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INTRODUCTIONThe design and implementation of anadvanced system to track vehicle conditions and smart navigation testedsuccessfully as presented in the earlier chapters of the thesis. The objectivesof the present work aims at developing a system that would aid the driver/userin keeping track the vehicle parameters/conditions such as Fuel level, Enginetemperature and Weather monitoring.

The work also in real time monitors theroad and provides detected input if an obstacle is present and also accidentidentification and alert the driver/user. The prototype is designed to send anSOS whenever an accident is detected. The system also providing the security tothe vehicle from intruders from the of vehicle and also security to thepassengers through different verification tests of Finger, Face recognition andAlcohol detection to the driver before he is ready to drive the vehicle berestricted if he is drunken alcohol by controlling the Vehicle ignitioncontrol. The following are the main objectives to design and implement anadvanced system to track the vehicle conditions and smart navigation.  ·      For monitoring the following parameters of the vehicle andintimate the user when the threshold is violated:·       Fuel Level·       Enginetemperature·      To determine the weather conditions of the driving terrain, that includes the temperature and humidity.·      To alert the user about the presence of obstacle/pedestriansalong the driving road.·      To identify the occurrence of accident and send emergencymessage to pre-defined Mobile Station using GSM Technology.

·      To provide an advanced security to the vehicle against theftusing Biometrics and safety and security to assist the driver through ·       Fingerprint, ·       Face Recognitionand ·       AlcoholDetection.·      It also provides an advanced Head Up Display connectivity andaids in infotainment on advanced display of Samsung Galaxy Notepad whichreadily available with all users which reduces the cost of the system. The developedsystem is implemented and tested successfully by following the methodology as presentedbelow. 7. 2  MethodologyThe system is being developed using RaspberryPi and Arduino Uno/Arduino AT mega with GSM/GPS and Bluetooth Technology fordata communication connected with different sensors already discussed in detailin chapter 3, Chapter 4 and chapter 5 and Chapter 6 of Integrated system.

7. 2. 1Methodology for objective-1 ·      To monitor the Fuel level of the vehicle using Ultrasonicsensor and whenever the fuel level falls below the threshold to be intimated tothe driver/user.·      To monitor the Engine temperature and weather condition of the driving terrain DHT11 using sensor.  7. 2. 2 Methodologyfor objective-2 ·      Micro switches are mountedacross the periphery of the car, each of them separated by an angle of 45degree (hence a total of 8 micro switches). These detect the presence ofpedestrians on road as well as occurrence of accident if any.

7. 2. 3 Methodologyfor objective-3 The security against theft/safety and security for the vehicleis provided using three levels of authentication. They are·      The drivers finger printVerification (Biometric).

·      The drivers Face Recognitionand ·      Alcohol Detection. 7. 2. 4 Methodology for objective-4  ·      It also provides an advanced Head-Up Displayconnectivity and aids in infotainment on advanced display using  Samsung Galaxy Notepad which readily availablewith all users that reduces the cost of the system.

The developed system isimplemented and tested successfully with the following procedure as presentedbelow. 7. 3Implementation ofHardware and Software of the System The prototype system is developedusing Raspberry Pi in conjunction with the Two Arduino AT Mega 2560Microcontroller. The sensors are incorporated to the Arduino and the datafetched by the microcontroller is then transmitted to the Raspberry Pi (RPi)using the Bluetooth module HC-05. The Raspberry Pi processes the fetched valuesand then initiates the necessary actions with GSM/GPS Module for datacommunication to display all the information on an advanced Head-Up display usingadvanced Samsung Galaxy Notepad is a new feature of the system to display theinformation of system in real time.

7. 3. 1 Algorithm of the proposed workThe following are the algorithm steps for implementingthe hardware of the system with developed software program as follows. 1.     Initialize the sensors and check for various pre-defined parameters. 2.

To turn On the vehicle Ignition the following Authentication needsto be satisfied: a.    A Finger Print matchb.    Face Detection3.     The system checks for presence of Alcohol. If the Driver is foundpositive, the Ignition turns off, else the vehicle starts. 4.     After the preliminary authentication, the vehicle conditions are tobe retrieved before the vehicle accelerates.

The vehicle conditions such as, fuel level and the engine temperature are compared against the threshold. a.    If the fuel is below threshold, a refuel display alert is shown. b.    If the temperature is above thethreshold, Engine cooling process is initiated.

5.     Clearing the conditions of Step No. 2 to 4, vehicle movement isinitiated. 6.     The system constantly monitors the weather conditions and thedetails are displayed on the infotainment screen. 7.     The system persistently monitors the presence of Pedestrians alongthe path, if found decelerates the vehicle, avoiding accidents. 8.

An accident if detected, the engine is decelerated and a SOS messageis forwarded to pre-defined Mobile Stations. 9.     Steps 3 to 8 are repeatedly and simultaneously carried out wheneverthe vehicle is in motion. The block diagram and experimentalsetup and flow chart of the proposed work is shown in figure 7. 1, 7.

2 and 7. 3respectively  which gives completeprocess of the system. Figure 7. 1 : The complete Block diagram of VehicleSmart Navigation System            The connection details of allsensors used for the measurement and monitoring of vehicle conditionsinterfaced with Arduino AT mega 2560 microcontroller as shown in figure 7. 2. The second microcontroller board is used to transmit the values of the sensorsto the Raspberry Pi processor through Blue tooth module to display allinformation on display of Samsung Galaxy Notepad through GSM/GPS technology  which we already discussed in  previous chapters of the thesis.

Figure 7. 2 : Experimental Setup of the proposed work of Vehicle Smart Navigationsystem   Figure7. 3 : Flow chart of the Vehicle smart Navigation system7. 3   Results and Discussion             The objectives of the presentresearch work are satisfactorily realized. The developed prototype system to track the vehicle conditions and smartnavigation system has been implemented and tested successfully and the resultsare presented in below figures of 7. 4, 7. 5 and 7.

6 respectively on the Samsung GalaxyTab Used as the advanced display of the Navigation system. The developed systemis working steadily and consistently tested for many times. 1.     The System measures and monitors the important Vehicle conditions/parametersof Engine temperature, Fuel level of the tank and also determines the weatherconditions of the driving terrain that includes the temperature and humidity outsideof the weather for further control the internal conditions of the vehicle tocontrol the Air conditioning unit.  Mainlyit monitors the fuel level and engine temperature in real time on the display. 2.     The driver/user is intimated whenever the fuel level falls below thethreshold and the Engine heat level conditions above the normal values to stopthe vehicle movement by giving advanced information to the driver that keepsthe vehicle in good health condition. The system detects and also alert the driver/ user whenever a pedestrian is detected along the driving road to provide the safety and security to the passengers by avoiding the accidents.

. The system also identifies the occurrence of an accident, if occurred. Immediately it sends an emergency SMS message to pre-defined user numbers, High way petrol police team people or Emergency Health care Vehicle services such as 108. 5.   The system also provides advancedbiometric based authentication of Finger print and Face recognition and Alcoholdetection which provides a high security to the vehicle from the theft and safetyto the driver/passengers through vehicle ignition control which cannot bemimicked easily.   Figure 7. 4  : Face recognition results Alcohol Detection                       Figure7.

5 :   Display of Alcohol Detection               Figure 7. 6 : Theparameters of the Smart Vehicle Navigation System                    on the Head-Up display ofSamsung Galaxy Notepad 7. 4 Conclusion and Scope of Future work The developed Proto type system of the hardware and software isimplemented and tested successfully in the first step of the process for themonitoring of Fuel level, Engine Temperature and Humidity values and alsoWeather Monitoring parameters of Temperature and Humidity outside the vehiclealso. In the second step it detects the obstacle/pedestrian and detects theaccident occurrence and send alert messages to provide immediate help to thepassengers of vehicle.

In the third step it provides the security to thevehicle from the theft by intruders and security to the passengers form thedriver not permitting to drive the vehicle by the ignition control of thevehicle by Finger, Face recognition and alcohol test to the driver. All theseparameters and Navigation system is also successfully implemented as presented above.            Scope of theFuture work As a future scope of the work it suggested that to develop a general purpose plug-in sensors single application board to interface all the vehicle parameters to connect with the processor including Bluetooth and GSM/GPS module board to reduce the hardware complication and reduce the cost of the system. Now even today some vehicle/cars are not having colour touch screen display system up to the cost of Rs. 10. 5 Lakhs worth. They are giving this as a specific feature to only High End/ SUV vehicles.

Hence it is suggested the researchers to implement the Touch screen as display unit with their system with lowcost which is quite possible.  3.    As per myobservation now some of the vehicles having seat belt provision as an importantfeature that provide the safety to the driver and co-passenger at the frontside of the vehicle. If the driver and co-passenger are not putting their seatbelt properly will give an alarm for 3 minutes and stop which is not providingthe complete safety feature of the same. Hence it is suggested the researcherswho are going to work on seat belt feature has to implement the condition ifboth are not properly putting seat belt, then immediately the engine has to beoff by controlling the ignition to self-motor or stop the petrol supply to theengine through an electro mechanical valve arrangement interfaced with thesystem processor. 4.     It is also suggested to introduce new kind oftechnology to replace the air bags with a low cost as a feature in the vehicleswhich can be affordable by the low, middle and average middle class users as itis a burden to them if once opened. 5.

Now a days all vehicle accidents are happened only dueto the negligence, drinking and tiredness i. e. unrest or sleepless and alsorash driving. At present all high end and SUV vehicles also not having thefeature of Ignition control system with Finger, Face recognition, alcoholdetection and detecting the emotions of the driver. Hence, it is suggested tonew researchers to introduce a DSP based image processing system to analysesthe face emotions of the driver.

Based on that the the vehicle has to be stopif the condition of the vehicle driver face emotions are deviating with actual parameterssuch as blinking of eyes etc. 6.     Now mobile phones are playing advanced role in vehiclesystems.

Hence it is suggested to introduce new Mobile eye technology that useartificial vision to some Advanced Driving Assistance system (ADAS) in onedevice that analyses the road on detect and alert of hazards as pedestriancollision. 7.     It is also suggested the researcher to use the mobileapplication of Finger, Face and password provision to use as an Ignitioncontrol system of the vehicle controlled through mobile phone.