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A Frame Work Based On IOT for Car Safety Management System

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Abstract: **IOT technology has been used to build the safety car system, which can be monitored and can actively report the condition to predict routine maintenance of car and provide service information in order to achieve an efficient way of working. The main purpose of predictive maintenance is to allow convenient scheduling of corrective maintenance. This paper discusses on technological advancements in the areas of IOT and Analytics. The automobile and fleet management, majority of the consumers and the car service companies are following the smart car predictive analyses for their automobiles. In existing system, the person has to monitor manually each and every aspect of the car like as verifying the seat belt is lock or not and checking whether the doors are locked properly or not. Here the system we using raspberry pi developed using sensors and IOT technology stack which collect and analyze fitness and running condition of different parts of the car and send this data to a centralized system.**

Key words: **predictive maintenance, internet of things, raspberry pi, pressure sensor, IR slot sensor**

I. INTRODUCTION

Today the Internet has become ubiquitous, has touched almost every corner of the globe, and is affecting human life in unimaginable ways. However, the journey is far from over. We are now entering an area of even more pervasive connectivity where very wide variety of appliances will be connected to the web. We are entering an era of the "Internet of Things" (abbreviated as IoT). IOT refers to the connection of devices to the Internet. Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes. IOT is a system of Interrelated computing Devices, Mechanical and Digital Machines, objects, Animal or People with ability to Transfer data over a Network. IoT devices are equipped with embedded sensors, actuators, processors, and transceivers. IoT is not a single technology; rather it is an agglomeration of various technologies that work together in tandem. Internet of Things (IoT) is fast emerging and becoming an almost basic necessity in general life. The concepts of using technology in our daily life is not new, but with the advancements in technology, the impact of technology in daily activities of a person can be seen in almost all the aspects of life. Today, all aspects of our daily life, be it health of a person, his location, movement, etc. can be monitored and analyzed using information captured from various connected devices. Some consumer applications envisioned for IOT sound like science fiction, but some of the more practical and realistic sounding possibilities for the technology are receiving warnings on your phone or wearable device when IOT networks detect some physical danger is detected nearby (think: smart smoke detectors),self-parking automobiles (think: Volvo S90), automatic ordering of groceries and other home supplies (think: Amazon Dash Wand),automatic tracking of exercise habits and other day-to-day personal activity including goal tracking and regular progress reports (think: fitness trackers) The Internet of Things finds various applications in health care, fitness, education, entertainment, social life, energy conservation, environment monitoring, home automation, and transport systems. We focus on these application areas in "car safety prediction system" We find that, in all these application areas, IOT technologies have significantly been able to reduce human effort and improve the quality of life.

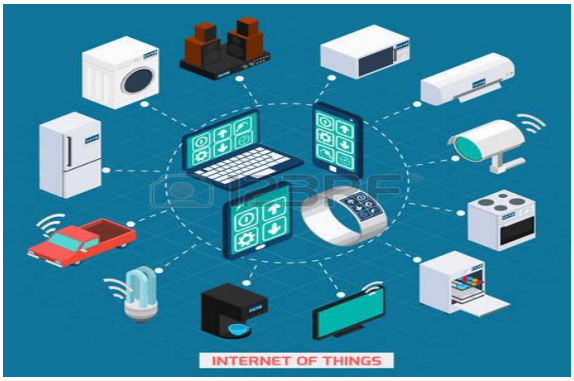

Figure 1: Internet of things

Above figure1 shows that all the devices are connected to the electronic devices based on the internet

of things concept. In this paper we propose a system is to apply IoT in the smart car system so that car's predictive maintenance and monitoring functions can be realized. The predictive maintenance helps to allow convenient scheduling of corrective maintenance, and to prevent unexpected equipment failures. The data being shared can be about the tire pressure of the car, status of various parts/lubricants of the car, and if the car needs urgent service or not. we discusses on technological advancements in the areas of IOT and Analytics, which are capable of internet connectivity and sharing of various kinds of data with backend applications and provide information in order to achieve an efficient way of working. The data is sent to user and service center if the car needs urgent service or not.In this paper we used Raspberry pi it is a series of small single-board computers developed in the United Kingdom by the Raspberry pi foundation its acts as a small-sized CPU. A power supply which provides power supply to the raspberry pi and a SD card which stores the data, Pressure sensor connected to the raspberry pi which checks the tire condition. In this system the vibrator sensor placed in spare parts which checks the conditions of parts using the battery power and sends SMS to the registered email of the user and service center according to scheduled time. IR slot sensor connected to the raspberry pi which operates the seat belt. In this system the car auto locks the doors automatically and based on seat belt engine operates using the battery power and sends SMS to the registered email of the owner according to scheduled time.

II. LITERATURE SURVEY

Rohit Dhall, Vijender Solanki[1] proposed This paper they discusses one such use case, which can be implemented by the automobile industry, using technological advancements in the areas of IoT and Analytics. Connected Car is a terminology, often associated with cars and other passenger vehicles, which are capable of internet connectivity and sharing of various kinds of data with backend applications. The data being shared can be about the location and speed of the car, status of various parts/lubricants of the car, and if the car needs urgent service or not. Once data are transmitted to the backend services, various workflows can be created to take necessary actions, e.g. scheduling a service with the car service provider, or if large numbers of cars are in the same location, then the traffic management system can take necessary action.

Arijit Chowdhury et.al[2] proposed in this paper they presents a smartphone based application whereby a vehicle owner can obtain a reasonable prediction of the vehicle's potential failure time. Through a hybrid model based and data-driven approach, one can obtain a predictive maintenance suggestion; given the current state of degradation. The smartphone is used both for sensing and computation. The proposed minimal-sensing approach is only meant to indicate Level-1 failure - the first step in identifying the existence of fault. Here, one assumes that the vehicle's vibration continues to increase over time thus indicating progressive degradation in its ability to absorb shock.

Yaping Li, Ershun Pan, Zhen Chen[3] proposed in this paper they consider the predictive maintenance according to the health condition of the machine to develop a joint optimization model of SPC and maintenance policy. The objective of the model is to minimize the cost per unit time in the cycle by find the optimal values of maintenance time threshold about the health index, maintenance frequency, control limit, sample size and sampling interval**.** A joint optimization model of a health condition based predictive maintenance and *X* control chart is developed in this paper, which considers the actual health condition of the machine and reduces the probability of unnecessary or absent maintenance actions. In the model, effects of both machine age and maintenance

Nathalie herr et.al[4] proposed this paper, they discussed to optimize both the assignment of missions and the maintenance scheduling of moving systems Maintenance scheduling of moving systems has been proposed in a Prognostics and Health Management (*PHM*), allowing to launch maintenance operations only when they are needed. A mathematical formulation of the joint mission assignment and maintenance scheduling problem has been detailed, including an objective function which aims to minimize the degradation level reached before each maintenance and several constraints related to the application context. Linear programming has been proposed to tackle the considered optimization problem.

Kevin et.al[5] proposed this paper they presents a sensory-updated degradation based predictive maintenance policy (herein referred to as the SUDM policy). The proposed maintenance policy utilizes contemporary degradation models that combine component-specific real-time degradation signals, acquired during operation, with degradation and reliability characteristics of the components Population to predict and update the residual life distribution (RLD**).** A simulation model of a small manufacturing facility with five parallel workstations is used to evaluate the performance of the proposed maintenance policy. We consider two main cost Components cost of planned replacement and failure replacement. Three cost ratios were studied

Riccardo satta et.al[6] in this paper they first review taxonomies and main methodology currently used for condition based maintenance secondly they argue that the mutual dissimilarities of the behaviors of all appliances of this set can be exploited to detect upcoming Faults.Specially inspired by dissimilarity-based representations they proposed an approach based on the analysis of concurrent mutual differences of the measurements coming from the cohort. Our method

considers cohorts of identical appliances globally, rather than individually. Indeed, in each instant of time, we consider the telemetry of all the appliances to extract representative features of every single appliance; we claim that in this way, anomalous behaviors can be more easily detected. We tested our dissimilarity-based features over one year of historical.

Emir husni et.al[7] proposed this paper, the research will bring IOT technology to build the smart car system, which can be monitored and can actively report the condition to predict routine maintenance and provide information in order to archive an efficient way of driving, smart car is realized by utilizing a standard an-board-diagnostic (OBD) which is applied to vehicle available at this time. OBD allows any vehicle parameters can be monitored electronically using OBD scanner tool. IOT car monitoring system using IBM BLUEMIX cloud applications. The monitored data transmitted from the OBD II device via Bluetooth and uploaded to IBM BLUEMIX cloud using smart phone internet connection so the vehicle data can be stored on the cloud database.

III. PROPOSED WORK

This paper discusses on technological advancements in the areas of IOT and Analytics, which are capable of internet connectivity and sharing of various kinds of data with backend applications and provide information in order to achieve an efficient way of working. The data is sent to user and service center if the car needs urgent service or not. Instead of getting a car serviced periodically, if a system developed using sensors and IoT technology stack is used, which collect and analyze fitness and running condition of different parts of the car and send this data to a centralized system. In this centralized system, data received from these connected cars, can be analyzed further and if any service is needed, a service request can be raised. This proposed system can also generate emergency alerts, in case any part is about to break down, thus avoiding car/part failure.

In this paper we used Raspberry pi it is a series of small single sized CPU developed in the United Kingdom by the Raspberry pi foundation its acts as a small-sized CPU. A power supply which provides power supply to the raspberry pi and a SD card which stores the data, Pressure sensor connected to the raspberry pi which checks the tire condition. In this system the vibrator sensor placed in spare parts which checks the conditions of parts using the battery power and sends SMS to the registered email based on seat belt engine operates using the battery power the user and service center according to scheduled time. IR slot sensor connected to the raspberry pi which operates the seat belt. In this system the car auto locks the doors automatically and and sends SMS to the registered email of the owner according to scheduled time.

3.1 Advantages of proposed system

- Reduction in service and maintenance costs, as only parts which needs to be replaced or serviced.
- Giving information about the car parts.
- Checking tire pressure.
- Seatbelt is the first safety measure in the design of the car so my device will not let the ignition to start until the person put on the seatbelt.
- Giving information about car auto locks to the owner.

3.2 Proposed Algorithm:

Algorithm for car safety prediction system
Input: Data from all the sensors
Output: Message alerts are given to the owner as well as to the service center
Algorithm for car safety prediction system ()
{
If (car starts)
Message send to car owner
If (IR slot sensor==1)
Then seat belt is locked
After the seat belt is locked then car auto lock is activated
Else
Send message to car owner about seat belt
If (pressure==low or high)
Then give email alert to the owner and service center
If (vibrator sensor==1)
Then send message to owner as all parts condition is safe
Else if (vibrator sensor==0)
Then send email to the owner and service center for scheduling of the car
}

3.3 System Architecture:

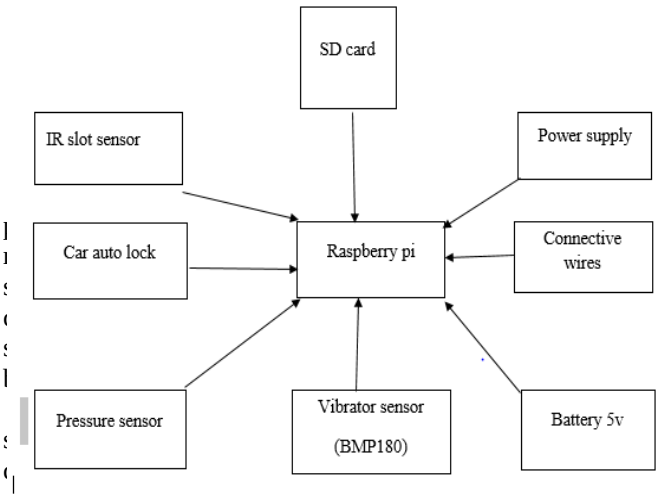

Figure2: System Architecture

In this system the car auto locks the doors automatically and based on seat belt engine operates using the battery power and sends SMS to the registered email of the owner according to scheduled time

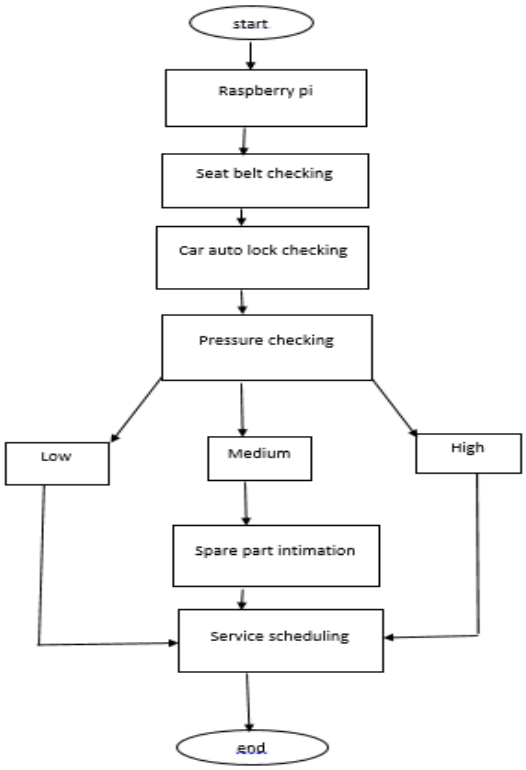

Figure 3: car safety prediction system

IV. RESULTS AND SYSTEM ANALYSIS

Test Case 1: Tire Pressure
Input: Checking tire condition.
Output: checked successfully

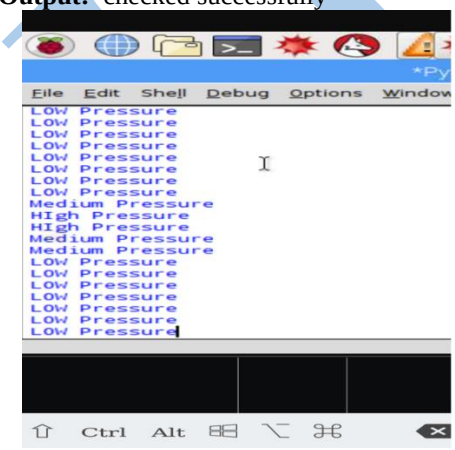

Figure 4: Tire Condition

This pressure sensor is a BMP-180 based digital barometric pressure sensor module and is functional compatible with older BMP-085 digital pressure sensor with less power consumption smaller in size and more accurate. Pressure sensor connected to the raspberry pi which checks the tire condition

Test Case 2: spar part condition
Input: Checking the spar part condition.
Output: Intimation trough mail successfully.

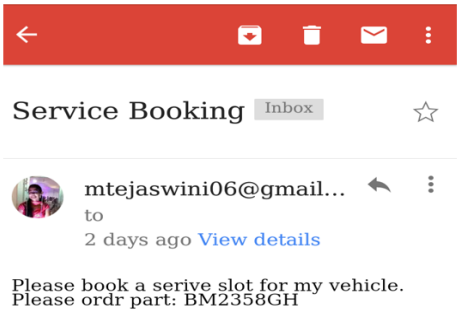

Figure 5: spare part order service

Vibration sensors are sensors for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration the vibrator sensor placed in spare parts which checks the conditions of parts using the battery power and sends SMS to the registered email of the user and service center according to scheduled time.

Test Case 3: service scheduling
Input: Intimation of service schedule.
Output: service scheduling

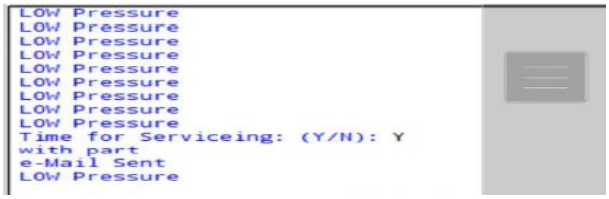

Figure 6: service scheduling intimation

It intimate to the the car service center if any spare part failure and to prevent unexpected equipment failures the data being shared can be about the tire pressure of the car, status of various parts/lubricants of the car, and if the car needs urgent service or not it send email according to the schedule time.

Test case 4:
Mail sent automatically for scheduling

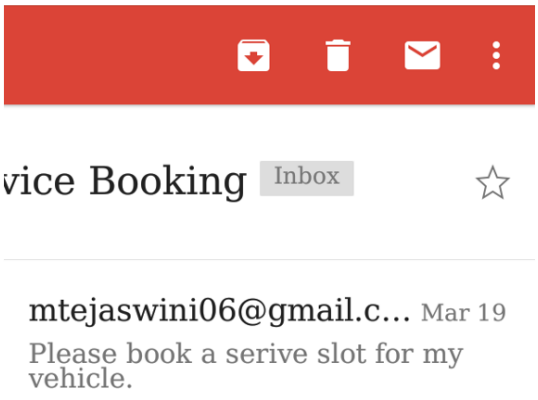

Figure 7: service booking

This system is expected to be able to increase the efficiency of the car for better maintenance and planning. It communicate with the users about the status of the car and intimate for car scheduling.

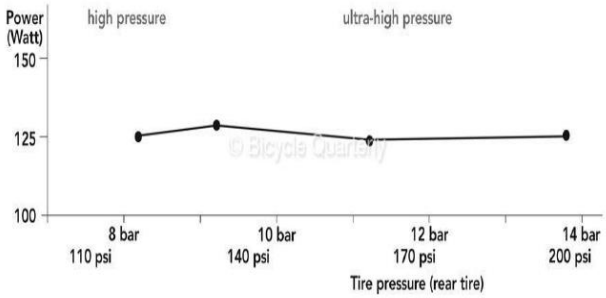

Figure 8: Tire Analysis

The efficacy of a tire pressure monitoring device is reflected primarily in the level of under Inflation it allows before illuminating the low pressure warning lamp. The above analysis is focused on three aspects of tire inflation - correct tire inflation, under inflation, and over inflation and compares the TPMS and Peer group of vehicles for each of these three tire conditions. Specifically, the TPMS and Peer group of vehicles are compared with respect to:

• Correct tire inflation:

– None of the vehicle's tires is underinflated or overinflated

• Under inflation:

No under inflation
Under inflation > 0 percent
Under inflation > 25 percent
Under inflation > 30 percent

V. CONCLUSION

The predictive maintenance helps to allow convenient scheduling of corrective maintenance and provide more information about car condition by using the IOT technology it alerts the user about unexpected failures. The main goal of the system is predicting the failures and intimating the user about condition of car. This system uses sensors to check the condition of parts this system is a user-friendly technique that helps increase the efficiency compared to manual checking this concept provides some advance features in the mode of security so this application can be used in any smart cars.

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