Project Based Seminar (Oral) Presentation
On

"Vehicle interface monitoring and Accident control using Artificial Intelligence"

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Guide
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Day and Date of Exam : Friday, 24 April 2020

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Introduction

- With the increase in demand for smart intelligent devices, integration of smart systems in automobiles is inevitable and certainly has gained large attention in recent times.

- To develop the intelligent smart systems, installing vehicle sensors and processing data from them is the key fundamental step.

- This presentation provides overview of how to capture certain critical vehicle data from various sensors and process the data which can later be processed for intelligent systems development and to display the relevant information for the rider.

Literature Survey

The last two years has seen a sea change in motorcycle instrument clusters. The interface has moved from traditional dials and LCD displays to TFT screens as seen in cars. This has allowed bike makers and designers to utilise every pixel, colour range and motion possibility to the maximum and going by current trends they are.

A blog article by Ather energy, a smart EV startup aimed at developing a next generation intelligent connected scooter mentioned as it is about how the digital revolution is transforming various products and how the need to connect with a machine in its physical environment and gather data without any help from humans has been the premise of smarter, connected products.

The Bike Side stand unfolded ride lock link for two wheelers is the one of the lifesaving mechanism, which prevents the ride from riding the bike in unreleased position (retracted position) of the side stand.

Motivation

- The current automobile industry is struggling with the issue of lack of information about the performance of product and its sub systems during its usage, which can later be used for future product development or improving the current product or sub systems. This is mainly due to the fact that the collection of data from sub systems of gasoline vehicles is hectic and processing such large chunks of data is not possible.

- With the advent of AI vehicles and owing to its simplistic design and lesser number of parts one can collect large amounts of data from the vehicle and use it for further research. With cloud connectivity, this data can be transmitted at real time and this paves way for an entirely new era in the transportation sector leading to intelligent connected transportation systems.

Aim of the Project

- The aim of this project is to provide a digital interface and safety measures for the motorcycle using Artificial Intelligence.

- The project also aims at:

  – Rider's Safety: Detecting the side stand by using Side stand alarm indicator and sensors.

  – Digital Speedometer: Instead of the analog speedometer we see in today's two wheeler vehicles, a digital speedometer will be provided in the interface.

  – Speed Barrier: The speed barrier will trigger if the vehicle is in a crowded place.

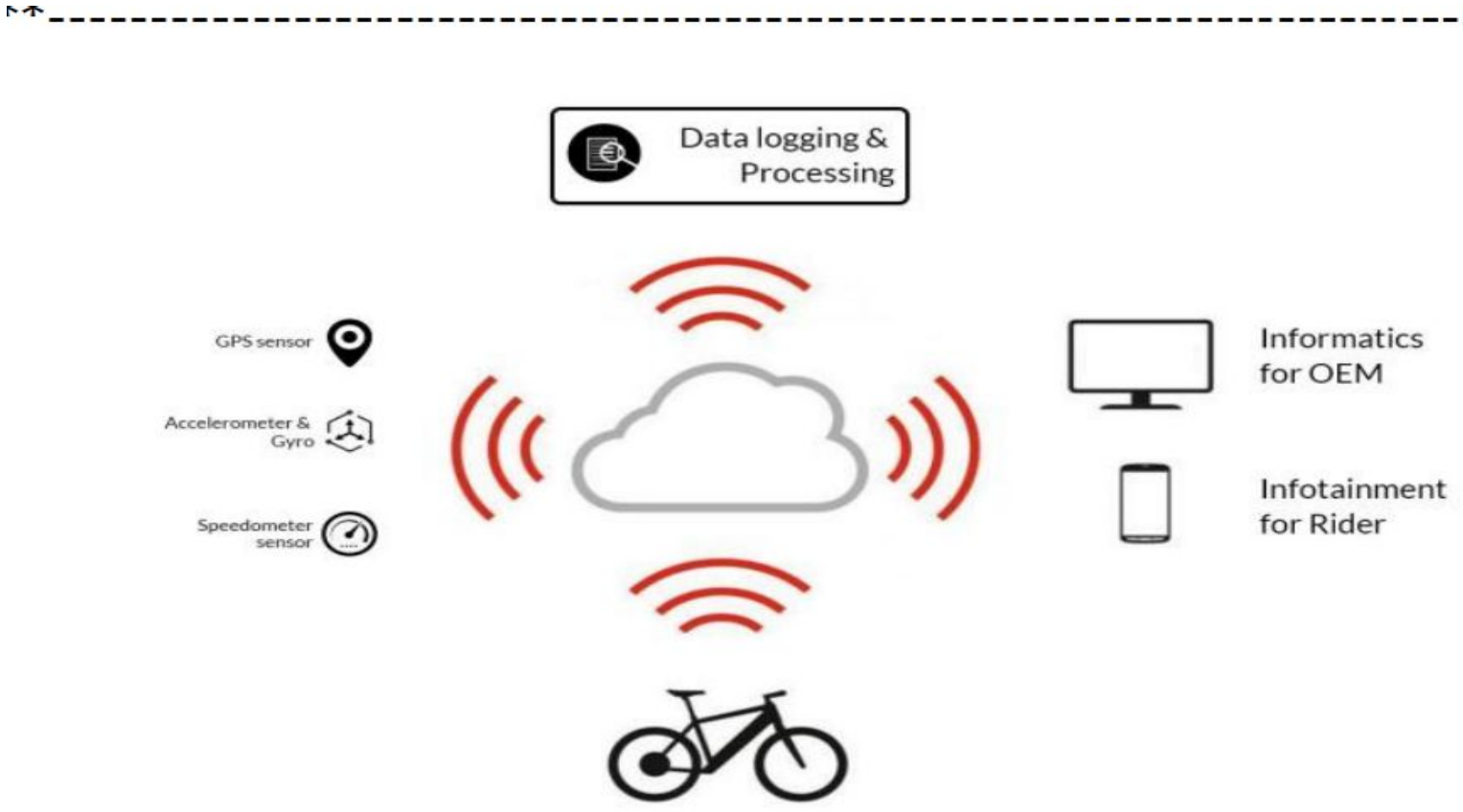
Objectives of the Project

- The prime objective of this project is to develop a module which can collect data from vehicle sensors like speed, GPS information and motion tracking using accelerometer and gyro sensor and log the data onto a database file.

- The information collected is used to display ride metrics information onto a display dashboard on the vehicle.

- The Bike Side stand unfolded ride lock link for two wheelers is the one of the lifesaving mechanism, which prevents the ride from riding the bike in unreleased position (retracted position) of the side stand.

Contents of Seminar

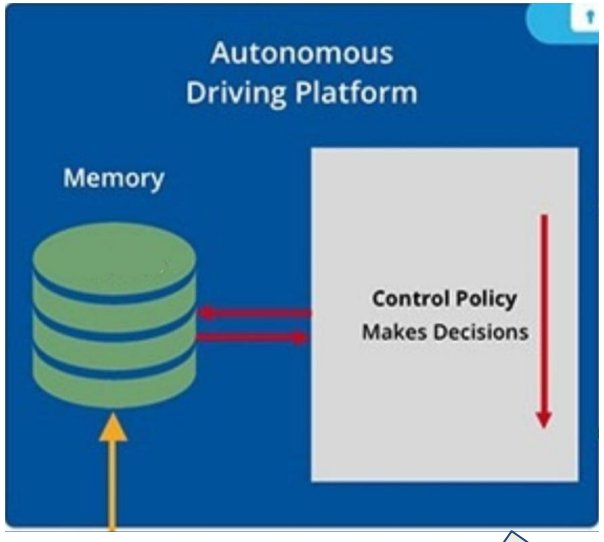


Key Words: Artificial Intelligence, Machine Learning, Informatics, Infotainment, Smart Vehicle, GPS, Odometer, Speedometer, Data Logging, Dashboard.

GPS	Fuel Sensor	Accelerometer	Speedometer
Battery Sensor	Odometer	Gyro Sensor	Side-Stand

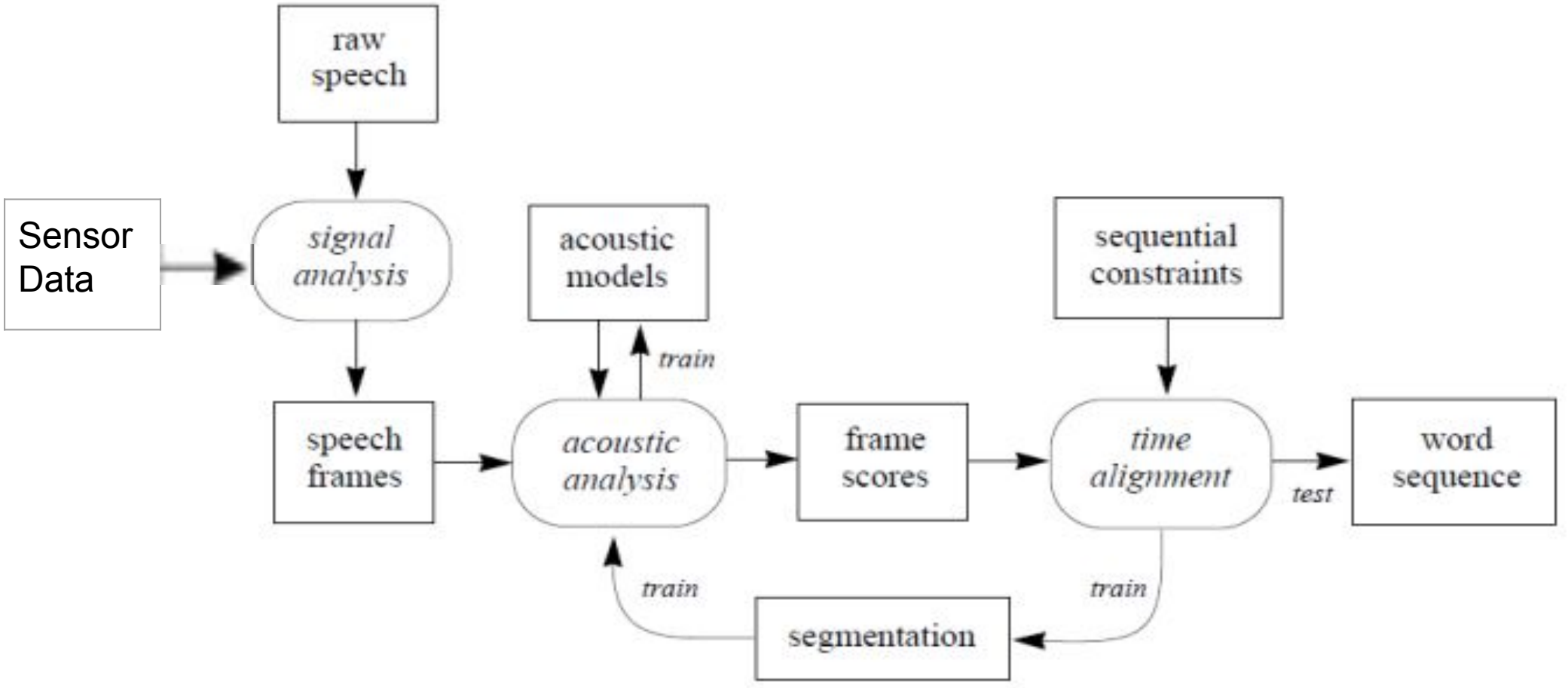
Component 1
(Inputs)

Component 2
(Processing)



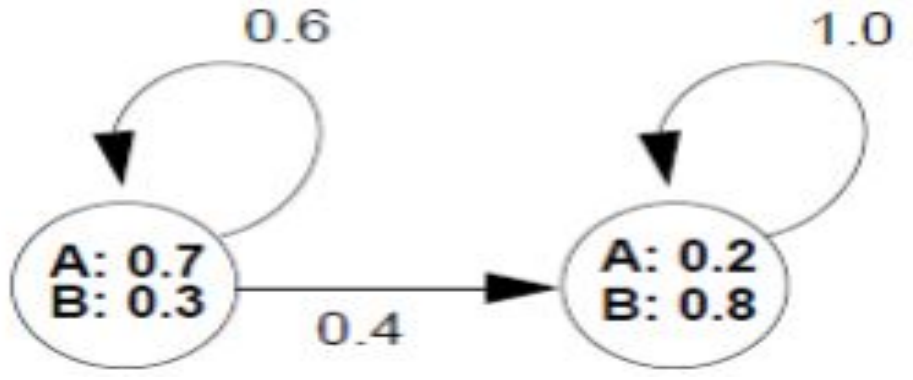
Component 3
(Output)

Safety Systems	Driver Monitoring	Mapping Systems	GPS Tracker
Object/Crowd Detection	Side-Stand Buzzer	Speed Barrier	Battery/Fuel Status



Algorithm Structure

HMM
(Hidden Markov Model)



A Hidden Markov Model is a collection of states connected by transitions.
It begins in a designated initial state. In each discrete time step, a transition is taken into a new state, and then one output symbol is generated in that state.
The choice of transition and output symbol are both random, governed by probability distributions.

HIDDEN MARKOV MODEL (HMM)

It is a statistical model which generates models.

Model generation based on some sets of input sequence.

If we have a set of input sequence then it gives a new state on which the transitions are done. "

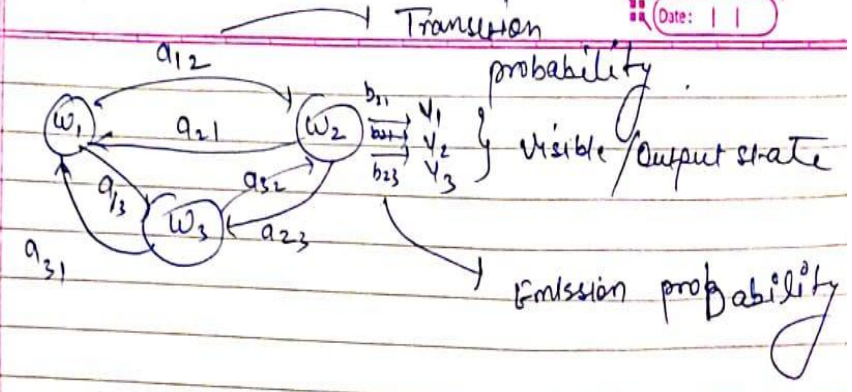
Input sequence $(S_1, S_2, S_3 \text{ ---})$

→ Property -

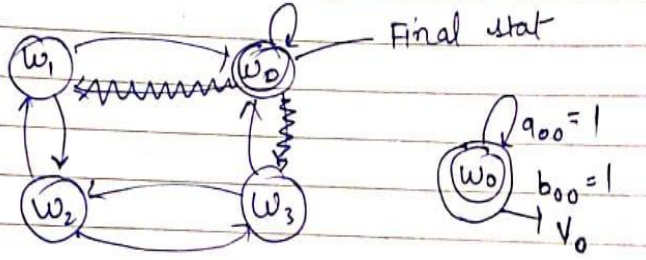
- Memory less, because it takes 1 state into consideration.
- Size
  It has a sole past on which future prediction depends on present state only.

HMM

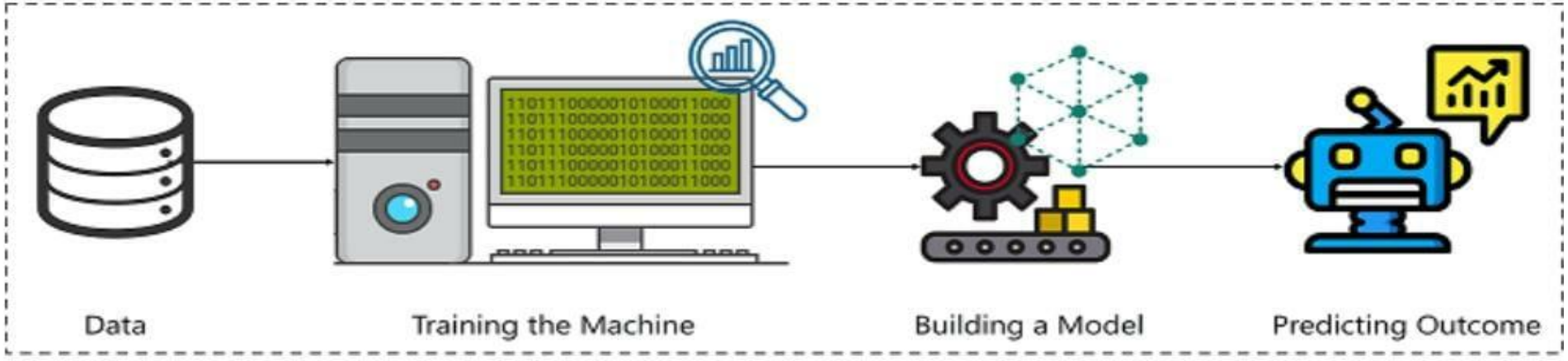
- Finite state machines
  1. Hidden state (w) representation
  2. Visible state / Output state (V).



$$\sum_j a_{ij} = 1 \quad , \quad \sum_k b_{jk} = 1$$



$a_{00} = 1 \quad b_{00} = 1 \quad \boxed{V_0}$



- When an HMM is applied to speech recognition and sensor caliberation, the states are interpreted as acoustic models, indicating what sounds are likely to be heard during their corresponding segments of speech.

- While the transitions provide temporal constraints, indicating how the states may follow each other in sequence. Because speech always goes forward in time, transitions in a speech application always go forward.

Digital Interface

- A DIGITAL INTERFACE is the medium through which humans interact with computers. Interfaces represent an amalgamation of visual, auditory, and functional components that people see, hear, touch, or talk to as they interact with computers (digital devices).
- In Bikes, information can include fuel amount, engine temperature, altitude,, cut off fuel, turn off ignition, turn on headlight, turn on taillight, battery status, engine RPM and GPS.

SPEEDOMETER

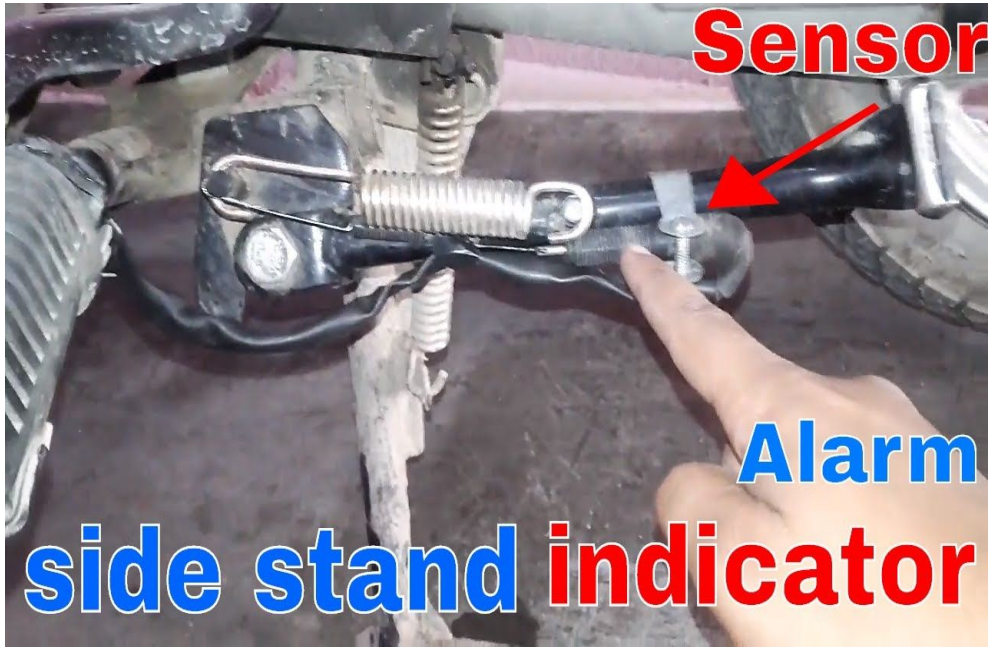
A **speedometer** or a speed meter is a gauge that measures and displays the instantaneous speed of a vehicle.

By connecting the interface with the speedometer sensor,
we can display the speed of the vehicle digitally(user friendly mechanism).

Digital Interface

- GPS tracking: The device fits into the vehicle and captures the GPS location information.
- The tracking server has three responsibilities: Receiving data from the GPS tracking unit securely storing it, and serving this information on demand to the user.
- A tracker may be placed on a vehicle to follow the vehicle's movements.

Side Stand Alarm Indicator



- The side stand is used for supporting a parked Motorcycle it has some disadvantages.It takes place as while the driver starting the motorcycle, there may be possibility of forgetting to release the side stand. This will cause to unwanted troubles.

- Then the undistracted stand hitting the ground and affected the riders control during the turn.

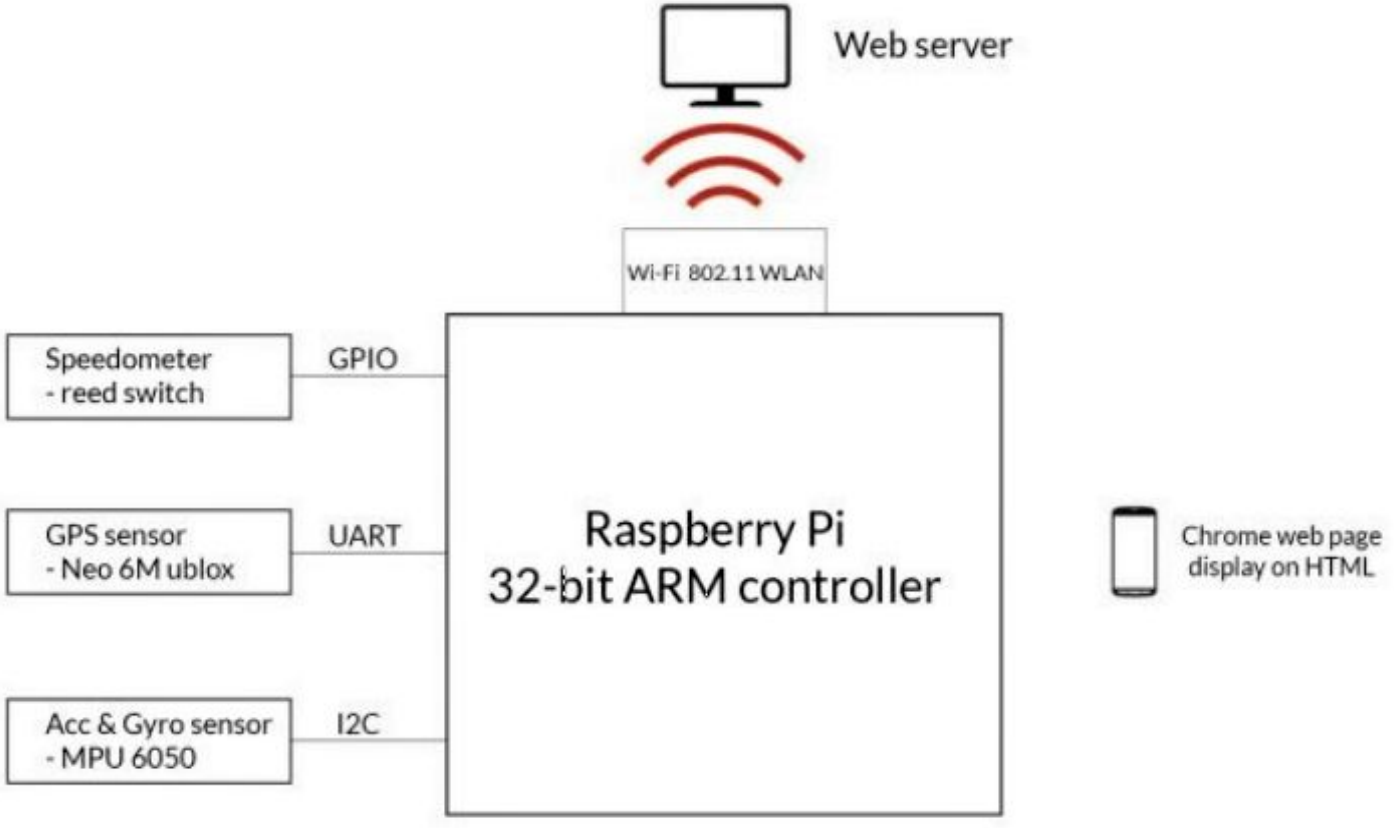
- Forgetting to lift the side stand causes huge accidents in rural areas partly in urban areas too, because all the other source of accident has preventive measure, but accident due to side stand do not have proper preventive measure. If you see the accident status 36% of the accidents occur due to this problem.

- The side stand sensor works in the following way:
  When the ignition process of the vehicle is started, the sensor warns the rider by a buzzer to lift up the side stand which minimizes the possibility of forgetting the same.

System Requirements

- Python 3.7 for AI.
- Sensor(Side-Stand).
- Speedometer.
- Gyroscope.
- GPS.
- Raspberry P.I.
- LED Display.

SYSTEM DISCRIPTION



Raspberry pi connections with sensors

This project is designed using a Raspberry PI single board computer used for embedded application. The Interfacing components used are Reed switch sensor, GPS Modem, Accelerometer and gyro sensor, WiFi Dongle . USB mouse and keyboard can be used for user-friendly usage of the Board. The 32-bit ARM controller on the Raspberry Device supports the Functionality as the CPU Core. Block diagram of informatics and infotainment system for an E-Bike.

The Linux OS is used as the Default operating system responsible for handling the tasks and peripheral on chip components. Python scripting is used for the programmingthe device and functionalities.

Reed switch is connected to raspberry pi GPIO pin, GPS module Neo 6M is connected via asynchronous UART communication, MPU 6050 Accelerometer and gyro sensor is connected via serial I2C interface.. The data from the sensors is processed and updated in a database file. The data is concurrently sent via sockets to a running web server through Wi-Fi module.

Advantages

- A rider can access the digital dashboard on the vehicle which will display the current speed, trip distance, access calls.
- GPS information is directly fed to a Google maps API which will locate the vehicle.
- This integration makes sure that the side stand, which is responsible for around 36% of the accidents, is lifted as soon as the helmet is worn and the ignition is turned on.
- If the rider is in crowded areas, the speed barriers acts and restricts the speed limit using Artificial Intelligence.

Conclusions

- In this paper we have proposed an Informatics system for an E-Bike which displays the riding information on the screen
- Major accidents can be avoided which makes this project a life saving mechanism.
- To develop the intelligent smart systems, installing vehicle sensors and processing data from them is the key fundamental step.
- There is a vast scope for research in this field as just the indication is not enough to ensure the safety of the rider since most of the time these warnings are ignored.

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Thank You