

# Centralised Periodic Vehicle Inspection using ELM based Android Application.

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**Abstract** - This paper presents the Android application for periodic vehicle inspection in service stations. The main goal of employing this application in centralised vehicle inspection procedure is to increase safety of owners on road. This application can be easily used by the Incharger at service stations to maintain the digital records. Incharger can check the actual condition of vehicle using ELM 327OBD. Incharger can update the record to the centralised web application. Web application is owned the administrator. Owner can get the report of the vehicle inspection via android application. This also supports the RTO to track the fake documents submitted by the Owner.

**Key Words:** ELM 327 OBD, periodic vehicle inspection, volley library, spring framework, unique IP address.

## 1. INTRODUCTION

An automobile service may be a series of maintenance procedures administered at a group of your time interval. The service intervals are specified by the vehicle manufacturer during a service schedule.

Periodical vehicle safety inspection (PTI) may be a technical service provided by vehicle inspection service stations to stop traffic accidents caused by a vehicle malfunction. The vehicles are checked if they don't meet with national safety regulations. These inspections are performed together with the emission inspection, the main objective is to inspect the vehicles if they don't satisfy emission regulations. Road-worthiness checks not only to make sure your vehicle is working properly, they are also important for environmental reasons and for ensuring fair competition in the transport sector. The completed services are usually recorded during a sacred text which is rubber-stamped by the service center upon completion of every service. A complete service history usually adds weightage to the resale value of a vehicle.

Now the question is whether the status of the vehicle updated in the record is proper, as the entry is done manually by the person who is entering it may not be genuinely entering it. So in this project, we are introducing a hardware component named ELM 327OBD which will be fetching the actual condition of the vehicle and it will be

providing the output result, this will be connected to the smartphone the person at the service station and the person will be directly sending this result to the centralized web server. This can also be viewed by the RTO station to check the vehicles which are not in the good condition.

## 2. RELATED WORKS

According to the survey, we got some of the methodologies used in the previous studies for this purpose. Those are 3.5 G wireless network, and cloud computing technologies. The application requires the orientation during which the z-axis acceleration is negative when braking. Hydraulic brake systems operate according to Pascal's law. Techniques currently used involve routine RR (repair or replace) inspections of critical components at predetermined intervals no matter the particular condition of the component. radio frequency identification (RFID), Global System for Mobile Communication (GSM) and the Internet of Things (IoT), On-board diagnostics (OBD) is a self-diagnosing system built on the power train control module (PCM), MIL Lamp check, The principle of oil pressure indicator lamp, The semiconductor pressure sensor's principle, Fuzzy Logic method.

The drawbacks of the above-mentioned methodologies are accuracy is an important issue, since there is a vast number of vendors and models, therefore testing the Smartphone prior to measurement would be necessary, Even though it is not that as accurate and precise as special dedicated hardware, it appears to be sufficient for brake testing in PTI. There is no cross-checking method to know whether that is matching with the same vehicle or not. This paper does not include a method of capturing the image of the car with the vehicle number. RR procedures are done because there have been few reliable, cost-effective diagnostic techniques that can determine the condition of a sealed braking system. People who are not very much used to the technology may find it very difficult to use this. Suppose if any problem occurs with the application then manually checking may be difficult. Implementation is difficult and time-consuming. Fuzzy logic is not always accurate, so The results are perceived based on assumption, so it may not be widely accepted.

According to the survey, we can see the advantage of using vehicle sensors that are multifunctional, composite,

and intelligent by using pressure sensors. So we have ELM 3270BD which is integrated with all the sensing features which are necessary for getting the actual condition of the vehicle.

### 3. METHODOLOGY

There will be a centralized server that stores and retrieve the data from the Mysql database. There are three modules in our application: Admin, Incharge, Owner.

1. **ADMIN:** Admin uses a web application to interact with the server. Admin can manage incharge, manage vehicles, view reports, and can also send alerts of vehicle inspection.
2. **INCHARGE:** Incharge is the one who inspects the vehicle and through android application can view the vehicle status, its inspection history and update the new report of vehicle inspection.
3. **OWNER:** Owners of the vehicle can receive the inspection alert and also can see the inspection history of their vehicle.

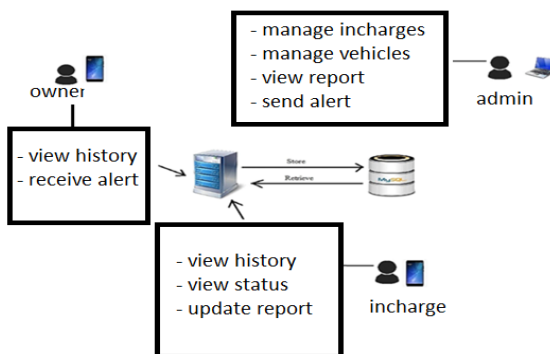


Fig -1: Architecture Diagram.

#### 3.1 PROPOSED SYSTEM.

This provides the best application for vehicle companies. This application is used for digitizing the paperwork and reduces paperwork. It is very useful software for service centers who want to computerize their work. We are making use of a hardware component ELM 3270BD which will be detecting the actual condition of the vehicle and the result will be updated to the android application via smartphone, which is being used by the person who is at the service station and then it will be updated to the webserver.

This feature is added to avoid the wrong usage of the application. So that it will check the authentication before entering the vehicle condition. Once it is done then this information can be accessed by the RTO department to know

which are all the vehicles that are not in a good condition and need to be serviced or changed at the earliest. even the FC or any other documents cannot be faked by the vehicle owner.

The advantages of the proposed system are mentioned below.

1. Condition of the vehicle is being checked by the machine so it will be accurate.
2. Work done in less time.
3. This paper proposes a new method of reading the Registration number of the vehicle as proof so that cheating cannot be done.
4. This process is highly accurate.
5. Vehicle registration number can be recorded while the physical examination of the vehicle via ELM 3270BD.

Our proposed system overcomes the following drawbacks over the existing system.

1. Inadequate management of vehicle inspection reports.
2. Periodic inspection alert.
3. Inaccurate values of vehicle components.

#### 3.2 IMPLEMENTATION

We develop an application in two levels i.e. client and server levels. On the client-side, we create a web application in Eclipse that will be running on our laptop/System. In our application client is an android application, We are using a local area network i.e. we are using a local server. The network provider provides a static IP address so that the system can access the internet from anywhere. For identification purposes, we use this static IP address (which acts as a unique ID).

Likewise, all over the world, many systems are connected to the internet. To identify the particular System which system should get the access permission, provide the IP address of the respective system. In dynamic or local IP, networks are connected to many of the systems so that router assigns the unique IP address for each system. So in our application mobile is the router for the network in which it identifies and sets the IP address of the particular connected system. Hence, mobile and laptop/systems should be on the same network. Why because systems have different IP addresses. If the IP address not get matched so that we can't communicate with the system. That's why we are using a local IP address for system identification.

### 3.2.1 HOW CLIENT & SERVER SYSTEM INTERACT BY USING IP ADDRESS

There are different protocols for communication like HTTP, FTP, TCP, etc. But we usually use the HTTP Protocol to communicate client and server systems. For data transferring purposes we are using the HTTP protocol. By using this, the client system can communicate with the server system.

1. **REST API OR RESTFUL API:** Application programming interface which consisting of a set of programs or class or functions. REST API is an architectural style for an application program interface(API) that uses HTTP requests to GET, PUT, POST, and DELETE data. We use this API inside the HTTP Protocol to communicate client and server systems.
2. **SPRING FRAMEWORK:** Inside the spring framework we develop a REST API so that client and server can communicate with each other. Client-side REST API sends the request to the Server-side REST API and gets the response from the server and processes the task.
3. **VOLLEY LIBRARY:** It is an HTTP library that makes networking for Android apps easier and most importantly faster. Volley offers the automatic scheduling of client requests. All the tasks that need to be done with networking in Android, can be done with the help of volley.

### 3.2.2 EXPERIMENT

Firstly we have to connect the mobile to the laptop or system through a USB cable and enable the Developer options on the mobile. Then run the project in the eclipse so that project runs on the server-side and displayed the web page(Home page) on Google chrome. After connecting the mobile and the system, we have to run the mobile device that is connected to the android studio. Hence it starts gets installing the android app on the mobile. So in this figure, we can observe that its asking permission to install the vehicle inspection application in the mobile through the USB cable. Once we give permission to install the app then the vehicle inspection app gets installed on the mobile.

Mobile devices and the laptop /system should be connected to the same network. In our project, we are using a local IP address to identify the system. Why Because many systems have different IP Addresses. If the wrong IP address of a particular system is input to this app then the system not get connected to the app. So that they can't communicate with each other.

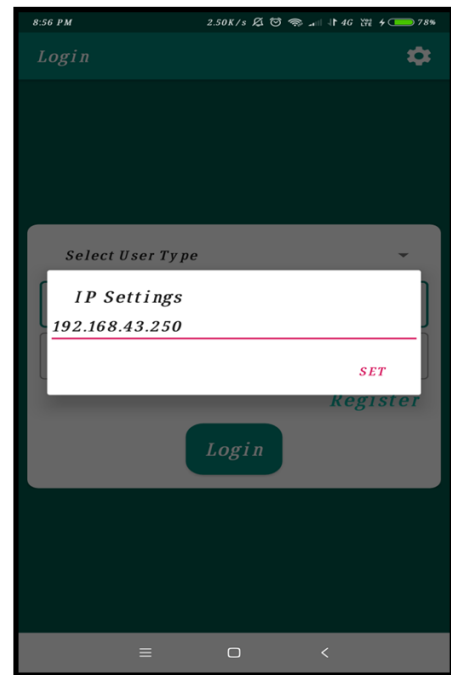


Fig -2: IP Settings for Android application.

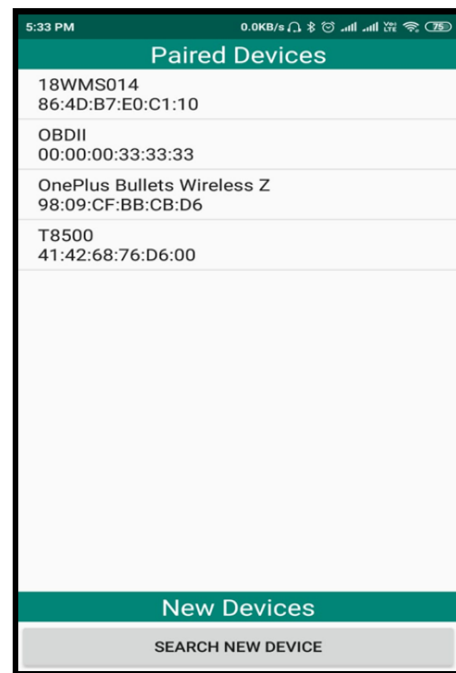
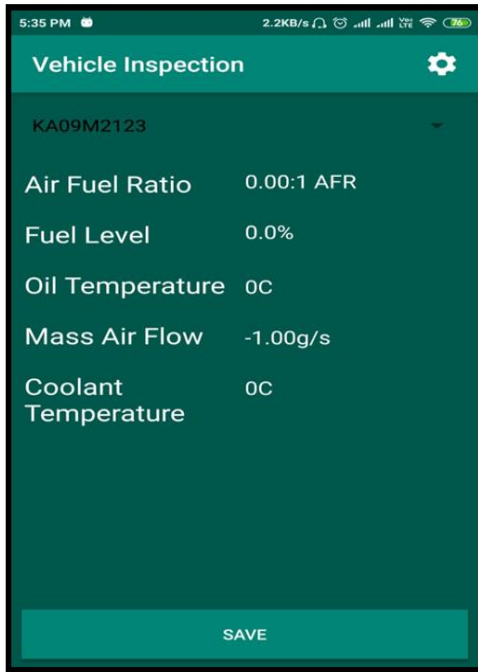
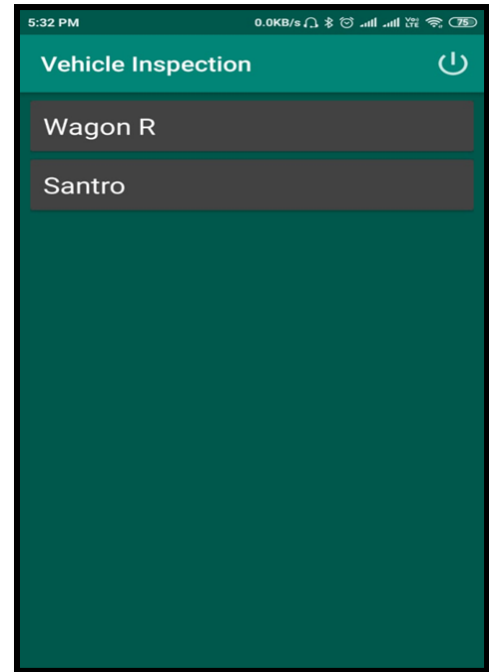


Fig -3: Bluetooth Connection for Android Application.



**Fig -4:** Vehicles Details Obtained by ELM 327OBD Via Bluetooth to the Incharger.

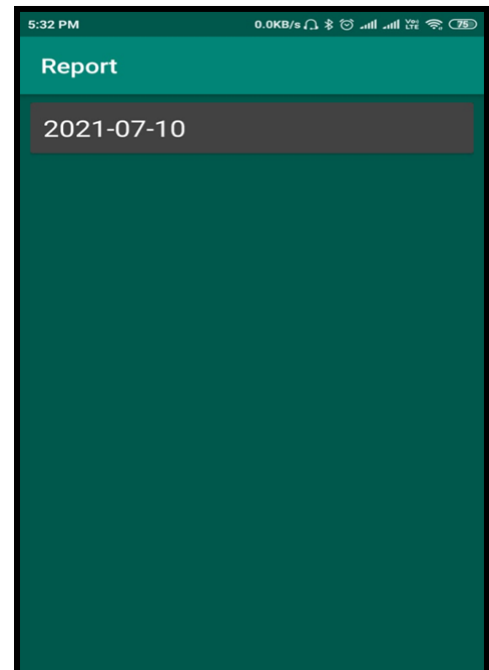


**Fig -5:** Owner can choose the vehicle name to see the Vehicle Inspection Report.

Select the type of the User whether he is In charger or Owner and provide the login credentials as mail id and password. If he is a new user then he has to go through the registration process by clicking the register option. Then enter the IP Address as shown in Fig -2.

The android application asking to turn on the Bluetooth of the mobile phone to get the connectivity between the application and the hardware that is fixed to the car. Once it gets to allow it provides the actual condition of the vehicle after the connectivity of Bluetooth. Select the respective Bluetooth device that incharger was using for connectivity purposes as mentioned in Fig -3. Incharger can get the details of the vehicle and save it as shown in Fig -4.

If he is the owner then he has to log into the system by providing owner login credentials using user type as owner. Each owner can have multiple vehicles, Owner can see the report of the different vehicles but he can choose the particular vehicle by selecting the vehicle name as shown in Fig -5. After choosing the particular vehicle name, the owner can able to get the vehicle inspection history on which are all dates the vehicle has undergone this physical examination as shown in Fig -6. After clicking the particular date, the Owner can see the details or the results of the physical examination test of the particular vehicle on a respective day as shown in Fig -7. Results can also be viewed by Incharger by selecting user type as In charger.



**Fig -6:** Owner can see the date of Vehicle Inspection.

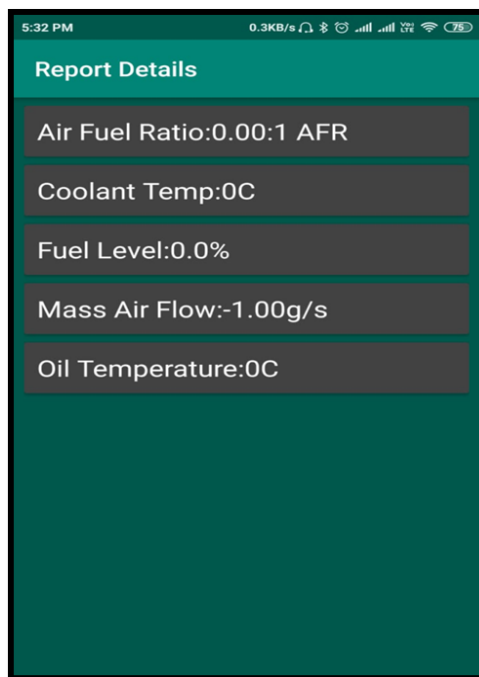


Fig -7: Owner can see the Results of Vehicle Inspection.

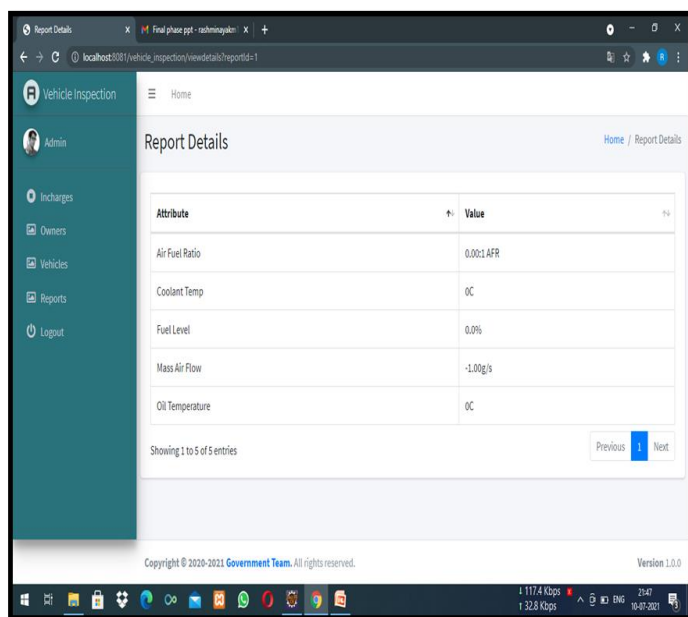


Fig -8: Centralised Web Server For Vehicle Inspection.

Admin can log in to the webserver using the credentials. Admin can add, edit, view, and update the details of the incharges, owners, Vehicles, Reports. Reports can be viewed by selecting the owner's name and also selecting the particular vehicle of that owner. Report details of the particular vehicle can be seen as shown in Fig -8.

#### 4. RESULTS

The presented results show the very high potential of Smartphone utilization in centralized periodical vehicle inspection. The measurements of physical examination of vehicles yielded similar results to commonly used sensors. The Smartphone contributes more to the process, such as prevention of falsification of the measurement, ability to send the data to the servers immediately, and many other functions and services. It is inexpensive and multifunctional.

#### 5. CONCLUSION

The proposed Centralised Periodic Vehicle Inspection using ELM-based Android Application has been successfully implemented and tested with the vehicles in real-time setup. Here we have used the concept of web applications, android applications, Internet of Things. This is the best method to check the actual condition of the vehicle without any falsification of data by the owner. RTO can get accurate results from the administrator of the webserver. In future work, a Virtual notice can be sent to the owner if there is any falsification of the report.

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