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A PROJECT SYNOPSIS

ON

"*i*-SMART MOTOWHEELS"

Submitted in partial fulfillment of the requirement for the degree of Bachelor of Engineering

B.E.

in

Electronics & Communications Engineering

by

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I. Abstract

The transportation industry is incurring a lot of losses because of drivers taking unwanted breaks, taking longer routes, excessive fuel consumption. A big part of their monetary funds is lost to accidents caused due to negligence. For vehicle fleets, much of the commercial mass-produced fleet telematics systems most likely provide simple tracking and tracing functions. However, the major improvement that these systems require is the manual detection of the inconsistencies between the real data of the system and the expected data in the logistics system by the supervisors/dispatchers. Moreover, the actual data between the telematics system and the logistics system has to be manually transferred. It is very important the discrepancies that seem to appear during manual detection be nullified to improve the quality of the organization. As much as the efficiency and productivity of the company are of utmost priority, the entire concept of safety, security, unforeseen ambiguities must also be kept under the radar. An upgrade in the existing system which provides the complete reviewed data of driver's output including storing correct arrival and departure times at the customer location and updating the logistics system database is almost a very essential need. Since unexpected events and ambiguities are identified automatically, the messages can be spared of needing to be interpreted by the vehicles manually and can respond to potential disruptions in the transport processes quickly. We present a *i*-Smart Motowheels in this project which aims to enhance the vehicle tracking API.

The competition within the transportation industry based on promptness, coherence, and quality has increased. The quality of operation of commercial vehicles can be improved using the concept of telematics which also helps in overcoming problems. The systems present on-board inside the vehicles may be capable of communicating with a stationary machine inside the dispatching office.

In the areas of information sharing between dispatchers and drivers, monitoring & tracking of fleet management, and preparation of handling operations, the main potential of fleet telematics systems emerges. Fleet telematics solutions vendors pledge that their solutions will be used to take advantage of the different possibilities. However, to get a grip on the full potential of fleet telematics systems, it is important to compare the actual data available in the fleet telematics system with the expected data in the logistics system.

II. Introduction

i-Smart Motowheels is the project undertaken to provide possible solutions for the problems in transportation industry. It is the system in place that helps manage and operate vehicle fleets. Knowing where the vehicles are, what the drivers doing and monitoring every event in real time are the key parameters for a well-managed decision process. An approach for *i*-Smart Motowheels using Internet of Things, Machine learning and other technologies is proposed to show the exact position of the mission, travelled path, fuel consumption rate, speed limits, and other necessary information.

i-Smart Motowheels is used for monitoring different kinds of motor vehicles such as cars, vans, trucks, aircraft (planes, helicopters etc.), ships as well as rail cars. Fleet Management is a function which allows companies which rely on transportation in business to remove or minimize the risks associated with vehicle investment, improving efficiency, productivity and reducing their overall transportation and staff costs, providing 100% compliance with government legislation and much more.

The proposed system comprises different hardware and software parts which are presented in the following sections with more details. Features of the system include Fuel Indication, Weight Indication, Temperature Indication, GPS Tracking, Driver Drowsiness Alerts, Driver Driving Patterns, Dashboard, Alerts Notifier, etc.

III. Problem Statement

Almost everyone is more focused towards domains like medical and agriculture, we wanted to work on something which is more prone to happen and is less looked up on. We know that we get our online products delivered from distinct and far places. It's important for us to check if the people and mode of transportation by which our products are being delivered is safe on track always. So, we came up with idea of "*i*-Smart Motowheels".

In addition, to check and maintain the system of transportation industry which is undergoing a lot of losses because of drivers taking unwanted breaks, taking longer routes, excessive fuel consumption. A big part of their monetary funds is lost to accidents caused due to negligence.

IV. Literature Survey

[1] Gowda, V R Channakeshava; Gopalakrishna K(2015). ***[IEEE 2015 IEEE Recent Advances in Intelligent Computational Systems (RAICS) - Trivandrum, Kerala, India (2015.12.10-2015.12.12)] 2015 IEEE Recent Advances in Intelligent Computational Systems (RAICS) - Real time vehicle fleet management and security system., (), 417–421.*** **doi:10.1109/raics.2015.7488452**

In many organizations like cab service providing companies, public vehicles and school busses do not have the security system. The purpose of this project is to provide the effective vehicle tracking, real time online monitoring, dedicated remote server for fleet data storage and security features in a single system.

GPS Receiver is interfaced for vehicle location tracking, GSM-GPRS modem is used for communication and for Security purpose a physical panic button, Biometric sensor, Camera, and speakers are used. A dedicated server used for data acquisition and a GUI renderer is created for user interface. This GUI-renderer will plot and displays the real time data dynamically.

[2] Zantout, Rached; Jrab, Mazen; Hamandi, Lama; Sibai, Fadi N. (2009). ***[IEEE 2009 International Conference on Innovations in Information Technology (IIT) - Al-Ain, United Arab Emirates (2009.12.15-2009.12.17)] 2009 International Conference on Innovations in Information Technology (IIT) - Fleet management automation using the global positioning system. , (), 30–34.*** **doi:10.1109/iit.2009.5413792**

In this paper, a system for automating *i*-Smart Motowheelss is described. The hardware of our system is a microprocessor-based embedded system. The software consists of firmware embedded in the hardware in addition to remote high-level software that keeps track of the position of the units and prepares reports to be sent to the customers.

The system is currently operational in a couple of Arab countries. More than 2000 units are currently operational in a variety of modes that are described in the paper. The paper also contains suggestions for future research based on the accomplishments reported here.

V. Scope of the Project

Scope Description	• A complete all-in-one *i*-Smart Motowheels • All aspects customized according to the user's requirement • Economic, highly efficient, and user-friendly system
Project Deliverables	• A system with all sensors mounted at dedicated locations of the vehiclewith required indicators. • A completely customized dashboard for monitoring all parameters. • A separate panel to display alerts based on priority. • An app for the driver with all details for the driver's current trip.
Constraints	• False alarms were triggered due to a few inaccuracies in the data. The accuracy of the driver metrics report is not guaranteed for one month from the period of installation. This is due to the inadequate training ofthe model. • A good light source is needed for accurate drowsiness detection if animage processing algorithm should be incorporated.
Assumption	The end-user has the required infrastructure to equip our dashboard.
Out of scope	Guaranteed accurate working of the system in bad network areas

Table 1 Scope of "*i*-Smart Motowheels"

VI. Objectives

1. To monitor and keep in track of the real time changes of the vehicles.
2. To locate and get the driver out from unpredictable situations like accidents and hijacking.

VII. Proposed Methodology with Block Diagrams

1. The vehicle will be embedded with fuel, weight and temperature sensors.
2. The fuel sensor will continuously be monitoring the amount of fuel left and in case the fuel level drops less than 10%, it will get a level 2 alert in the driver's app and as well will display the location of the nearest gas stations.

3. The weight sensors measure the weight of the contents in the truck and display it in the dashboard. The maximum weight that is not to be crossed for safety or other reasons can be entered in the app and case it crosses the limit, a level 2 alert will be sent to the dashboard including the excess weight to be removed.
4. The sealed digital temperature probe that is SEN-11050 lets you precisely measure temperatures even in wet environments with a simple 1-Wire interface. The temperature rangewhich has to be maintained can be specified and any time the values go off-limit, a level 2 alert is sent to the driver's app.
5. With the help of the GPS tracker, the vehicle's precise location along with the speed can be continuously monitored. If any deviations were taken from the preset final location, alerts willbe sent.
6. The drowsiness detector constantly monitors the driver and in case drowsiness detected by the camera placed such that it can focus on the eyes of the driver or through the pulse rate recorded by the sensors on the steering. It sends a Level one alert (the most prioritized alert) to the supervisor's dashboard hence ensuring the safety of the driver and the truck. A detailed log of the driver's performance including any unwanted breaks taken, speed, duration of the trips etc. will be sent on a timely basis.

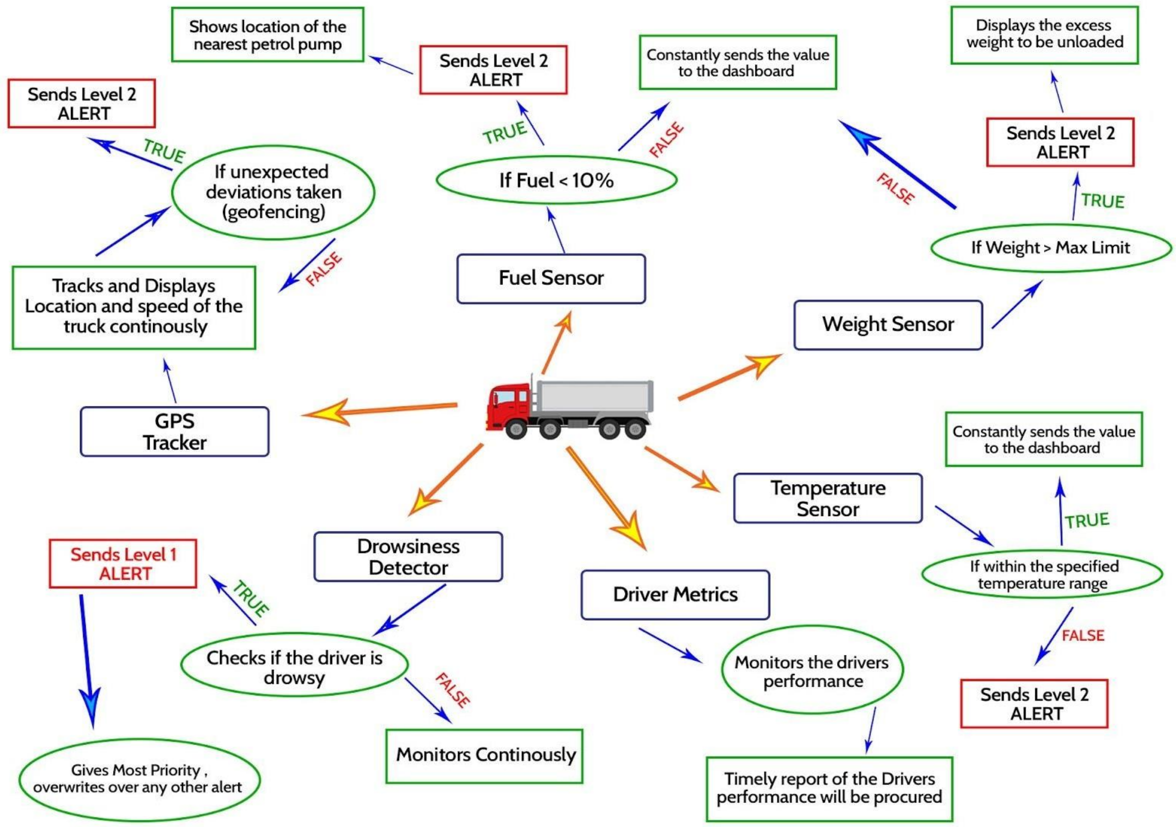

Figure 1: Block diagram of *i*-Smart Motowheels

VIII. Tools

The *i*-Smart Motowheels is developed by integrating all sensors keeping **Raspberry Pi** at the centre.

1. **Fuel Indicator** - The optical liquid level sensors which work on the principle of infrared sensors to determine the depth of the liquid i.e. fuel in this case and computes the amount of fuel present in the vehicle.
2. **Weight Indicator** - The steel load cells monitor the weight of the contents inside the truck and if it crosses the specified limit, it sends an alert to the dashboard.
3. **Temperature Sensor** - The temperature sensors are placed inside the truck at desired locations and send the data to the controller which in turn transmits it to the dashboard.
4. **GPS Module** - The ublox GPS module gives the best possible positioning information. It can be configured to read the location and speed of the vehicle. The location is then fed to the Google Maps API which displays the location with real-time movement.
5. **Drowsiness Detection** - Several methods to detect driver drowsiness are present. One of them includes monitoring the drivers' eyes in real-time using a webcam and feeding this data to OpenCV and using haar cascades algorithm (or anything equivalent) to decide the drowsy state of the driver. This model is also fed with a dataset of drivers eyes open and closed and then trained to give more accurate and better results. Drowsiness Detection using the pulse of the person is also ongoing research. The pulse sensors are embedded onto the steering. The pulse of the driver is obtained and using appropriate frequency domain analysis the drowsy state can be detected. If the driver falls drowsy it triggers an alarm inside the truck and also sends a high priority call alert to the supervisor The best working method among image processing and pulse will be used in this project.
6. **Driver Driving Patterns** - The truck over speeding can be easily monitored from the input from the GPS Module.
7. **Dashboard** - The dashboard gives a full view of all the parameters of the truck. It gives a graphical representation of the data for better and more clear understanding. The alerts panel displays all the alerts based on the priority order. Trips can be created by the supervisor and set the limits for all parameters (weight, temperature, geo-fencing) making it a fully customizable solution.
8. **Alerts** - A separate panel is created to display all alerts at every stage. All high priority alerts.

IX. Implementation Process

The basis of any good project depends on an extremely efficient strategy with a suitable Methodology.

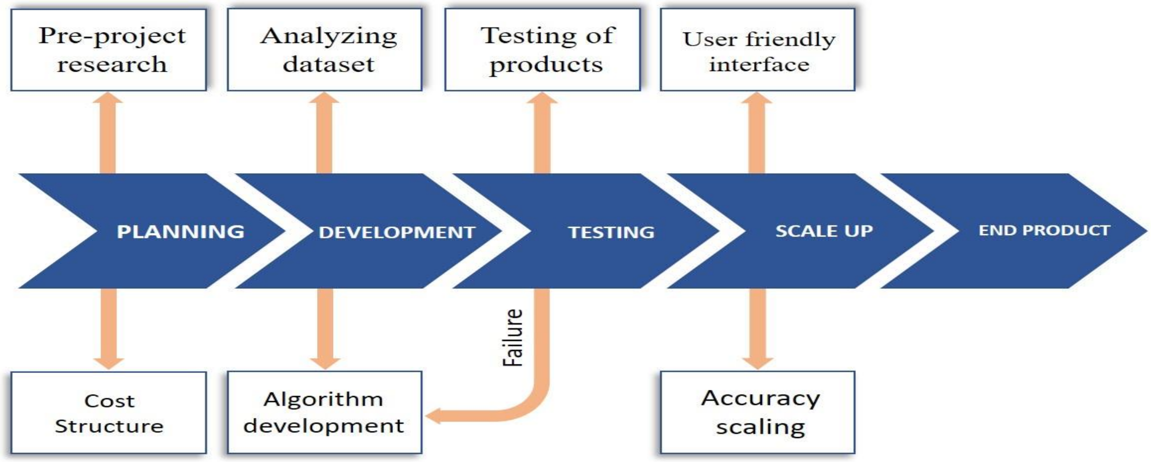

Figure 2: Implementation of *i*-Smart Motowheels

1. Planning :

- There are also many sensors offering the same features but one needs to choose a dashboard that is not too heavy on the pocket.
- Therefore, based on the cost-effectiveness and maximum features, we shall choose the best IoT dashboard.
- We plan on choosing the most reliable sensors for the features we aim at incorporating.
- For example-The camera being chosen for the drowsiness, the detector should be immune to the dark light, it should not falsely accuse/ raise an alarm if the surrounding is dimly lit.

2. Development :

- Efficient drowsiness detection algorithms are developed, where datasets are procured and the model is trained.
- Given that drowsiness detection using image processing is an already approved method, the extent of drowsiness of a person can be detected by his/her pulse rate (Beats per minute BPM) using appropriate pulse sensor and frequency domain analysis.
- Recognition and analysis of driving styles are incorporated for better driver performance reports.
- Other sensors like liquid level sensors, load cells, temperature sensors are configured.

3. **Testing :**
    - The product has to be tested that has been primarily aimed at sensing all the anomalies correctly.
    - The algorithms of the various sensors used such as drowsiness, driver anomaly, temperature, and weight is to be checked and tested for correct detection.

4. **Scale-up :**
    - We aim to make our '*i*-Smart Motowheels' as user friendly as possible.
    - With an interface easily accessible and manageable by the supervisor and all those concerned, it helps our product to reach better to the masses.
    - We believe in having a prototype that cannot be installed in its raw form and hence needs to be commercialized.
5. **End product** use into application.

X. Expected Results

1. Monitoring: Indication of fuel in tank, weight of the total goods, location of the vehicle are monitored in the dispatch office with the help of display system in the vehicles. The stystem detects the drowsiness of the driver and provides information to the monitoring dashboard. Furthermore, SOS helps us to detect accidents using sensors, camera and speech recognition.

2. Maintainance: All hardware components are frequently analysed to check their performance. Components that are not working should be replaced as soon as possible. Software system is revised frequently to increase the performance of the system.

3. Safety: Fuel and goods theft can be avoided. Vehicles are tracked in order to make sure that the vehicles are reached to their destination and to access the vehicles' location in case of any unauthorized service. Accidents are avoided by recognizing the drowsiness of the driver by cutting off the engine's ignition system.

XI. Advantages

- Stolen vehicle recovery.
- Field service management.
- It is used for food delivery and car rental companies.

XII. Applications

- It provides more security than other system.
- From the remote place we can access the system.
- Custom reporting helps increase efficiency and cuts costs.
- Integrate with Enterprise Applications.
- Cab Service providing companies need to monitor their cabs in real time to provide the better service to the customers.
- For School Bus monitoring will help the school managements for online monitoring of the school busses and they can check the vehicles over speed etc.
- For cargo carrying trucks companies need to monitor their vehicle through online, which allows to better usage of the warehouse.

XIII. Conclusions

The technology that exist today, is unable to provide exact tracking details and safety of the driver and the goods in transit. Hence "*i*-smart Motowheels" is an approch to maintain and monitior the entire process of logistics from one point to the other. Including the safety servies that will be included such as SOS, drowsiness detection and emergency engine ignition cut-off systems.

Overall system will help the logistics service to provide the customers with exact tracking details of there online order/goods with also safety of the human carring out the transt of the goods.

XIV. Flow of the future works (Nov'21 – Jun'22)

No.	Month	Nature of the works that you are going to do in the particular month
1.	Oct'2021	Project title selection, Project guide allotment and synopsis submission.
2.	Nov'2021	Project phase presentation and final project allotment.
3.	Dec'2021	Literature survey of project.
4.	Jan'2022	Phase – I presentation and examination.
5.	Feb'2022	7th semester examination.
6.	Mar'2022	Hardware implementations.
7.	Apr'2022	Testing.
8.	May'2022	Observation of final working project.
9.	Jun'2022	Final presentation and examination.

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