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SHARED STEERING CONTROL BETWEEN A DRIVER AND AN AUTOMATION: STABILITY IN THE PRESENCE OF DRIVER BEHAVIOR UNCERTAINTY

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Abstract: Presently a-days the Automatic control has been progressively executed for vehicle control framework. Particularly the controlling control is fundamental for counteracting mishaps. In the current frameworks there is no completely programmed directing control and it has significant issues. When it is made programmed, the framework multifaceted nature is more. In this way, the common directing idea is utilized as a part of the proposed framework to maintain a strategic distance from mishaps. In this, the position of the street is discovered utilizing the web camera introduced before the vehicle which is associated with the PC introduced with MATLAB. Utilizing MATLAB the picture is prepared to check the street qualities. This paper displays a propelled driver help framework (ADAS) for path keeping, together with an examination of its execution and steadiness as for varieties in driver conduct. The car ADAS proposed is intended to share control of the directing wheel with the driver in the most ideal way. Its improvement was gotten from a H2-Preview enhancement control issue, which depends on a worldwide driver– vehicle– street (DVR) framework. The DVR demonstrate influences utilization of a computerized driver to model to consider any driver–vehicle connections. Such a plan permits 1) Considering driver help participation criteria in the control blend, 2) enhancing the execution of the help as an agreeable copilot, and 3) examining the strength of the entire framework within the sight of driver demonstrate vulnerability. The created help framework enhanced path keeping execution and lessened the danger of a path flight mischance. Great outcomes were acquired utilizing a few criteria for human– machine collaboration. Poor steadiness circumstances were effectively maintained a strategic distance from because of the vigor of the entire framework, disregarding an extensive scope of driver demonstrate vulnerability.

Keywords: Driver model, H2-Preview, lane keeping, shared steering control, vehicle lateral control

I.INTRODUCTION

Driving is an unsafe action that can have genuine human and financial results. As per the measurements, unintended path takeoff is the second most incessant sort of single light-vehicle mischances . By and large, the mishaps can be credited to corruption in driver execution, which is caused by such factors as exhaustion, sluggishness, or absentmindedness. This reality has propelled significant research exertion went for helping drivers and enhancing security, especially using dynamic frameworks that can possibly counteract vehicle mischances. A few propelled help frameworks have been proposed throughout the most recent decade to enhance vehicle horizontal control . Some of them depend on the guideline of common control between the driver and the mechanization framework. The test in outlining such human–machine cooperation is the manner by which to join the versatility of people with the exactness of machines since manual control undertakings are inclined to human mistake, and completely robotized assignments are liable to far reaching restrictions. As of late, an option arrangement, known as haptic shared control or haptic direction, has gotten expanded consideration. In the common control worldview, the machine's manual control Interface is mechanized to permit both a human and a controller to have the capacity to apply control at the same time. In such a setup, the haptic interface can detect the activity of the administrator and encourage the powers back to him. Shared control has been examined for an extensive variety of utilizations, e.g., in the control of autos And flying machine, or amid tele-worked control to help protest control, surgery, smaller scale get together or the controlling of unmanned elevated vehicles. Haptic criticism on the directing wheel is accounted for in the writing as a promising approach to help drivers amid a guiding errand. One effective acknowledgment is the path keeping help framework (LKS), which constantly creates torque on the guiding wheel to coordinate anticipated horizontal path deviations. Subsequently, both the driver and the emotionally supportive network add to the controlling assignment. The advantage is that the driver knows about the framework's activities and can overrule them. Such LKS frameworks are regularly composed in light of a vehicle–street (VR) display and consider driver activity as an aggravating sign. In this manner, these frameworks don't ensure the worldwide steadiness of driving and can't give a strength examination within the sight of varieties in driver's conduct. An execution investigation of LKS frameworks has featured the way that the vehicle and the driver shape a human–machine framework. Such a framework ought to be considered all in all to build up an agreeable co-pilot that screens the driver's control activities, and comprehends and adjusts them if fundamental.

II.LITREATURE SURVEY

Jose I. Hernandez and Chen-Yuan Kuo, in 2003 proposed a **Steering Control of Automated Vehicles Using Absolute Positioning GPS and Magnetic Markers** (IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, VOL. 52, NO. 1, JANUARY 2003) Controlling control for traveler autos on mechanized thruways is investigated. Possibility of a programmed directing framework in light of supreme situating worldwide situating framework (GPS) and an attractive marker direction framework has been assessed utilizing PC reenactments. State estimation and control calculation issues are inspected for such control framework.

By utilization of GPS and an attractive marker sensor, an exact and ongoing estimation of the vehicle's parallel relocations as for the street can be expert. A directing control calculation in view of street ebb and flow review for accomplishing great street following and giving ride comfort is additionally introduced.

Jóse E. Naranjo, Carlos González, Ricardo García, Teresa de Pedro, and Rodolfo E. Haber, in 2005 proposed a **Power- Steering Control Architecture for Automatic Driving** (IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 6, NO. 4, DECEMBER 2005) The unmanned control of the steering wheel is, at present, one of the most important challenges facing researchers in autonomous vehicles within the field of intelligent transportation systems (ITSs). In this paper, we present a two-layer control architecture for automatically moving the steering wheel of a mass-produced vehicle. The first layer is designed to calculate the target position of the steering wheel at any time and is based on fuzzy logic. The second is a classic control layer that moves the steering bar by means of an actuator to achieve the position targeted by the first layer. Real-time kinematic differential global positioning system (RTK-DGPS) equipment is the main sensor input for positioning. It is accurate to about 1 cm and can finely locate the vehicle trajectory. The developed systems are installed on Citroën Berlingo van, which is used as a testbed vehicle. Once this control architecture has been implemented, installed, and tuned, the resulting steering maneuvering is very similar to human driving, and the trajectory errors from the reference route are reduced to a minimum. The experimental results show that the combination of GPS and artificial-intelligence-based techniques behaves outstandingly. We can also draw other important conclusions regarding the design of a control system derived from human driving experience, providing an alternative mathematical formalism for computation, human reasoning, and integration of qualitative and quantitative information.

A. Emre Cetin, Mehmet ArifAdli, DuygunErolBarkana and HalukKucuk, in 2010 proposed a**Implementation and Development of an Adaptive Steering-Control System** (IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, VOL. 59, NO. 1, JANUARY 2010) An adaptive steering-control system for a steer-by-wire system, which consists of a vehicle directional control unit and a driver-interaction unit, is developed. The adaptive online estimation method is used to identify the dynamic parameters of the vehicle directional-control and driver interaction units. A nonlinear 4-degree-of- freedom (DOF) vehicle model, including the longitudinal, lateral, yaw, and quasi-static roll motions, is derived using Newtonian mechanics to simulate and test the adaptive steering-control system. Experimental results are performed to demonstrate the efficacy of the proposed

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adaptive steering-control system.

Xiang Chen, Tiebao Yang, Xiaoqun Chen, and KeminZhobw, in 2008 proposed a **Generic Model-Based Advanced Control of Electric Power-Assisted Steering Systems** (IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY, VOL. 16, NO. 6, NOVEMBER 2008) Electric power-assisted steering (EPS) systems have been used to replace traditional hydraulic power steering systems in vehicles. In an EPS system, the assisting steering torque is from an electric motor. In principle, the control of an EPS system involves two aspects: 1) motor torque control to satisfy thetorque requirement and 2) steering motion control to yield a satisfied feeling of the driver during the steering process in a disturbed environment. In this paper, a column-mounted steering system is taken as a generic target system to illustrate a model-based approach for advanced steering control design. In particular, we present a two-controller structure proposal for the generic EPS system, addressing motor torque and steering motion, by applying 2 and design methods, respectively. Controller model reduction is also discussed and compared to show that, actually, a reduced-order controller could be applied. This is important for industrial applications because a reduced-order control law costs less in computing resources. Finally, simulation for the EPS control system is discussed and a software-in-loop approach is presented using offs-the shelf Software. It is interesting to see that, based on the simulation results, the advanced two-controller design yields superior performance to the one-controller structure for the steering control.

Yoshiyuki Tanaka, Naoki Yamada, Toshio Tsuji, and TakamasaSuetomi, in 2014 proposed a **Vehicle Active Steering Control System Based on Human Mechanical Impedance Properties of the Arms** (IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 15, NO. 4, AUGUST 2014) It presents the experimental data of human mechanical impedance properties (HMIPs) of the arms measured in steering operations according to the angle of a steering wheel (limbs posture) and the steering torque (muscle cocontraction). The HMIP data show that human stiffness/viscosity has the Minimum/maximum value at the neutral angle of the steering wheel in relax (standard condition) and increases/decreases for the amplitude of the steering angle and the torque, and that the stability of the arms' motion in handling the steering wheel becomes high around the standard condition. Next, a novel methodology for designing an adaptive steering control system based on the HMIPs of the arms is proposed, and the effectiveness was then demonstrated via a set of double-lane-change tests, with several subjects using the originally developed stationary driving simulator and the 4-DOF driving simulator with a movable cockpit.

III.PROPOSED SYSTEM

Before to introduction of electronic

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modules in automotive the vehicle is fully controlled by human and after that the vehicle is partially controlled by embedded control system and now the automated systems were developed to control the vehicle without any human interaction. But there is a problem in human-machine interaction system because manual control vehicle tasks are prone to driver error, and fully machine controlled tasks are subjected to wide–ranging of limitations. Finally, in this work a solution is given by providing a switching operation between the embedded control system and the driver by providing sharing of steering between the ECS or driver.Many advanced assistance systems have been developed over the last decade to improve vehicle lateral control. Some of them (man-machine systems) developed based on the principle of mutual control between driver and automation system. In man-machine systems, the mechanical response of the Control interface (e.g., knob, mouse, joystick, steering wheel) to the action of a human is not typically considered as a feedback signal to the human operator. Rather, a visual or auditory sensory input closes the loop in the traditional manual control analyses. In many cases, the response from the control interface does not carry information pertinent to the execution of manual control.

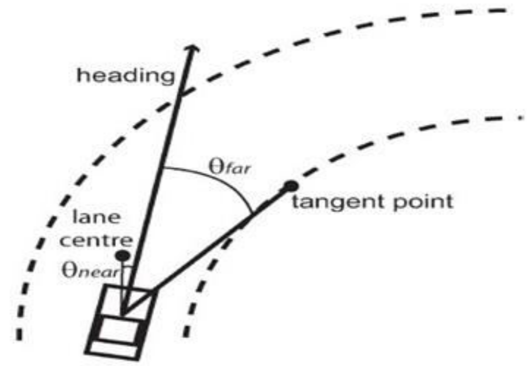

Fig .1 Road pattern

IV.IMPLEMENTATION

A steering control concept is implemented. The figure 1 shows the general road pattern and the position of the car. Based on the road pattern and the obstacle present on the road the vehicle need to adjust its position. The position of the object is given as input using the push buttons and based on this position, the steering is adjusted. Using PSIM, code was build and with the help of PROTEUS the simulation is done.

WORKING:

The system consists of two push buttons, DC motor (act as an engine), a stepper motor (act as a steering wheel) and a LCD display to display the status of the movement of the car. The push button is used to show the obstacle position.Initially when the supply is given the motor starts rotate. After some time, the position of the obstacle is given using the push buttons. If the obstacle is found in the right direction then the speed of the vehicle gets reduced and the steering (stepper motor) starts rotate in the left direction. After the steering gets adjusted

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to some position the motor starts to run in its original speed. If the obstacle is found in the left position then the speed of the vehicle gets reduced and the steering starts rotate in the right direction. After the steering gets adjusted to some position the motor starts to run in its original speed. This method also help us to overcome the over steering and under steering problem.

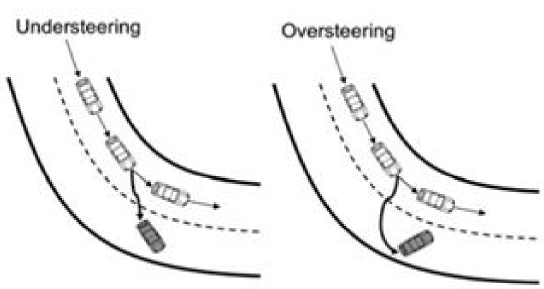

Fig 2 Understeering and Oversteering

Depending on the situation to enhance vehicle controllability by preventing skidding in cases of under steering or over steering. If the car understeers (i.e. the front wheels begin to skid), ESC decelerates the rear inner bend wheel (Figure 2 (left)). As a result, the car's heading is corrected, and the vehicle can safely continue to take the bend. If the car oversteers (i.e. the rear wheels begin to skid), ESC decelerates the front outer bend wheel (Figure 2 (Right)), which has the same benefits.

V.SIMULATION RESULTS

If Lane is normal and there is no obstacle in front of vehicle, then the vehicle is move in a particular direction without interference of the control signal from the steering.

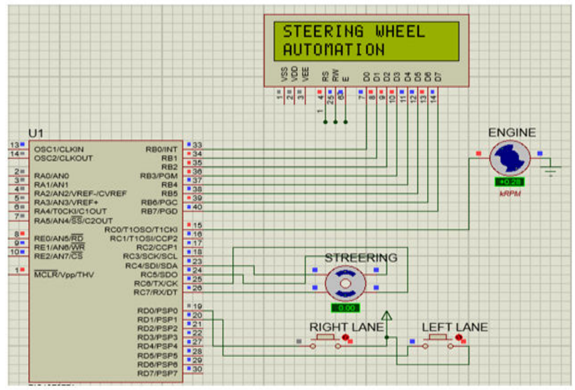

Fig 3. Initial Condition

If any object is found on the lane, then the corresponding signal is given to the controller and based on that, the position of the steering gets adjusted. If the vehicle detects the obstacle in the right side border of the lane then the vehicle become automatically slow and taking the left side of the lane. Fig 7.2 shows the left rotation of the steering wheel.

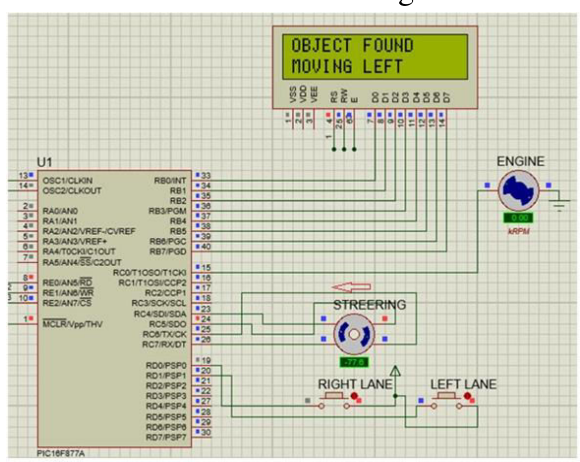

Fig 4. Left Direction

Similarly, if the vehicle detects the obstacle in the left side border of the lane then the vehicle become automatically slow and taking the right side of the lane. Fig 7.3 shows the direction of the vehicle after it detects the object in the left side. Fig7.3 shows the left rotation of the steering wheel.

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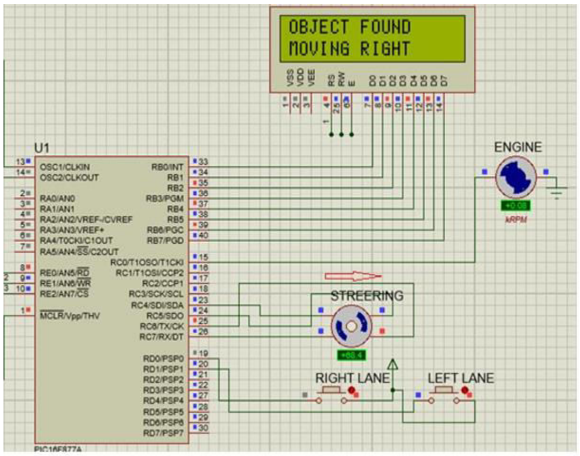

Fig 5. Right Direction

V. CONCLUSION

This model is best reasonable for electric autos; with a few adjustments this can be material to the autos which contain motors. In the operation there are different cases as takes after; if Lane is ordinary and there is no snag before vehicle. On the off chance that the vehicle crossing the correct side fringe of the path then the vehicle turn out to be naturally moderate and taking the left half of the path. In the event that the vehicle crossing the left side outskirt of the path then the vehicle turn out to be consequently moderate and taking the correct side of the path.

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