans the distance of targeted object (using a speed of light). Depending on the fact presented by sensor the computer system can determine safest path for self-driving car to reach to its correct destination. Lidar can make out the position of people and attempts to stop around the vehicle to work out the needed speed and the footway at which they are moving.

II. OBJECTIVE

Self-driving cars help reduce the pollution emitted by vehicles. Autonomous capabilities such as consistent driving speeds and keeping a measured distance between vehicles can reduce unnecessary breaking and re-acceleration. Electronic models of self-driving cars with an electric or hybrid engine further reduce pollution by eliminating or lessening the use of fuel. Road accidents result in 1.25 million deaths and 20-50 million injuries worldwide. If nothing changes, road traffic injuries may become the fifth leading cause of death by 2030. Self-driving cars may be the solution to road accidents. Since human error is the cause of around 90% of traffic accidents, delegating most or all the vehicle operating responsibilities to the ADS can increase road safety. While fully automated vehicles have not been commercially adopted yet, many cars today are equipped with sensors and advanced systems that alert drivers to dangers. Self-driving car technology, such as connected cars, may offer a solution to clogged roads. Connected cars can communicate with each other can help optimize routes for each individual vehicle, creating a network of information that helps distribute traffic flow. The largest R&D endeavor in self-driving cars took off in 1987 in Europe where several universities and car manufacturers participated. Ernst Dickman's and his team demonstrated their twin robot vehicles VAMP and VITA-2 autonomous capabilities when they drove 1000 km at speeds of 130 km on the Paris highway

III. LITERATURE SURVEY

Zhilu Chen and Xinming Huang, "End-to-End Learning for Lane Keeping of Self-Driving Cars", 2017 IEEE Intelligent Vehicles Symposium (IV) June 11-14, 2017, Redondo Beach, CA, USA. 978-1-5090-4804-5/17/$31.00 ©2017 IEEE This paper presents the end-to-end learning approach to lane keeping for self-driving cars that can automatically produce proper steering angles from image frames captured by the front-view camera. The CNN model is trained and evaluated using comma.ai dataset, which contains image frames and the steering angle data captured from road driving. The test results show that the model can produce relatively accurate steering of vehicle. Further discussions on evaluation and data augmentations are also presented for future improvement.[1]

Mohammad Faisal Bin Ahmed, Md. Muneef Anjum Timu, Shakura Akter,Md. Jubayer Sarker, "The Issues and the Possible Solutions for Implementing Self-Driving Cars in Bangladesh", 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC) 21 - 23 Dec 2017, Dhaka, Bangladesh. 978-1-5386-2175-2/17/$31.00 ©2017 IEEE Self-driving cars have potential to become the permanent solution to Bangladesh's infamous traffic problem. In this research, we have tried to achieve just that by finding out the issues and possible solutions. Despite our limitations like not having an actual selfdriving car and lack of funding for building a prototype, we believe our study is a good path forward for other researchers to follow. We have made necessary adjustments by observing our simulations. If the simulations are any indications, it will be possible to build a prototype on this that will work on Bangladeshi roads. With proper implementation and adjustment, Bangladesh can also take part in this driverless car revolution.[2]

Gim Hee Lee, Friedrich Fraundorfer, Marc Pollefeys, "Motion Estimation for Self-Driving Cars with a Generalized Camera", 2013 IEEE Conference on Computer Vision and Pattern Recognition. 1063-6919/13 $26.00 © 2013 IEEE In this paper, they demonstrated visual ego-motion estimation for a car equipped with a multi-camera system with minimal field ofviews. The camera system was modelled as a generalized camera and we showed that the generalized essential matrix simplifies significantly when constraining the motion to the Ackerman motion model (i.e. circular motion on a plane). We derived an analytical 2-point minimal solution for the general case with at least one inter-camera correspondence and a special case with only intra camera correspondences. We showed that a maximum of up to 6 solutions exists for the relative motion in both cases. We investigated the degenerate case of straight motion with intra-camera correspondences (which appears frequently in real data) and presented a practical solution using one ad-additional inter-camera feature correspondence. We evaluated our method on a large real-world dataset and compared it to GPS/INS ground truth. The results of the comparison clearly showed that our assumptions on the vehicle motion hold for real-world data.[3]

Rassolkin, T. Vaimann, A. Kallaste, R. Sell, " Propulsion Motor Drive Topology Selection For Further Development of ISEAUTO Self-Driving Car", 2018 IEEE 59th International Scientific Conference On Power and Electrical Engineering of Riga Technical University (RTUCON), 978-1- 5386-6903-7/18/$31.00 ©2018 European Union The energy required from the propulsion unit depends on the desired acceleration and the road load force that the vehicle has to overcome and it is necessary for the design and selection of the energy source or batteries to cover a certain distance. An energy storage system is not a part of the propulsion drive system, but its features have influence on the system is not a part of the propulsion drive system, but its features have influence on the systems, as an electric car.[4]

Raivo Sell, Anton Rassolkin, Mairo Leier, Juhan-Peep Ernits, "Self-driving car ISEAUTO for research and education", 2018 19th International Conference on Research and Education in Mechatronics (REM) June 7-8, 2018, Delft, The Netherlands. 978-1-5386-5413-

2/18/$31.00 ©2018 IEEE. Building a self-driving car is an undertaking that requires multidisciplinary collaboration from mechanical and electrical engineering, mechatronics, electronics, computer systems and software engineers. Thus, participating in such a project helps to develop various important skills such as cross-discipline communication, working on large projects, and understanding large and complex legacy systems. There are currently 15 students involved in various aspects of software development, 11 students in the electronics and low-level microcontroller software development. We are integrating the project work into the studies of students in two main ways: final theses and project courses. For example, in the software development sub team, we awarded 72 ECTS in the first half year for project courses and students plan to achieve 60 ECTS for project courses and 98 ECTS for thesis in the second semester. Such arrangement enables students to work on the project for more than one semester as the software is complex and building up understanding of the principles requires time. This far we have observed that the clear objective and exciting equipment available in the project has maintained student motivation for two semesters. The project courses are set up as 10-12 ECTS courses where student teams of four to six are supposed to complete a realistic task within a semester. The first project course was a 10 ECTS start-up project course, where student teams are expected to come up with an idea and implement a minimal viable product. One of the teams chose the self-driving car project with a goal to make the self-driving car drive autonomously in the Gazebo simulator closely integrated with ROS. In that process, the students discovered that the vector maps are essential to enable autonomous driving and that the vector map creation tools are not available in Auto ware. As a result, they developed a prototype vector map creation tool, based on a widely used GIS software ArcGIS. In the second project, the students were supposed to carry out a predefined software development task. The task was to make Auto ware drive the car-based platform autonomously. At the time of writing, the students are on track of achieving it by the end of the semester. The achievement is supported by 4 MSc students pursuing their MSc theses related to various aspects of the software of the self-driving car.[5]

Chris Urmson and William "Red" Whittaker, "Self-Driving Cars and the Urban Challenge", IEEE INTELLIGENT SYSTEMS Published by the IEEE Computer Society, 1541-1672/08/$25.00 © 2008 IEEE Although the Urban Challenge was a resounding success, the challenge of fully autonomous urban driving hasn't yet been met. Despite the Urban Challenge vehicles' strengths, none of them could interact with traffic lights, most would operate poorly around pedestrians, and all relied on sensors that are too expensive or unwieldy for consumer vehicles. As the bounds of what's possible for autonomous vehicles are pushed forward, these technical issues and the social and legal issues associated with relinquishing driving control will be at the forefront of the research agenda. Despite the challenges, the future appears to be now. Heavy equipment manufacturers are announcing autonomous haul trucks, with some ready for deployment as early as 2010. General Motors announced that autonomous vehicles will be ready for market by 2020. These are heady times for Autonomous vehicle research.[6]

IV. IMPLEMENTATION

LiDAR technology allows self-driving vehicles to make calculated decisions with its ability to detect objects in its immediate environment. It can be thought of as a vehicle's "set of eyes" and the most important component in making self-driving vehicles a reality. Automakers are leveraging this technology as they compete to develop self-driving vehicles which are safe. How can one feel comfortable with this technology? LiDAR systems can see things that go beyond human abilities. Imagine if your eyesight provided continuous 360-degree visibility or if your depth perception was always correct and you never had to guesstimate stopping distances between your car and those cars in front of you. LiDAR makes all this possible. With that being said, LiDAR is a technology of precision in gathering data and computing accurate distances, which promotes self-driving vehicle safety.

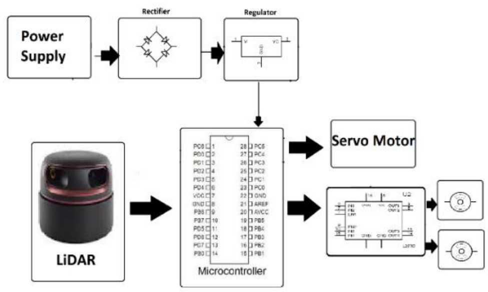

Figure 1: Block Diagram

V. RESULT

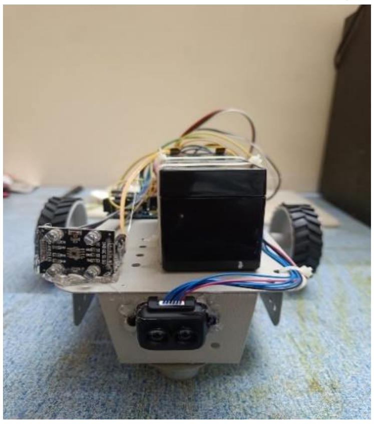

Figure 2: Front View of Proposed Prototype

When Car start Lidar and Colour Sensor send their input to microcontroller. With the received information from Sensors, microcontroller decide to take next decision like Start, Stop, Move Forward, Move Backward, Turn Right, Turn Left, etc. Microcontroller end instruction to the motor driver for controlling motors with respective input taken from sensor.

VI . CONCLUSION AND FUTURE SCOPE

CONCLUSION

This is an advanced step for autonomous driving vehicles. With the help of this algorithm, vehicles can be set to automatically navigate to the destination location by continuously receiving the direction from another vehicle moving ahead to the same destination. The robotic vehicle routes itself with the guidance of another vehicle moving ahead to the same destination, therefore, deviations in time can occur. The goal of navigation process for a robotic vehicle is to move the robot to a known destination in an unknown environment. The navigation planning is one of the vital aspects of autonomous systems. When the robotic vehicle actually starts to move towards the planned route it may find unknown obstacles from the existing location to the destined location, hence the robotic vehicle must avoid the obstacles and follow an optimal route to reach the destined position. The potential applications of this robotic vehicle are to use these types of autonomous vehicle on highways or heavy traffic roads. These types of autonomous vehicles can also be used when a driver travels to the new areas. It is an improved navigation system for autonomous vehicles.

FUTURE SCOPE

Vehicles last longer, cost more, impose larger external costs, and are more highly regulated than most other consumer goods. As a result, vehicle technologies take Longer to penetrate markets than most other sectors. It will probably take decades for autonomous vehicles to dominate new vehicle purchases and fleets, and some Motorists may resist using them. Optimistically, autonomous vehicles will be safe and reliable by 2025. A few more years will be required for testing and regulatory approval, so by 2030, autonomous vehicles may be commercially available and allowed to operate in many areas. If they follow the pattern of previous vehicle technologies, during the 2030s and probably the 2040s, they will be expensive and limited in performance, sometimes unable to reach a desired destination or requiring human intervention when they encounter unexpected situations. Customers will include affluent high-annual mileage motorists, and businesses that use vehicles to transport equipment and goods. For the foreseeable future most moderate- and low-income households will continue to use human-operated vehicles.

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"Self-Driving Cars and the Urban Challenge", IEEE INTELLIGENT SYSTEMS Published by the IEEE Computer Society, 1541-1672/08/$25.00 © 2008 IEEE.

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