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SMART CAR PREDICTIVE MAINTENANCE AND OTP KEY SHARING SYSTEM USING IOT

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Abstract:

In the modern world vehicular transportation has become one of the most common modes of movement for human beings. Today it is unimaginable for people to move to different places without vehicles. With the rapid growth in the population and also as the affluence of the people grows the number of vehicles on the roads are also increasing at an exponential rate. This increase in the number of vehicles there has been increase in the accidents as well as safety related incidents with the vehicles. This system proposes the concept of the smart car using IOT. The proposed system deals with the development of a connected car which includes monitoring of the different parameters of the car such as engine temperature, pressure, oil levels and other important parameters of the car and sending it to the cloud-based application using Arduino which can be monitored and analyzed for breakdown remotely using the application developed.

Index Terms **- GPS zone mapping, Self-Diagnostic , OTP.**

I INTRODUCTION

Now a day, problems of the accidents on the roads are increasing day by day. The accidents are caused due to human error as well as due to technical error. The currently increasing number of vehicles on the road is causing serious problems with respect to human as well as technical errors and this is causing the accidents. The increasing number of vehicles is also causing serious security and theft concerns. The vehicle theft is also increasing. The possibility to share the car securely when the owner is not in home or town with other person is also causing the issues of the difficulty in accessing or sharing the vehicle in need if the keys are not there. Thus there needs to be a smarter solution for vehicle safety and security.

The proposed system consists of innovative cloud based key sharing feature which will permit the users to share the cars with the authorized people using cloud-based application where the contact number of the person to share can be entered. The automated time-based random OTP will be generated and sent to the person via SMS using which he can use the keypad on the car to take control of the car using the secure OTP sent to the person. The proposed system also suggests safety features such as collision avoidance, adaptive braking and obstacle based braking system which will automatically stop the car when there is sudden collision alert for the vehicle. The system implements GPS zone-based speed mapping which will map the vehicle speed with respect to zones based on GPS location. Thus, this system deals with the implementation of advances safety and connectivity features for current vehicles making them smart and safe.

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II PROPOSED WORK AND METHOLOGY

The proposed system deals with the development of smart car using Arduino with connected features taking the vehicle safety and security to the next level. As the name suggests the main objective of the project is to develop and demonstrate the prototype of smart Vehicle which is equipped with different features to make the vehicle smart and secure using IOT. The objectives of the system are;

- To develop an OTP based secure key-sharing system which can be used to share the vehicle keys or transfer authorization of the vehicle to another owner (Keyless entry) using IOT and cloud.
- To implement adaptive throttle adjustment to limit the speed of the vehicle in worst cases based on exterior conditions encountered to prevent accidents
- To implement anti-collision braking system to avoid head on collisions
- To implement GPS based zone mapping system to control the speed of the vehicle
- To implement obstacles and speed hump detection and automatic slowdown of the vehicle speed.
- To implement reverse smart braking system
- To implement IOT based System record the different important parameters of the vehicle using different sensors present on the vehicle send the data collected by all the sensors to cloud for analysis. This develops the concept of connected car, where in the car is always connected to the manufacturer for real-time quick support using cloud-based web application and android application.
- To implement advance problem detection and notification system based on the analysis of continuous multisensory data from the vehicle.

This system involves development of smart car using IOT, a car capable of diagnosing all the problems in advance and taking a corrective action to rectify them even before they occur. The system involves development of an electric car prototype which can be controlled wirelessly. As shown in Figure 1, the developed prototype can be controlled remotely for the demonstration of the smart car using IOT which is also developed as a part of the project. The primary feature is the unique key sharing using Cloud based Secured OTP sharing. The cloud application developed permits the owner of the vehicle to share e-key of the vehicle by adding the contact number of the person with whom the car key is to be shared. The backend system uses mobile number to generate the secure OTP and sends it to the person with whom the car keys are to be shared. The keypad present on the vehicle can be used to enter the OTP and login into the vehicle, thus providing unique and secure approach to share the car keys. The different sensors connected to the ESP32 continuously monitor the data from the vehicle and analyze the data to detect the problem that may be encountered in. The ESP32 analyses the data as shown in the Figure 1 and alerts the driver regarding the problems with the vehicle in advance before any damage happens. Also as shown in the Figure 1 the Sonar sensor and the IR sensor monitors the obstacles in the path of the vehicle for adaptive speed control as well as anti-collision braking system thereby preventing accidents. The sonar sensor interfaced also determines the speed humps and controls the vehicle speed. Further the vehicle is made connected vehicle using IOT protocol so that the vehicle is always connected to the manufacturers cloud database and all the vehicle data from such sixth sense vehicles can be easily visualized over there. GPS based zone locking system is used to lock the speed of the vehicle.

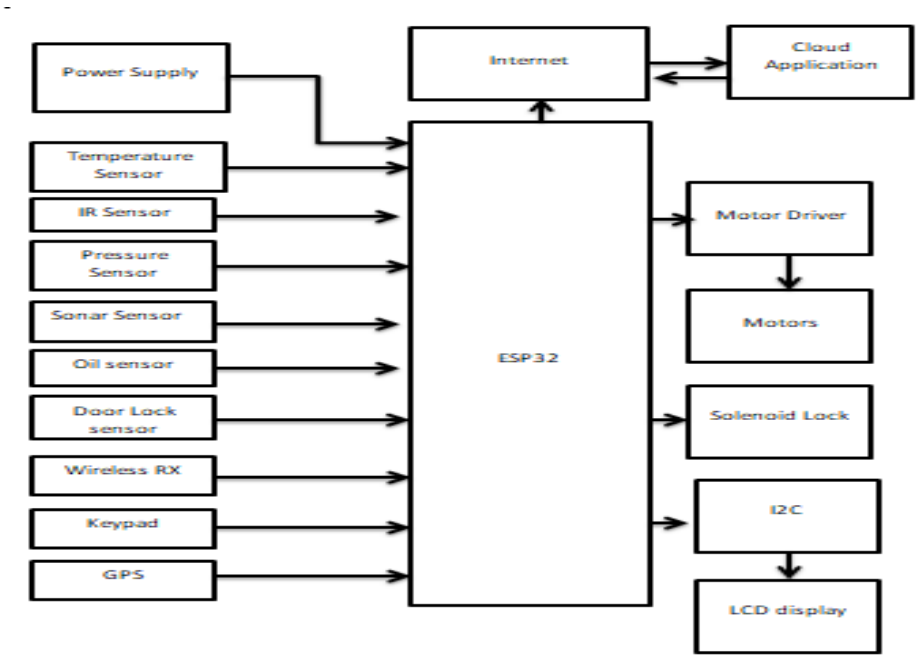

Figure1. Block Diagram of Smart Car Predictive Maintenance and OTP Key sharing System using IOT

A. Functional Requirements:

This section details the functional constraints of the system:

- **Development of Sensor Connected Self Diagnosis system**: In this phase the number of different sensors is interfaced with the microcontroller including temperature, Oil level, Door status, Tyre monitoring, and other required parameters for device self-diagnosis system to sense future problems.
- **Adaptive Speed Control:** In this phase the Sensors are interfaced to sense the external conditions and obstacles in the path of the vehicle to adjust the vehicle speed. The vehicle underneath obstacle detection such as speed hump and vehicle speed regulation system is also developed in this phase.
- **Forward and Reverse Anti-collision Development**: In this phase the anti-collision system is developed which prevents the vehicle from collision, by overriding the braking system, both head-on and rear collision.
- **IOT Telemetry and cloud application:** In this phase the IOT hardware is interfaced to push the entire sensor Data to cloud. The web application and android application is developed which receives the data received from the smart car, which can be visualized as well as analyzed for problems.
- **Development of Secure e-Key Sharing system:** In this phase the cloud-based backend is developed for advanced key sharing system. The app developed can generate the cloud based auto expiring OTP stored in database and send it to the person with which the access of the car is to be shared. The OTP then acts as an e-key for pre-determined access of the vehicle and expires automatically once it has been used.

B. Data Design and Description

At the backend we are accessing the data in the database where it gets saved in MySQL database. The different parameters are saved in the database and can be fetched from the front end and developed backend using API.

Data dictionary

Sl. No.	Field Name	Data format	Field size	Description	example
1	id	Integer	11	Unique id for each entry	123…….
2	OTP	Integer	11	Random number generation	“594”
3	temperature	Integer	11	Engine temperature data	35
4	Oil level	Integer	11	Oil level data	95
5	Tyre Pressure	Integer	11	Pressure data	80

Table1. Data Dictionary

IV Results and Analysis

The screen shot of the software part is shown in Figure 2. The output part is the cloud hosted IOT app which can be used for maintenance prediction using IOT data and an android application for the purpose of remote key sharing.

Proposed IOT app UI:

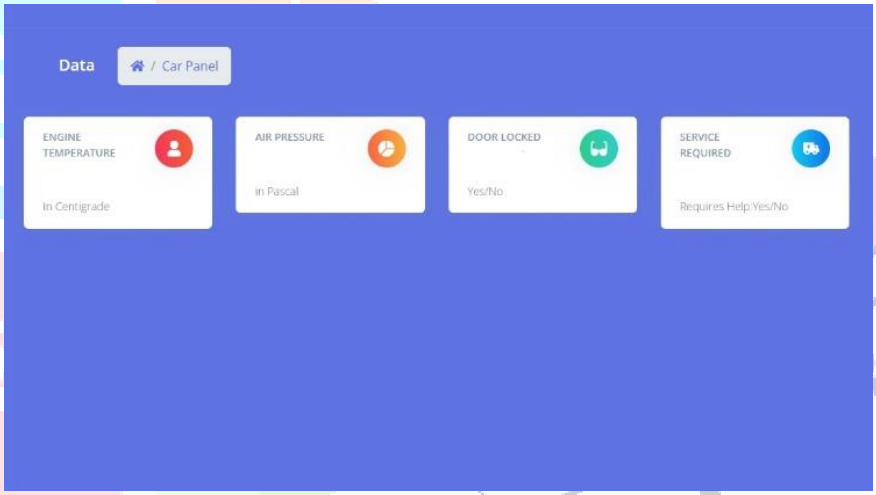

Figure 2. IOT app UI

Proposed Android app UI:

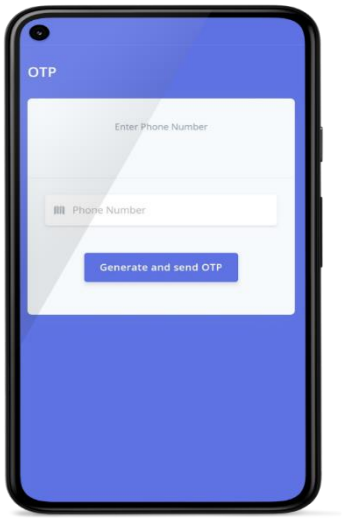

Figure 3. Android app UI

IV CONCLUSION

This system deals with the development of smart car using Arduino with connected features OTP based secure key-sharing system which can be used to share the vehicle keys or transfer authorization of the vehicle to another owner using IOT and cloud, adaptive throttle adjustment to limit the speed of the vehicle in worst cases based on exterior conditions encountered to prevent accidents. Anti-collision braking system is used to avoid head on collisions and obstacles. As well as speed hump detection and automatic slowdown of the vehicle speed facilities are used to predict accidents.GPS based zone mapping system used to control the speed of the vehicle in crowded area.

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