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ADAS USING TOUCH SENSOR

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***Abstract*:** EPS systems integrate Advanced Driver Assistance Systems (ADAS) while the driver controls the steering wheel. Touch sensors, torque, and position sensorsimprove driver involvement, safety, and control in EPS. ADAS features like lane-keeping assistance and adaptive cruise control are activated by the driver's steering wheel touch. EPS with driver-enabled ADAS integration, using touch sensors, empowers drivers while leveraging enhanced automation.

The vehicle model design incorporates touch sensors, Arduino, and motor drivers to enable Advanced Driver Assistance Systems (ADAS) exclusively when the driver holds the steering wheel. The touch sensors detect the driver's touch on the steering wheel, triggering the ADAS functionalities and allowing the vehicle to move. The Arduino microcontroller, equipped with embedded C code, processes the touch sensor inputs and communicates with the motor drivers to initiate vehicle propulsion. The embedded C code facilitates real-time monitoring and control of the touch sensor inputs, enabling a seamless integration between driver interaction and vehicle movement, thereby enhancing both safety and user experience.

Keywords: Steering, Automobile, Sensor, Autonomous

I. INTRODUCTION

Automatic steering is a primary and crucial section of a driverless which is highly recognized as the end developments of vehicle [11]. Automatic steering system is now not only one of necessary components of Intelligent Vehicles however additionally, a core method in using support systems such as computerized parking systems [3]. Here Ackerman principle for geometric path monitoring is used. The purpose of geometric path monitoring is, it's vital to nation that the automobile model simplifies the fourwheel vehicle by combining the front two wheels together with rear two wheels to form a shape of two-wheel vehicle. So there is a need to implement automatic steering system in vehicles in order to decrease the work load and avoid accidents [1]. Present autonomous vehicles can't calculate exact look ahead distance while the vehicle is traveling at higher speeds and can't cut at extreme corners [13]. There is a problem in overshoot and undershoot while turning. And no current technologies allow reliable operation in heavy rain or snow or on unpaved roads. Complex software is required for driving in traffic [5]. Long way more decisions is required for driving in traffic which orders more complex software because of the range of viable interactions. Autonomous vehicle will be efficient and works efficaciously only when it has dedicated lanes. It will increase the risks of catastrophic, multicar crashes, mainly if drivers attempt to merge into those platoons.

Road safety has become a paramount concern issue in the present-day situation. The increase in the population of automobiles, the incidences of road accidents which increases day by day, and also the comfort in driving is a considerable factor along with these active safety features. ADAS (advanced driver assistance system) is a prominent feature in any modern automobile which enhances the vehicle to operate in a self-reliant mode without expecting many drivers or human intervention with improved safety levels [1,2]. Presently,ADAS are solely implemented for cruise control in most cases along with a few more utilities such as collision avoidance, navigation, lane changing detection, and a few other warning and indication mechanisms [2]. Yet, all these subsystems or features may not be integrated as a single entity in current ADAS and also the reliability or self-relian operation of these systems does not meet the expectations. Even though several upgrades and improvisations were introduced in this system there are still plenty of enhancements that can be offered which will increase the overall safety and performance [3]. This work will be discussing a few of such enhancements with the integration of multiple technologies with the proposed ADAS design.

In the aspect of safety, this work uses computer vision-based lane change detection and proximity alert mechanisms to indicate the change in lane and to avoid collision [3,4]. There are already a few implementations available in both mechanisms but using computer vision yields more precision and sensitive alert indications. In this proposed work, the advancement of ADAS technologies is the connected car in which the vehicle intercommunication vehicle-to-vehicle (V2V), and cloud connection with vehicle-to-infrastructure (V2I) are completed [5]. Additionally, a drivability mode improvisation is proposed where we will continuously monitor critical parameters influencing the drive modes of an automotive, and based on this monitoring, the level of smooth drive can be indicated to the ADAS [6,7].In addition, several custom modes of driving can be formulated for individual vehicles based on their nature of drive which is observed from the monitored parameters. The novelty of this custom driving mode formulation is that we could design the mode such that the ADAS can operate accordingly for different terrain regions and different traffic, and road conditions in an efficient way by adjusting the cruise, throttle, and operating factors as formulated [8]. By fusing this data with the vehicle's sensor inputs it will become possible to create much more details of the surrounding area with real-time AI-based lane detection which can provide more accurate alerts and corrective actions, to avoid collisions.

The unique mission which need to be met was the design and development of the steerage mechanism and pace manipulate structures which is one of the major modules [9]. A computerized guided car uses flexible navigation in the real surroundings of the opposition which requires a sturdy and environment friendly response steerage attachment, which guides the rover path [15]. The potential of the rover is to navigate successfully while detecting the ten-foot track and averting the obstacles on the course, which immediately depends on how the steerage mechanism respond to many of the indicators that the different sub-systems fed into it [4]. The accurate response and the real track of the robot which is observed ultimately depends on the steerage control system grasp with different modules being perfect and fed in the right signals. Each of the systems wanted to be examined for six accuracy of statistics [7]. Then the conclusions are derived on whether the steering control machine designed is working as per the defined specifications. The pace control device also needed to be built-in efficaciously with the guidance module to make sure the right speed of the automobile on the track [14].The opposition required that no vehicle exceed a speed limit of 5mph for safety reasons. Hence, the higher limit of the design pace was beginning fixed, and quite a number of factors like terrain slopes, friction, speed of reactance of the variety of modules, and the time taken to steer the automobile as soon as a signal was obtained were taken into consideration [10].

With developments in information, communication and automobile techniques, the competition to boost and commercialize self-reliant cars has been intensified [2]. The principal aim of the system is to secure automobile stability and driver ease and to enhance a steerage control system for direction monitoring of self-reliant automobile and to recognize the stability of the vehicles on curved road [12].

Drowsy driving is the primary hassle seen at some stage in the world. This generally happens when the driver is feeling sleepy and may additionally lead to accidents. The moto of the project is to reduce accidents due to driver error, distractions and drowsiness [6] and the mission helps driver to hold him alert by using an alarm. The Project keeps record of the lane on roadways and whenever vehicle crosses the lane or go out the lane, guidance of the vehicle is mechanically controlled. Taking lane as the reference, if automobile crosses the lane, a signal is sent to provide an alarm to driver and manipulate the guidance of the vehicle.

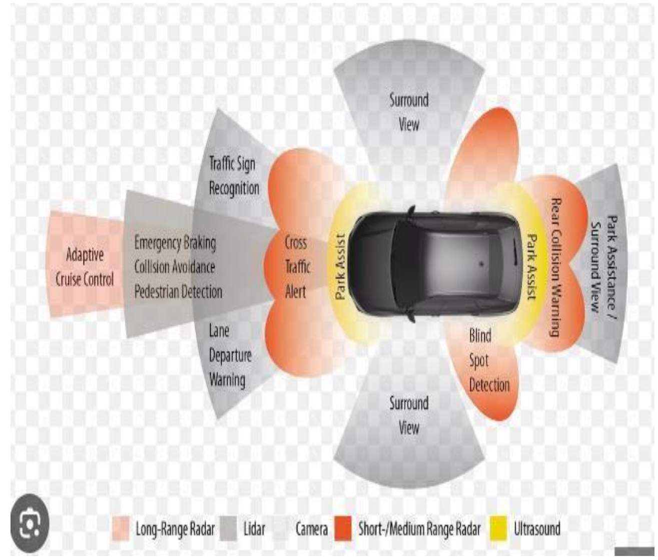

Figure 1: ADAS Sensors

II. LITERATURE SURVEY

[1] Yousuke Yamaguchi et al. acquired an expected steering characteristic of steering by wire vehicle using adoptive control methods. [1, 2] Paul Yih tried to modify the handling characteristic by discussing the driver's steering commands with full car state feedback. [3] Holly E. B. Russell and J. Christian Gerdes discussed the design method of variable handling characteristic of four wheel steering by wire.[4] J. S. IM et al. proposed a novel bilateral control scheme. Sohel Anwar and Lei Chen found a new analytical method to reduce the number of sensors on a triply redundant steering by wire system based on a novel observer. [7] D. PAUL and T. H. KIM designed a new steering wheel system equipped with a new wireless angle sensor to evaluate the characteristic of steering by wire system. [8] Hai Wang represented the steering by wire system with a nominal model and an unknown gain, and designed a side-mode compensator to less the effect of both the unknown system dynamics and uncertain road conditions on the steering performance.

[3]A. Emre Cetin [2], and a control design based on energy optimal was presented byArslan, M.S. and N. Fukushima present to improve the steering performance of the vehicle.[10] Daher, N. et al. discussed the efficiency of a Displacement controlled steering comparing with the conventional valve control steering by wire system[11]. But Methods on how to reduce the energy consumption motor driving steering by wire system are not found in literatures.

As to the Steering wheel systems, most researchers only thought of it as a simple mechanism composed of motor andsteering wheel, whose researches are focused on methods of acquiring, calculating and simulating of road feel precisely. Abhijit Baviskar designed a nonlinear adaptive tracking controller which could modify the steering "feel" online to suit different driving scenarios and safety requirements.

[4] Avinash Balachandran et al. used the steering wheel angle, front wheel angle, lateral force of the front

angle and slide angle of the front wheel as input parameter to calculate the needed motor torque. [12] Karimi, D. et al. discussed the design and calculation of road feel feedback torque of steering by wire of agriculture vehicle. Seong Han Kim et al. proposed a novel manual steering torque estimation model based on vehicle dynamic model. [13] Ahmet Kirli et al. presented a hysteresis-based online optimization model of road feel and demonstrate the quality the optimization by testing.

[5] K. T. R. Van Ende implemented the technology of neural networks to evaluate the uncertain steering torque. [16] Avinash Balachandran and J. Christian Gerdes used objective measuring method to design the road feel of the steering by wire vehicle and acquired the artificial feel model according to emulating conventional steering Feel.[17] Avinash Balachandran and Matthew J. Jensen also finished the modelling and predict controlling of road feel torque during their research of obstacle avoidance. [18, 19]

In addition, Diomidis I. Katzourakis et al. develop a high- fidelity FF steering device and achieved highly accurate simulating of feel torque. [20] A. Rodriguez-Angeles et al designed the road feel model of the steering by wire system with active disturbance rejection control methods.

III. PROPOSED METHODOLOGY

Design of automatic steering control system for automobilesis initiated with the design of simple chassis for the prototypeand the selected material for the chassis has to carry all the weight of electronic components which are to be used for thedevelopment of model which includes various types of motorand its specification that are to be used to run the model, the sensors to be used,the microcontroller, the motor drivers, the wheels and other electronic components to be used on the model. gives an overview of how the design of Sensor based Automatic Steering control system for Automobiles is designed and assembled. It starts with deciding on the how the sorting of items is done and ends with the testing and analysis. Illustrates the working of Automatic Steering control system for Automobiles which starts by uploading the pre-defined path to the model that needs to be moved like a vehicle, the vehicle moves forward or backward my checkingfor obstacles and avoids them if any.

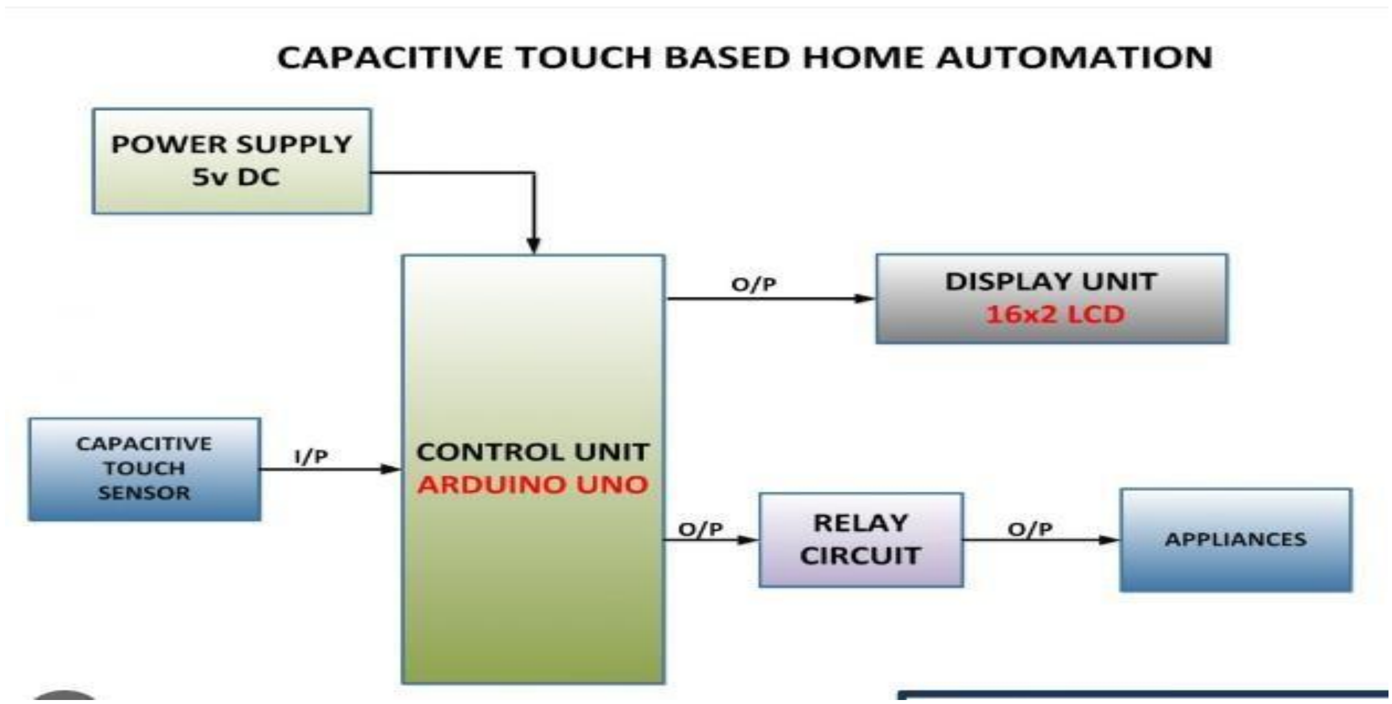

Figure 2: Block diagram of home Automation

Ultrasonic sensor is used for route detection and for obstacles during motoring. The obstacle will be sensed and for that reason exchange the path. To decide the position, GPS is used. Ultrasonic sensor receives the signal from satellite television for personal computer and Arduino from GPS received the same signal. The geographical coordinates are read by GPS of a vicinity with the assist of the signals obtained from countless satellites orbiting the earth. For conversion of one form of energy to another, an ultrasonic sensor is used which always consists of transducer. The ultrasonic waves into the air are transmitted by ultrasonic sensors and the mirrored waves are detected from an object. Both ultrasonic sensors and GPS work simultaneously. These offers alerts to the Arduino. Arduino will process and give the output to DC motor and servo motor. Steering is used for altering the turning perspective to keep away from accidents..

The experimental purpose and futuristic insight of the ADAS for an electric vehicle are completed based on the various user-defined physical inputs using software such as Simulink in MATLAB. The proposed methodology is based on the various inputs in the cloud infrastructure from which the behavior of electric vehicles for different drive cycles in series, parallel and hybrid configurations [14] are analyzed continuously.

The overall working system involves the end nodes, the control cloud hub, and the cloud database as mentioned in In the proposed work, the end nodes are the vehicles that are interfaced with the communication module. In this work, each vehicle sending its performance data such as state of charge (SOC), input power, average speed, and distance.

IV. RESULTS

The entire work proposed has been completed with the aspect to the software and hardware codesign process for the system exhibited. To simulate a vehicle dynamic in a drivable model, the Simulink design in MATLAB. This simulation is implemented to generate real-time data during an electric vehicle drive cycle. These generated data are used as the performance metrics in our proposed work. Any vehicle parameters determine the vehicle performance such as SoC, traction rate, voltage input, and weight of the vehicle.

The major four critical parameters of a car that has been monitored are input speed (speed from battery drive cycle), actual vehicle speed, SOC for the motor performance, and the power applied to motor gear from the power controller as thespeed at the MG input system.

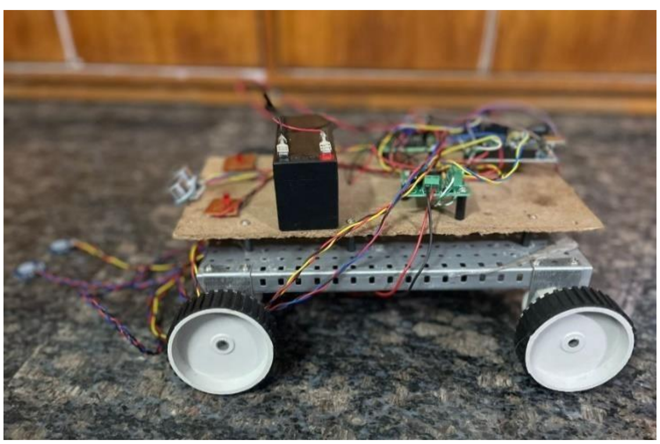

Figure 1: Results of ADAS using touch Sensor

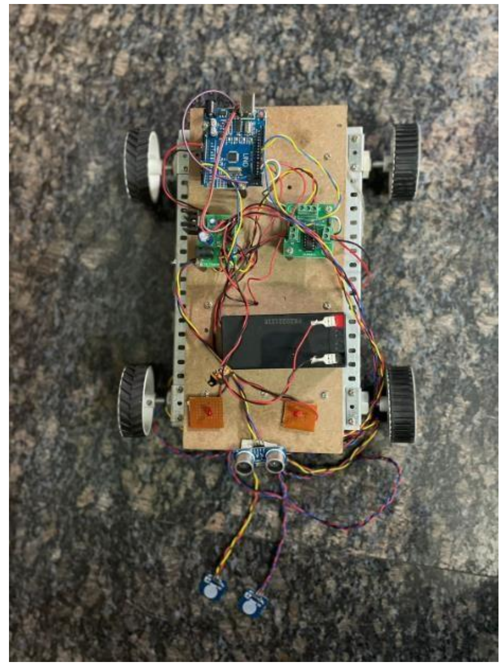

Figure 2: Results of ADAS using touch Sensor

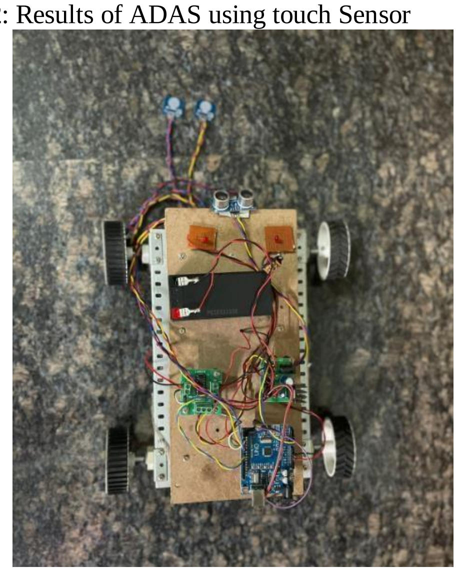

Figure 3: Results of ADAS using touch Sensor

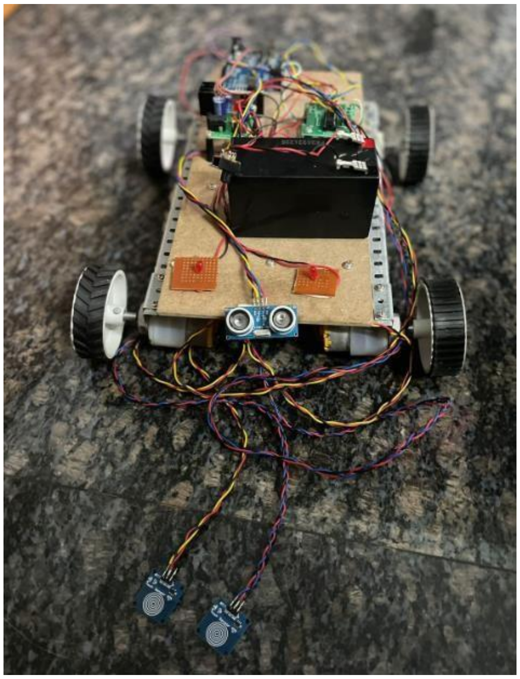

Figure 4: Results of ADAS using touch Sensor

Based on the thickness of the wheel, the length of the knuckleis assumed. The end point of the knuckle which will be attached to the frame is joined to the centre point of the rear axle in order to achieve 100% Ackerman. By assuming the length of the tripod and keeping the width of the tripod as 3 cm, a value for the steering arm and joined the end of the steering arm to the end of the tripod known as tie-rod. Iterations are performed for turning radius. After getting the required turning radius, inner and outer wheels turning angles are calculated by using the below formulae.

V. CONCLUSION

Collision detection and avoidance systems should emerge asmore common area with the passage of time. People are residing in a networked world and continuously feel that theyhave less time on their hands. It has been jokingly said, that ‘‘The extra developed a country is, the greater time it'scitizens waste behind the steering wheel.” To ideal this technique, it would possibly take various years, but thisassignment is really a step in the right direction. Prevention is better than cure. So rather of treating sufferers after an accident, accidents ought to be avoided by incorporating this system. The central theme of Automated automobile control system is to improve the throughput and safety of motor way traffic by way of the usage of computerized control with its precision and quickly react to substitute human drivers.

The sensors which we used has less sensing ability, so insteadof using those sensors usage of more reliable can give us effective performance. So that it will detect the obstacle accurately and more precisely in less time. By using wheel encoders one can input a predefined path, so that the vehicle can travel to the desired location accurately, which improves maneuverability of vehicle. The vehicle we developed requires more power sources so that it leads to increase in weightage so it leads to decrease in speed so to overcome thisa single battery of required power supply is used so that a single battery is enough to provide power supply to all partswhich in turn reduces weight on vehicle and provides more speed for the vehicle to move.

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