International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Automatic Vehicle Speed Control System

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ABSTRACT—

Automatic Vehicle Speed Control System (AVSCS), commonly referred to as cruise control, is an innovative technology integrated into modern automobiles to enhance driving comfort and safety. This abstract elucidates the principles, functionalities, and benefits of AVSCS. AVSCS enables drivers to maintain a constant speed without continuous manual throttle control, thereby reducing driver fatigue during long-distance journeys. The system consists of several components, including sensors, an electronic control unit (ECU), and actuators. Upon activation, the driver sets the desired speed using controls typically located on the steering wheel or dashboard.

Keywords: Speed control, Actuators, Sensors, ECU.

Introduction

The advent of modern automotive technology has brought about significant advancements aimed at enhancing both the comfort and safety of driving experiences. Among these innovations stands the Automatic Vehicle Speed Control System (AVSCS), more commonly known as cruise control. This introduction provides an overview of AVSCS, its evolution, and its importance in contemporary automobiles. AVSCS represents a milestone in automotive engineering, offering drivers a convenient means of maintaining a steady speed without the need for continuous manual throttle control. The system is particularly valuable during long-distance journeys, where sustained speed can reduce driver fatigue and enhance overall comfort. By allowing drivers to set a desired speed and relinquish constant throttle input, AVSCS promotes relaxation and attentiveness on the road.

LITERATURE SURVEY

A Review on cruise control system by M. H. Rahman: This paper provides an overview of cruise control systems, including their working principles, types, and applications.

"Adaptive Cruise Control: A Review" by R. Rajamani: This review paper discusses the principles and advancements in adaptive cruise control (ACC), a variant of AVSCS that adjusts vehicle speed to maintain safe distances from preceding vehicles.

"Intelligent Speed Control System using Wireless Communication" by K. S. Reddy, B. B. Appa Rao, and M. V. Prasad. The authors propose an intelligent speed control system that utilizes wireless communication for real-time speed regulation, enhancing both safety and convenience for

Drivers.

"Design and Development of Automatic Speed Control System Using RFID Technology" by S. K. Gupta and A. K. Gupta: This paper presents a novel approach to AVSCS using Radio-Frequency Identification (RFID) technology for automatic speed regulation based on predefined speed limits.

"Performance Analysis of Fuzzy Logic Based Cruise Control System" by M. Mohanraj and S. Kannan: The authors analyze the performance of a fuzzy logic-based cruise control system, assessing its effectiveness in maintaining vehicle speed under varying driving conditions.

"Driver Acceptance of Adaptive Cruise Control" by S. Lee, C. Boyle, and N. N. Sadek: This study investigates driver acceptance and behavioral responses to adaptive cruise control systems, shedding light on factors influencing user adoption and trust in AVSCS technology.

"Safety Analysis of Automated Vehicles with Adaptive Cruise Control" by J. Gao, H. Peng, and F. Borrelli: The authors conduct a safety analysis of automated vehicles equipped with adaptive cruise control, addressing collision avoidance strategies and reliability considerations for AVSCS.

"A Review on Vehicle Speed Control Using Intelligent Adaptive Cruise Control System" by S. Patel and V. A. Parekh: This review paper provides insights into the integration of intelligent technologies such as artificial intelligence and machine learning into adaptive cruise control systems for enhanced vehicle speed control.

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TECHNOLOGY

Automatic Vehicle Speed Control Systems (AVSCS), commonly known as cruise control, utilize a combination of technologies to achieve their functionality. Here are the key technologies typically employed.

SENSORS: AVSCS relies on various sensors to gather data about the vehicle's speed, position, and surrounding environment.

SPEED SENSORS: Wheel speed sensors or vehicle speed sensors measure the vehicle's speed and provide feedback to the control System.

RADAR OR LIDAR SENSORS: Advanced systems, such as adaptive cruise control (ACC), use radar or lidar sensors to detect the distance and relative speed of vehicles ahead. This information is crucial for adjusting the vehicle's speed to maintain a safe following distance.

CAMERA SYSTEMS: Some AVSCS systems incorporate camera-based technologies for lane detection and traffic sign recognition, allowing for more intelligent speed control based on road conditions.

ELECTRONIC CONTROL UNIT (ECU)**:** The ECU serves as the brain of the AVSCS, processing sensor data and making decisions about throttle adjustments to maintain the desired speed. It runs control algorithms and communicates with other vehicle systems to ensure smooth operation.

ACTUATORS: Actuators are responsible for physically adjusting the throttle position to control the vehicle's speed. In modern vehicles, throttle control is often achieved through electronic throttle control (ETC) systems, which use actuators to open or close the throttle valve based on signals from the ECU.

COMUNICATION SYSTEMS**:** In some AVSCS implementations, communication systems play a role in exchanging data with external sources. For example, connected vehicle technologies can enable AVSCS to receive real-time information about traffic conditions, road closures, or speed limit changes, allowing for more adaptive speed Control.

CONTROL ALGORITHMS: Control algorithms determine how the AVSCS responds to input from sensors and adjusts the throttle to maintain the desired speed. These algorithms may vary in complexity, ranging from simple proportional-integral-derivative (PID) controllers to more advanced adaptive or predictive control strategies.

HUMAN MACHINE INTERFACE (HMI)**:** The HMI provides the interface through which the driver interacts with the AVSCS. This typically includes controls for activating, setting, and deactivating the system, as well as indicators or displays to convey information about the system's status and Operation.

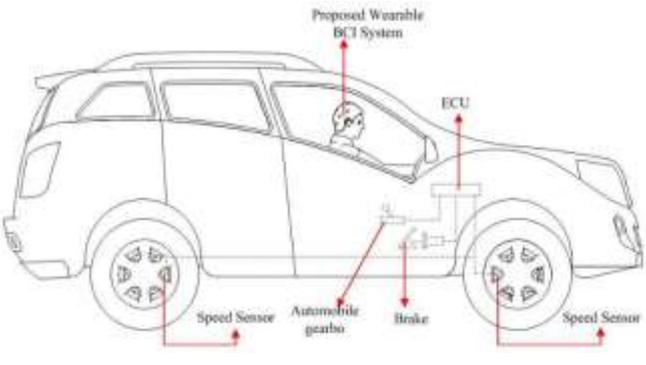

FIG 1. A Vehicle Active Safety Model

WORKING PRINCIPLE

Automatic Vehicle Speed Control Systems (AVSCS) use various technologies and mechanisms to control a vehicle's speed automatically. Here's a general overview of the working principles typically involved :

SPEED SENSING: AVSCS relies on sensors to continuously monitor the vehicle's speed. These sensors could be wheel speed sensors, radar sensors, lidar sensors, or camera-based systems. The sensors detect the current speed of the vehicle and send this information to the control unit.

TARGET SPEED SETTING: The driver sets a target speed, either manually or through preset options in the vehicle's control interface. This target speed serves as the reference point for the AVSCS.

CONTROL ALGORITHM: The control unit or Electronic Control Unit (ECU) processes the information received from the speed sensors and compares it with the target speed set by the driver. Based on this comparison, the control algorithm determines whether the vehicle needs to accelerate, decelerate, or maintain its current speed.

THROTTLE CONTROL: To adjust the vehicle's speed, the AVSCS can control the throttle electronically. If the vehicle needs to accelerate or maintain speed, the system can increase the throttle opening to allow more air and fuel into the engine, thereby increasing power output. Conversely, if the vehicle needs to decelerate, the system can reduce the throttle opening, limiting the engine's power output.

BRAKING CONTROL: In addition to throttle control, some AVSCS also have the capability to apply brakes if necessary. This could be achieved through systems like adaptive cruise control, which uses radar or lidar to detect vehicles ahead and adjust speed accordingly by braking when needed.

FEEDBACK LOOP: The system continuously monitors the vehicle's speed and adjusts the throttle or applies brakes as necessary to maintain the desired speed. This creates a closed-loop feedback system where the vehicle's actual speed is constantly compared to the target speed, and adjustments are made accordingly.

INTEGRATION WITH OTHER SYSTEMS: AVSCS may integrate with other vehicle systems such as traction control, stability control, and anti-lock braking systems (ABS) to ensure smooth and safe operation under various driving conditions.

Overall, the working principle of an AVSCS involves real-time monitoring of the vehicle's speed, comparison with a target speed, and automatic adjustment of throttle and brakes to maintain the desired speed set by the drive.

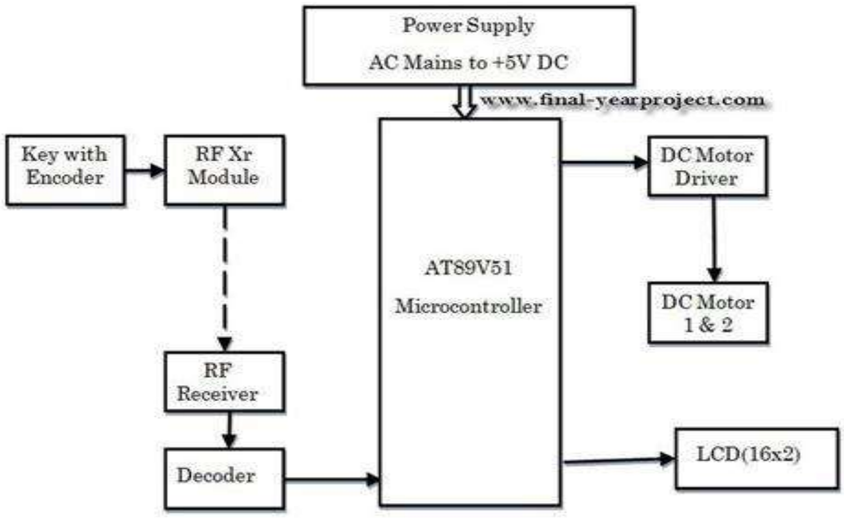

FIG 2. Block Diagram of speed control system using RFID.

APPLICATONS

Automatic vehicle speed control systems, often referred to as cruise control systems, have various applications across different domains. Here are some of the key applications:

AUTOMOTIVE INDUSTRY: Cruise control systems are commonly integrated into modern vehicles as a standard feature. They offer convenience to drivers by maintaining a constant speed set by the driver, which can enhance fuel efficiency and reduce driver fatigue during long highway journeys.

TRAFFIC MANAGEMENT: In intelligent transportation systems (ITS), automatic speed control systems can be used to manage traffic flow and reduce congestion on highways. By controlling the speed of vehicles and maintaining safe distances between them, these systems can optimize traffic flow and improve overall road safety.

PUBLIC TRANSPORTATION: Automatic speed control systems can be implemented in buses, trains, and other forms of public transportation to ensure safe and efficient operation. These systems help in maintaining consistent speeds, especially on routes with varying terrain and traffic conditions.

ENVIRONMENTAL IMPACT REDUCTION: By promoting smoother driving and optimizing fuel consumption, automatic speed control systems can contribute to reducing vehicle emissions and minimizing the environmental impact of Transportation.

SPECIALIZED VEHICLES: Automatic speed control systems can be utilized in specialized vehicles, such as agricultural machinery and construction equipment, to optimize performance and ensure safe operation in various working Conditions.

MILITARY APPLICATIONS: In military vehicles, automatic speed control systems can be used to maintain consistent speeds during patrols or convoy operations, allowing for better control and coordination among Vehicles.

References

[1] Amulya A M, et.al., Intelligent speed control system, Volume 5, Issue 4, April 2018, pp.2537-2540.

[2] Vaishal B. Niranjane, et.al., Automatic Vehicle Speed Control System Using Zigbee Technology, IJEECS ISSN 2348-117X Volume 6, Issue 3.

[3] Gummarekula Sattibabu, et.al., Automatic Vehicle Speed Control With Wireless In-Vehicle Road Sign Delivery System Using ARM 7, Volume 2, Issue 8, pp.32-34.

[4] Amruta Ramase, et.al., Automatic Speed Control of Vehicle Using RF Communication, pp.419-422.

[5] A Vengadesh, et.al., Automatic Speed Control of Vehicle in Restricted Areas Using RF and GSM, Volume 02, Issue 09, December 2015, pp.875-877.

[6] Akash Batra, et.al., Automatic Car Speed Control with Wireless RF Control, ISSN: 2277-9655, et al., 7(4): April 2018, pp.592-597.

[7] R. Ashok Kumar et.al., A Beacon Based Automatic Vehicle Speed Control System for Restricted Zone, Volume 7, Issue X, October 2018, pp.1152-1159.

[8] Shankhavi K B, et.al., Vehicle Speed Control using RF Communication, Volume 13, Issue 1, May 2016, ISSN: 2349 – 9303.

[9] R. Deepa. Design of Vehicle Speed Control System Using Wireless Instrument Cluster, Volume 4, Issue 1, January 2015.

[10] Sunil R Kewate, et.al., Automatic speed control system by the color sensor for automobiles – An innovative model based approach, ISSN 2250-3234, volume 4, number 2 (2014), pp. 223-230.

[11] Dr. K.S. Tamilselvan, et.al., Android Based Vehicle Speed Control System in Critical Zone Using GPS Technology, volume 7, issue 6, June 2018, pp.639-644.

[12] K. Govindaraju, et.al., Embedded Based Vehicle Speed Control System Using Wireless Technology, Volume 2, Issue 8, August 2014, pp.1841-1844.