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Machine Learning Algorithm for Driver Rating

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ABSTRACT
Reviewing and Rating mechanism for every consumer products provides a healthy competition in between the e-service providers. This paper work attempts to render the rating mechanism in the field of Intelligent Transportation system, ITS means adding intelligence in the field of vehicular transport. This paper work proposes a novel idea of Machine rating instead of human rating ie. the instead of consumer, the consumed product is going to rate the consumer. In proposed ITS consumer is the driver and the product is the vehicle itself. With the incorporation of sensor data processing in an ECU (Electronic Control Unit) in a car, it is essential to enhance the utilization of machine learning to accomplish new tasks. The potential applications include evaluation of driver condition or driving scenario classification through data fusion from different external and internal sensors and IOT(Internet Of Things).

In this paper, one of the major tasks of a machine learning algorithm is continuous rendering of various sensors and forecast the rating based on the ideal model. This helps to analyzer the quality of the driver even in the absence of consumer. The enables the police department to track the drivers behavior from the cloud. These system offer driving convenience features that will be more vehicles in future model years. When engaged they use cameras, radar, and other sensors and sometimes even mapping data to try to keep a car centered in a lane and control speed so that the car remains a set distance in traffic from vehicles in front.

Keywords: Intelligent Transportation System, Vehicular Technology, Internet Of Things, Wireless Sensor, Electronic Control Unit.

I. INTRODUCTION

The intelligent transportation system (ITS) is an advanced application which without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. After the invention of the integrated circuit, the sophistication of automation technology increased. Manufacturers and researchers subsequently added a variety of automated functions to automobiles and other vehicles. Intelligent transport systems vary in technologies applied, from basic management systems such as car navigation; traffic signal control systems; container management systems; variable message signs; automatic number plate recognition or speed cameras to automatic driver rating and to more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance and information systems; weather information. Additionally, predictive techniques are being developed to allow advanced modeling and comparison with historical baseline data. An increasing number of vehicles are equipped with in-vehicle satnaV/GPS (satellite navigation) systems that have two-way communication with a traffic data provider. Position readings from these vehicles are used to compute vehicle speeds. Modern methods may not use dedicated hardware but instead Smartphone based solutions using so called Telematics 2.0. Telematics is an interdisciplinary field that encompasses telecommunications, vehicular technologies, for instance, road transportation, road safety, electrical engineering (sensors, instrumentation, wireless communications, etc.), and computer science (cloud, Internet, etc.).The IOT can assist in the integration of communications, control, and information processing across various transportation system. Application of the IOT extends to all aspects of transportation systems (ie. the vehicle, the infrastructure, and the driver or user). Dynamic interaction between these components of a transport system enables inter

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andintra vehicular communication, smart traffic control, smart parking, electronic toll collection systems, logistic and fleet management, vehicle control, and safety and road assistance. In Logistics and Fleet Management for example, The IOT platform can continuously monitor the location and conditions of cargo and assets via wireless sensors and send specific alerts when management exceptions occur (delays, damages, thefts, etc.). This can only be possible with the IOT and its seamless connectivity among devices. Sensors such as GPS, Humidity, Temperature, send data to the IOT platform and then the data is analyzed and send further to the users. This way, users can track the real-time status of vehicles and can make appropriate decisions. If combined with Machine Learning then it also helps in reducing traffic accidents by introducing drowsiness alerts to drivers and providing self-driven cars too.

II. RELATED WORKS

Intelligent Driving Data Recorder in Smartphone using Deep Neural Network-Based Speedometer and Scene Understanding follows this algorithm. Record the data from gyroscope and accelerometer of mobile phone. Use Concatenated double layered LSTM deep learning algorithm to estimate speed. Capture the traffic conditions using light and multi-scale road facility detection algorithm. Use both the data to rate the driver behavior. efficient because of not using additional data recorder. Absolute mean error is very less compared to other methods. Reliable for most drivers since can be easily used with mobile phones itself.

III. ORGANIZATION OF THE PROPOSED SYSTEM

A machine learning algorithm will be developed to sense various driving parameters like i) speed increase interval ii) braking use interval iii) Horn using interval iv) Gear changing sequence and v) Steering angular interval. Every decision made by the driver will be stored and analyzed. Based on the driving behaviour of the driver the vehicle will calculate a rating level to the driver periodically. This rating can be a measurement criterion to decide who might be the best driver. This project work will be give an incentive edge to the drivers to drive. Passionately to achieve higher rating which will automatically reduce rash driving. Driver rating can be dynamically shared to a remote server, where the best driver competition poll will be created to award the best rated driver.

BLOCK DIAGRAM:

Block diagram

BLOCK DIAGRAM DESCRIPTION

EMBEDDED DATA ACQUISITION:

The block diagram in which data acquisition forms the initial stage. Here various sensor readings (accelerator, brake, steering etc..) will be sensed using AVR controller in the Arduino Board. Arduino board will transfer the sensor readings to the python embedded acquisition module through a serial cable. Arduino and python should follow a baud rate of 9600bps for synchronization. Received sensor readings will be tabulated in a dynamic python list variable.

DATA VALIDATION:

Sensors data will be merged into a single vector to ease the serial communication process between Arduino and python. Received da ta need to be Extracted from single memory and need to be stored inside separate python lists. Data validation module is used to detect and remove the outliers(noise) present in the acquired sensor data. Due to external interference the sensor data may be occasionally tampered even due to wiring interface. The received data will be analyzed to fit inside a expected boundaryelse it will be omitted as noise.

DATA CLASSIFICATION:

Data will be p reprocessed to find the absolute difference between the sample input list. Each sample reading will be compared to its neighbour array samples to find the difference between the sample readings. The difference samples will be further filtered and classified using a thresh holding algorithm. Classification involves certain rules which will be verified from the perfect driving model. Based on the classification result the data sample instance will be‘error’ or ‘error free’ driving.

PREDICTION

Based on multiple senor classification results the total number of error instance will be counted from overall sample. Error percentage will be calculated from the overall sample size. If the error count is below 25% then we can safely assume the driver is performing a perfect driving, so the rating will be predicted as 5star. If the error count is between 25%-35% then the rating will be

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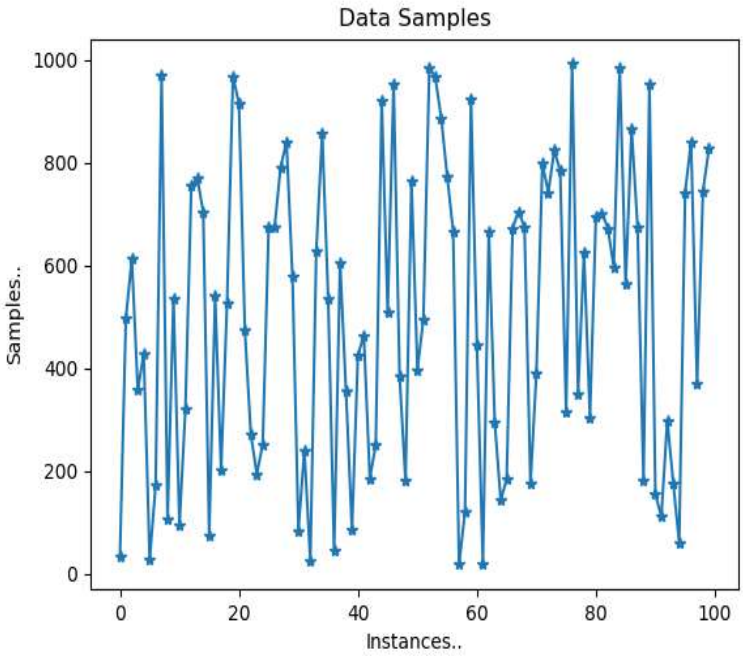
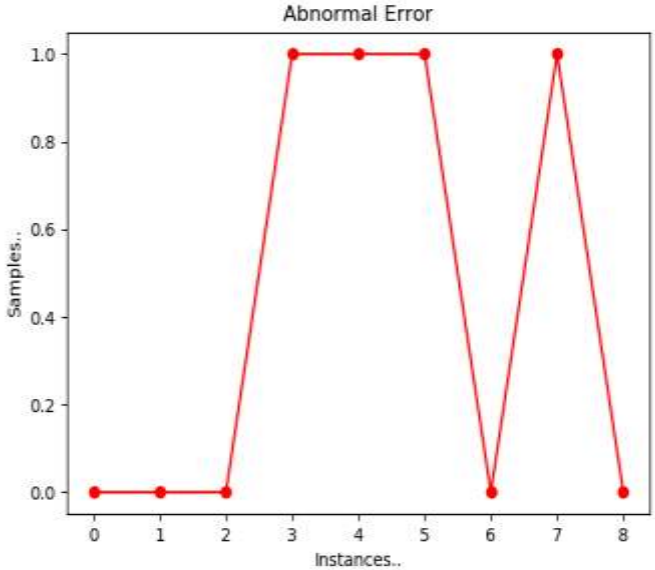
predicted as 4star.These rating, tabulation will be finalized after running various test case scenarios.



Sample data generation

Gradual deceleration in speed due to steady application of brake.



Error Validation
Sudden peak due to instantaneous application of brake.

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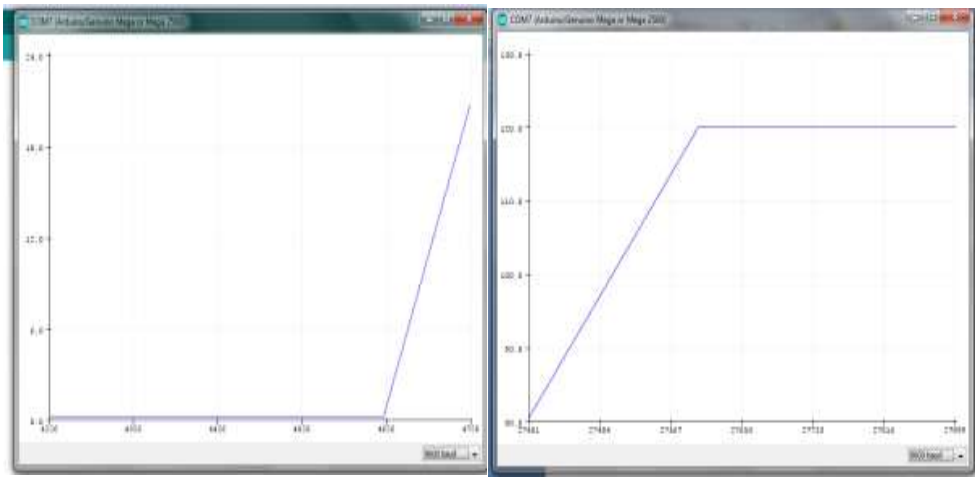
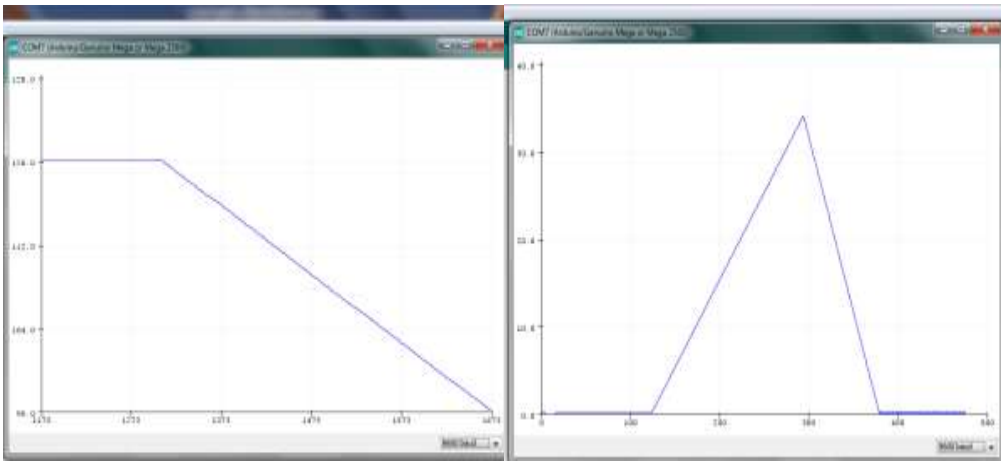
GRAPH OBTAINED:



Acceleration **Speed stable**

Due to gradual acceleration stable speed is maintained by the driver which is evident from the above graph.



Deceleration **Brake**

IV. RESULTS AND DISCUSSION

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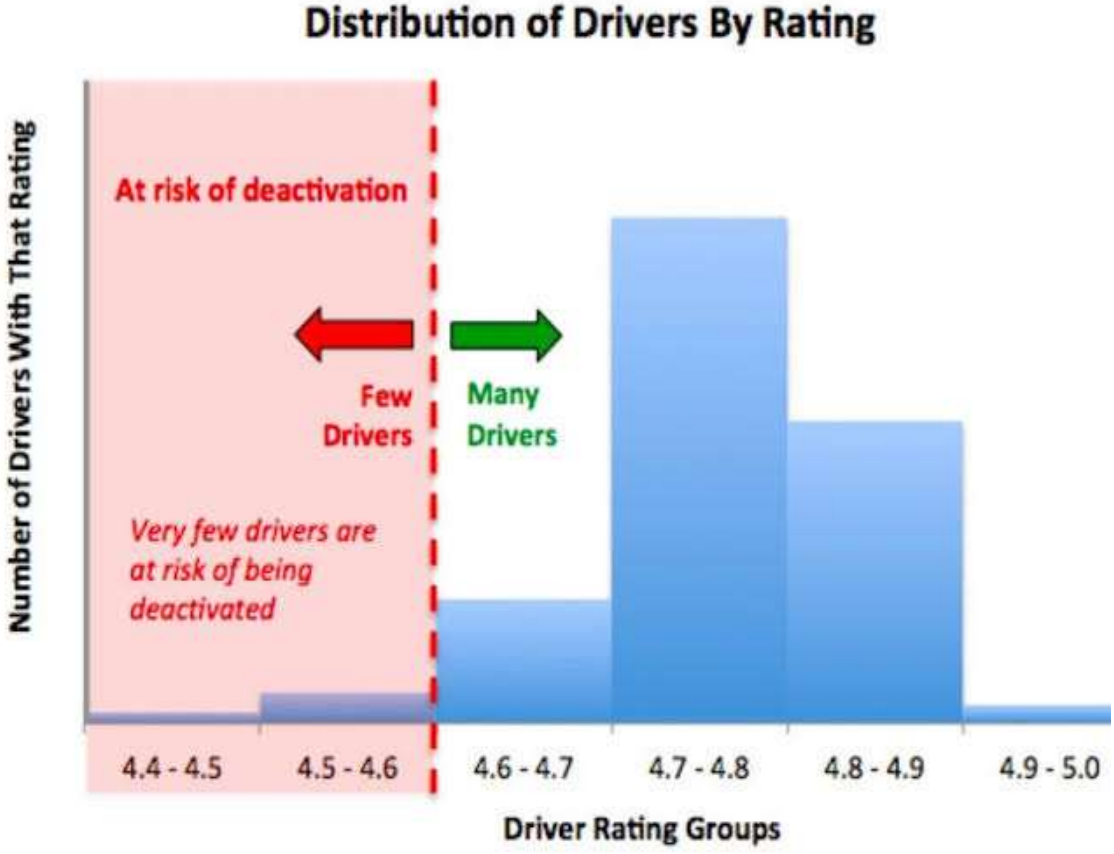
We can see that the algorithm works perfectly as expected. In this paper we have discussed the pipeline of our algorithm. The data is successfully acquired from the sensors used. These data are interfaced into personal computer and analyzed using the Python IDE. The error occurrence is calculated using different algorithms such as peak detection algorithm, thresh holding, sum of absolute differences. The number of error is also calculated depending on which the driver's rating will be rated using Machine Learning Algorithm. If the error count is below 25% then we can safely assume the driver is performing a perfect driving, so the rating will be predicted as 5star. If the error count is between 25%-35% then the rating will be predicted as 4star.

This rating can be used to take disciplinary action upon the driver for the mistakes committed by him/her. During driving license renewal these can be implied as penalties. Even the recorded data and the probability of good rating can be used by the cab providers to encourage their drivers by presenting them with incentives and rewards occasionally. Even the data can be accessed by Police Department to randomly check the behaviour of earlier accused drivers. Thus, we can only conclude that out of all methods existing related to Intelligent Transport System the proposed method can be used more efficiently and effectively to detect, store and analyze the driver's driving behaviour.



V. CONCLUSION

A successful design implementation of driver rating predictor is implemented using Arduino and python interface . Driver behaviour on the vehicle is sensed through steering , acceleration and breaking sensors used . Sensing data are collected with a sampling rate of 9600 baud rate. Collected data will be serial transferred to python data analyzer code in which the error rate of the driver is calculated with a predefined learning model. The result of the driver performance will be updated into a IOT port through which it can be monitored from an Android App.

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