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SMART VEHICLE SYSTEM

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Abstract—Smart vehicle systems constitute solutions that digitize the number plate of the vehicle to enhance the number plate system. The proposed system, being a model that can readily be fitted into the automobiles, is developed as a smart and resourceful traffic analysis and monitoring platform by the application of advanced technologies including IoT and communication systems. The basic elements are the smart licenses equipped with RFID and IoT sensors. They ensure uninterrupted communication between vehicles and other systems and even data exchange occurs without delay. The system puts out of sight the traffic accident along with vehicular thefts and vehicle misappropriations as smart transportation promises establishment of a future that looks more safer, efficient and connected in much more considerable levels from which it just seems to transcend mere transportation. This is toward the smart, data-driven solution for improving user experience and their well-being.

I. INTRODUCTION

To check the casual affixation of stickers on the motorized vehicles, Greater Chennai Traffic Police have initiated checking with fine collection of automobiles wherein unauthorized stickers are affixed. Cases under Section 198, Motor Vehicle Act, 1988 for unauthorized tampering of motor vehicle and Central Motor Vehicles Rule 50-Section 177, MV Act relating to defective number plate are also being filed against the erring persons from 2nd May 2024. "We were targeting vehicles which had 'Police' and 'Defence' stickers or number plates that were intentionally defaced," said the senior police officer. It is levied a ₹500 fine at the first offence. The traffic police had also warned the offenders to issue a fine of Rs 1,500 if repeated again. As many as 427 cases were booked and challan issued to the violators".

II. .PROBLEM DEFINITION

The automobile industry's production becomes obsolete, and smart cars face all the issues of olden transport. Today's cars lack technology that improves performance and road safety. Fraud and car theft: Avoid the case of fake licenses and fraud such as photocopying, change or developing the license for the purpose of car theft, hit and run or other crimes. Deploy some technological solutions like RFID tags, Arduino cards, QR codes, or other special symbols to make the license more secure and avoid more cases of fake public safety issues: The number of licenses valid to avoid will be reduced. The crime, toll on the transportation of persons or crimes plus posing any danger to public safety.

III. ORIGIN OF THE PROBLEM

Demand: Some causes of demand for more brilliant car which brings in growth of the market of competition, and has various drawbacks against the traditional car making industry. Technology The difference is increased of vehicle manufacturing segment from the standpoint of sensors connectivity and intelligence. Traditionally constructed vehicles have some amount of difference in competition and, therefore, cannot compete. The advent of smart devices, IoT, and complex computing systems gives an opportunity to change the way traffic and the environment interact. Increasing traffic: With the increased population and urbanization, traffic congestion has captured most cities. Traffic management systems are unable to adapt to the nature of traffic patterns. The use of real-time information and communication can make smart vehicles optimize traffic flow and reduce congestion. Safety issues: With the advancement in vehicle safety, the rate of accidents and deaths on the roads is still high. Most accidents result from human error, and the smart car with advanced driver assistance systems can reduce accidents and make it safer.

IV. MOTIVATION FOR THIS PROJECT

This is what these elements will collectively prove, where the demand for smart cars ranges from technologies that can tackle the present-day limitations to forge a future road of transport that is safer, more effective, and highly connected. The statement is the basis for carrying out research, development, and innovation in order to achieve all the challenges within the industry of automobiles that will dawn a new era of both intelligence and technology, where its last beneficiaries are realized.

V. BENEFICIARY OF THE FINAL PRODUCT

The collision management and intelligent driving Smart car product has beneficiaries among the drivers, passengers, and pedestrians who have made them safe and improved. By this means, fleet operators get an opportunity to upgrade their skills in fleet management, optimal routes, and decrease costs of operation. It will help the city and transport authority as mobility increases, thus reducing traffic congestion, improving access to vital information, and better decision-making information. Automobile manufacturers and technology providers see an opportunity for diversification of business and ancillary revenues. Insurance companies take advantage of the opportunity in risk reduction and change in insurance consumption behavior. The module is an incentive to incentives for energy saving towards the achievement of development goals. It is also a beneficiary of environmental protection and conservation organizations. Road safety, transportations, and management improve for the government and their regulatory authorities. Smart car system modules actually help various stakeholders realize a safer, more efficient and greener transportation in the not-too-distant future. Organisations appreciate the model promoting energy-efficient driving and contributing to achieving their sustainability and developmental goals. Governments and regulatory agencies have benefited with enhanced safety features on the roads and knowledge of information support developments of policies and regulations related to transportation. In fact, modules of the smart car system will help many stakeholders and contribute to safer, more efficient, and greener transportation in the future.

VI .CASE STUDIES

Smart cars and intelligent transportation technologies and services will change the largest share of human life activities. Elaborate current technology analysis and advance automatic number-plate recognition systems compared in terms of performance from many real-life experiments and simulation algorithms that include computer vision algorithms. The system is set to use optical character recognition for interpreting information that comes through in the image on the license card with help from the Raspberry Pi processor.
Algorithms, including computer vision (CV). A system with an application of Optical Character Recognition (OCR) as one possible interpretation of information retrieved from pictures of a car plate number processed by a Raspberry Pi. These ITS technologies are the smart cars and future and new dimension of city transport for maximum efficiency, safety, and sustainability. Case studies of Barcelona, Songdo, Singapore, and Moscow show how successful application of such systems can be achieved. Improvement in ANPR systems combined with a strong simulation algorithm has turned to be quite a useful tool for optimization of solutions concerning urban mobility. Further assessments will be needed to develop further ideal approaches and maximize gains on the cities embracing such technologies.

BOOT CAMP

I. FUNCTIONAL AND NON – FUNCTIONAL REQUIREMENTS

1. ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS):
   - Collision detection and avoidance
   - Lane departure warning and assistance
   - Adaptive cruise control
   - Emergency braking system
   - Blind-spot detection and assistance

2. CONNECTIVITY AND COMMUNICATION:
   - Vehicle-to-Vehicle (V2V) communication
   - Vehicle-to-Infrastructure (V2I) communication
   - Vehicle-to-Everything (V2X) communication
   - Reliable and low-latency data transmission

3 .VEHICLE MANAGEMENT:
   - Real-time tracking of fleet vehicles
   - Optimization of routes for efficiency
   - Fuel consumption monitoring
   - Predictive maintenance alerts

4. ELECTRIC VEHICLE (EV) FEATURES:
   - Battery management and optimization
   - Integration with EV charging
   - Range prediction and optimization
   - Energy-efficient driving

II. HARDWARE AND SOFTWARES REQUIREMENTS

1. HARDWARE:
   1. Arduino uno
   2. Geo location sensor
   3. GPS trackers
   4. On board diagnostics portals
   5. RFID sensor
   6. NFC Tag

2. SOFTWARE:
   1. Arduino Ide Compiler
   2. Google Colab
   3. Python
   4. Electro Docs

IV. BUSINESS MODEL

1. BUSINESS MODEL CANVAS

In the last few years, about lakh people are not licensed because of normal transportation and fake licenses are common in India. So, with the help of technology, we can overcome these problems and many more. So, we have seen that if we do these things cheaply then there is a beautiful place in our life. We want to create these pure things for our lives. Many are our target customers. According to our estimate, the cost of manufacturing this product is less than ten thousand rupees and it is a simple as well as useful product in our life. Till now, due to its sales and demand at a high level, ways to sell this product according to the present demand in India for four-wheelers are present. People perceive four-wheelers as a rich way of living and want to know that such advanced features and technology of four-wheelers are also available in the automobile industry.

2. COST MODEL

Equipment for the smart car project costs about Rs 10,000 that includes a GPS tracker, 16x2 LCD monitor, breadboard, etc. It also demands software knowledge like Arduino IDE and C programming knowledge from the Required website.

3. VALUE PROPOSITION

Our value to our customers is to enable the government to use it on two wheels and four wheels. The problem we solve for our customers is to replace the physical plate with a digital plate approved and registered by the government.

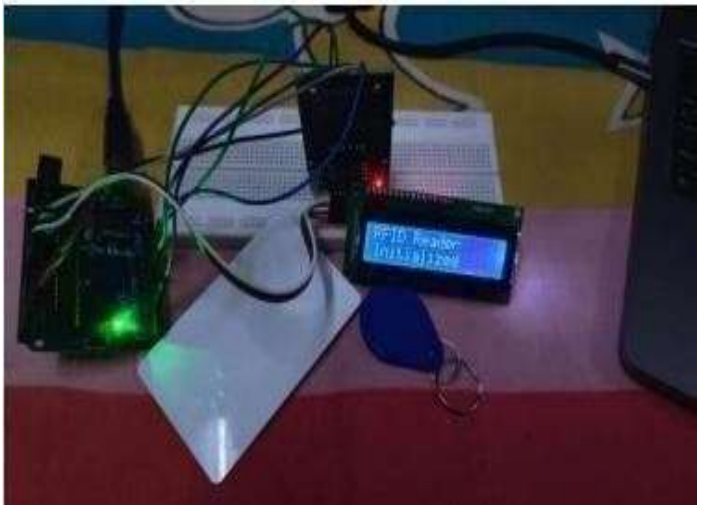
V. PROTOTYPE

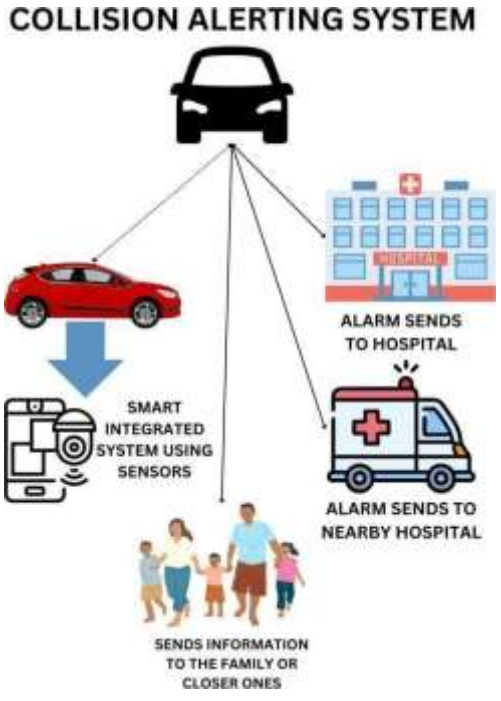
This is the Project that we have developed so far, So We are planning to improve this prototype in the further upcoming days. It contains the RFID receiver, 16x2 LCD display, Arduino Uno, Bread Board, NFC Tag. It starts with the NFC tags which contain unique user IDs. These can be programmed using an NFC writer device. Refine the prototype on the basis of test results and user feedback. Modifying the code, improving the connections of hardware, or optimizing power consumption is involved.

LCD DISPLAY AND RFID SENSOR

VI.FUTURE ENHANCEMENTS

In effect, the prototype would be perfected during the test and Feedback on the product. It may demand a change in the Arduino code, optimization of hardware connections, such that there is an efficiency in performance or strategies meant to reduce power consumption. Its aim is to make it more functional and friendly in the usability of your NFC reader. In short, we create a basis from which we can come up with a more powerful and user-friendly application for NFC readers. Improvement systems in safety This project comprises the design of pedestrian navigation systems as well as other novelties within the autopilot group functioning under the roof of collision detection with the likely prevention of accidents. Design an equipment with sensors that are supposed to detect possible real-time hazards and send alerts through both visual and audio signals. Piezoelectric sensors are used to convert mechanical stresses into electrical signals, which would be applied in detecting vibrations, force measurements, pressure sensing, etc. The training procedure of such sensors would also imply calibration to the conditions under which such a sensor would operate or is integrated into much larger systems aimed at improving accuracy and reliability of real-time monitoring and control applications.





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