iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VI **Month of publication:** June 2022

DOI: https://doi.org/10.22214/ijraset.2022.44724

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

Quick-Witted Fuel Monitoring System for Finding Nearest Fuel Station and Optimum Speed Notification using IoT Technology

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Abstract: ***"Quick-Witted Fuel Monitoring System for Finding Nearest Fuel Station and Optimum Speed Notification using Internet of Things (IoT) Technology" can help to map all the possible fuel refilling stations on Google Map and also have an Android application in the vehicle connected to fuel tank sensor which will generate an intelligent automated message regarding the nearest fuel station with details of the total fuel to be top-up for covering the remaining distance if the fuel level reaches the threshold value. The proposed system recommends when to fuel the vehicle and what petrol refilling station to use. If the fuel station is not in the desired distance then what should be the speed of the vehicle to reach the fuel station. This can be achieved by Google Map API's for real-time tracking and fuel station suggestion.***
Keywords: Fuel Monitoring, Sensor, Android application, Google Map, IoT

I. INTRODUCTION

In the present scenario, usage of vehicles plays a pivotal role in all the fields for transportation purpose. Without vehicles our day to day life will be miserable. It saves time and human energy. The tremendous growth of vehicle usages leads to the higher consumption of fuels which in turn gives a room to the growth of fuel refilling station business [1]&[8]. Though there are enough fuel refilling stations, a question arises "whether the vehicle thus used by most of us have an intelligent system for fuel monitoring?" In the world of uncertainty, all the actions should be monitored continuously to get a better result, for such monitoring Internet of Things (IoT) works good with sensors [2]. In the above said case, there must be a system to monitor the Fuel Level (fL), Current Location (cL), Fuel Stations (fS) is the set of all fuel stations distance in the route, Nearest Fuel Station (nfS) and Average Speed of the vehicle (aS). Since the expected system has to collect and store the data of highly variant continuously, the storage becomes an issue. In order to resolve this storage problem, storing those data on to the cloud will be a good solution [6].

All the vehicles have a fuel level meter which indicates the fuel in the fuel tank [3],[5]&[10]. With respect to the Indication, the driver search for fuel station. In some vehicles, the nearest fuel refilling station is also suggested. Though there is solution in the existing system, it does not focuses on some intelligent messages that tells the driver like the optimum speed suggestion with respect to the nearest fuel refilling station [11]. An intelligent and quick warning if provided during the travel may held the users to know about the speed, fuel level, routing, etc[13]. Thus in the Literature Review, the challenges and opportunities in the existing solution to the said problems are discussed.

This paper is organized as Literature Review, Proposed System, Conclusion and References in II, III, IV and V respectively.

II. REVIEW OF LITERATURE

As discussed in the Introduction section, considering factors related to the fuel monitoring and the role of IoT in this field a detailed review was done.

In [1], R.Kathun et al. proposed a system to monitor the fuel level in the vehicle using IoT technology and finds the nearest fuel station. The system sends a notification to the owner's mobile about nearest the fuel station. Gauri et al. [2] suggested a new approach to measure the actual level of fuel in the fuel tank of a vehicle using flow sensors and displays the notification in the display board in the vehicle and also suggests the nearest fuel station. The accurate level of fuel measuring and GPS/GSM system is proposed for secured and cost effective way of sending notification is given by [3].

In paper [4], a detailed analysis was made to forecast the speed and fuel consumption of a ship using artificial neural network technology. A capacitive sensor with controlled embedded system is proposed in [5] and also GPRS radio module for transferring data is used for real time fuel monitoring using IoT technology.

In paper [6], the authors propose a system to find the fuel level and fuel leakage using IoT sensors and the data thus gathered are stored in the cloud storage for further calculations. An Android application for Fuel monitoring using IoT is proposed in [7]. To ensure the identity and access of the application the usage is restricted to a single owner. Travel speed prediction using clustered K-nearest neighbors (CKNN) algorithm is proposed in [12], it optimizes the route and manages the traffic in work zone.

III.PROPOSED SYSTEM

Eventually after rambling through the existing IoT models in fuel monitoring, it is found that systems with sensors are used but while producing the results the model gives an inadequate messages. This research realizes that there is an urge to improve the effectiveness of the system. Thus, a Quick-Witted Fuel Monitoring System using IoT Technology is proposed.

A. Importance of Proposed System

The proposed system is developed in order to focus on the problems said above. Since the proposed system works on uncertain and variable features, R-Pi 3 is used. The proposed system is designed to work in Android Platform and receives input from IoT sensor for monitoring fuel and Google Map API for finding the nearest fuel station.

B. Methodology

The block diagram of the proposed system is shown in fig. 1. The single-board computer R-Pi is use for direct communication with the sensors to collect fuel level data continuously. The tracking of the vehicle is accomplished by Google Map API. The fuel in the fuel tank of the vehicle is monitored by the fuel level sensor. Thus, the data collected are sent the cloud environment by the GPRS network using the GSM/Wi-Fi connectivity in real-time. The calculation for finding the approximate distance that could be covered with the remaining fuel, finding the nearest fuel refilling station and the optimum speed of the vehicle are done in the cloud platform.

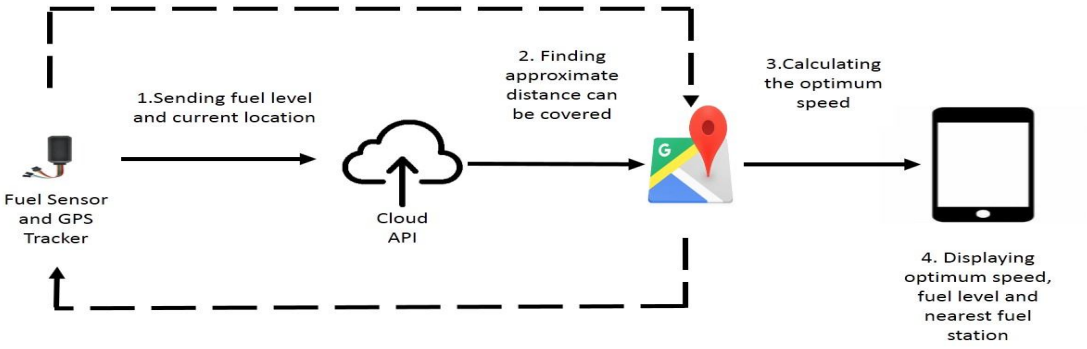

Fig. 1 Block diagram of the Proposed System

C. Mathematical Model

The focused parameters are Fuel Level(fL), Current Location(cL), Fuel Stations(fS) is the set of all fuel stations distance in the route, Nearest Fuel Station(nfS), Average Speed of the vehicle(aS), Optimum Speed(oS) and Threshold(Th)

nfS=min(fS) ---------- (1)

aS=(Total Distance covered) /(Total Time taken) ---------- (2)

Approximate distance (aD) to be covered with the remaining fuel= (Remaining fuel)×(kilometer per liter of the vehicle) ---------- (3)

Distance (D)= cL-min(fS) ---------- (4)

Let

oS= Optimum Speed

mL=Mileage speed of the vehicle

D. Algorithm of the Proposed System

The proposed system methodology shown in fig.2 gets the input from fuel sensor and the fuel refilling station from the Google Map and calculates the optimum speed of the vehicle with respect to the fuel level and remaining distance of the nearest fuel refilling station for the current location. As the system works in the highly uncertain circumstances, all the data are stored on to the cloud. The proposed algorithm continuously checks the fuel level. If the fuel level hits the threshold level then it starts calculating the optimum speed to reach the nearest fuel refilling station and nearest fuel refilling station then sends a notification to user mobile accordingly.

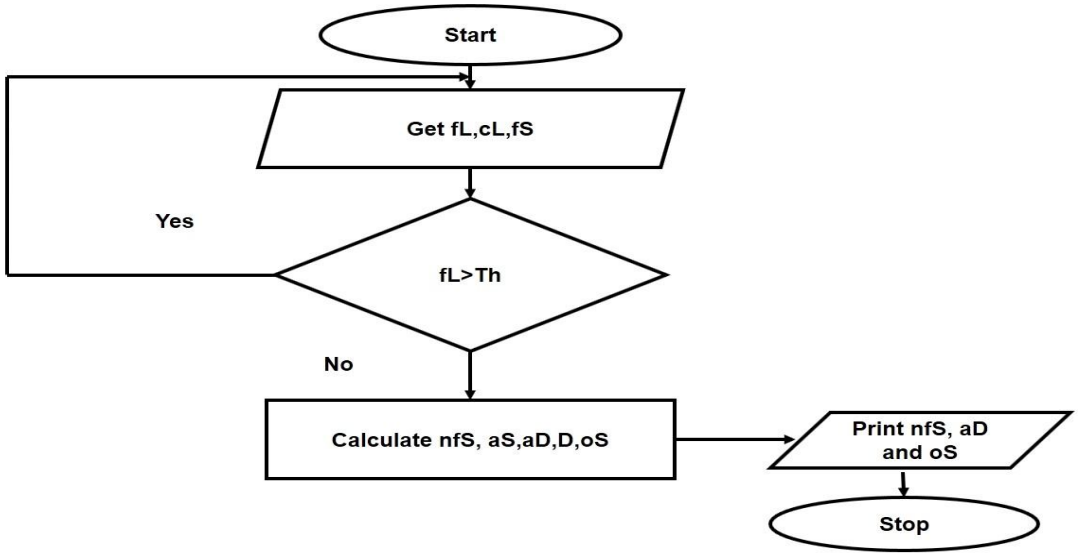

Fig. 2 Flow Chart of the Proposed Work

Algorithm Quick-Witted
Input: fL,cL,fS
Output: nfS,aD,oS
Start
nfS=min(fS)
aS=(Total Distance covered) /(Total Time taken)
Approximate distance (aD) to be covered with the remaining fuel= (Remaining fuel)×(kilometer per liter of the vehicle)
Distance (D)= cL-nfS
If(nfS<=aD)
oS=aS
else
oS=mL
Stop

IV. CONCLUSIONS

Concerning about the consumption of fuel leads to the optimum usage of fuel. For optimum usage and finding the appropriate time to refill the fuel tank needs an intelligent system which has to find the fuel level, nearest fuel refilling station and what should be the optimum speed of the vehicle with respect to the remaining fuel in the fuel tank. Quick-witted Fuel Monitoring System with IoT Technology is proposed to map all the fuel refilling stations in the specific route on Google Map with a fuel sensor connected to the fuel tank. The proposed system thus gets the input from the sensor and Google Map and calculates the Optimum speed of the vehicle to reach the nearest station and also send the message to the user mobile about the fuel level, optimum speed and the nearest fuel station. The proposed algorithm takes very less time for the execution because of fewer mathematical calculations. In the future, more parameters may be included and implemented with Deep Learning Technology with a dataset.

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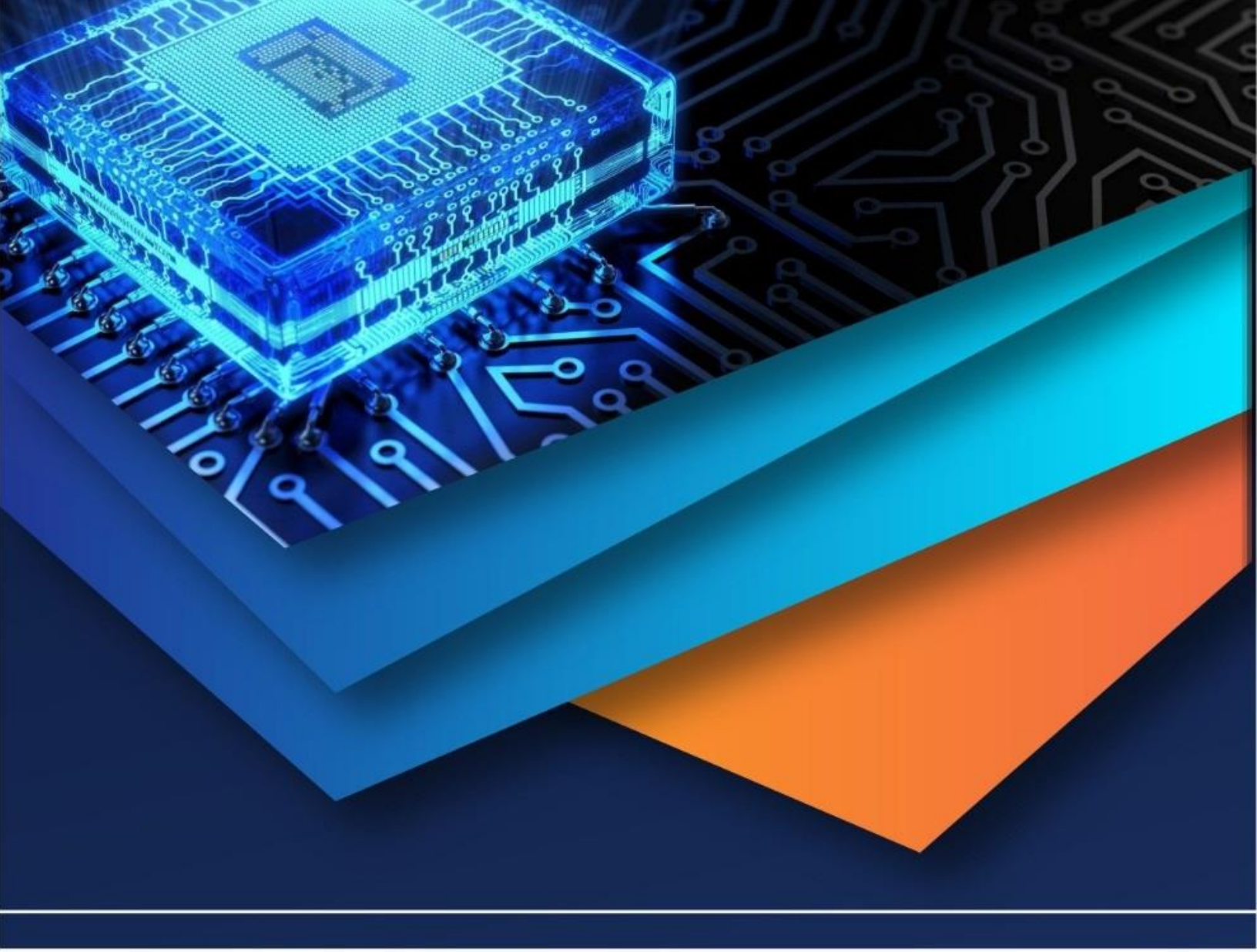

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