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A Concept of an IoT-Based System for Monitoring the Operation Parameters of Vehicles

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GOAL OF THE STUDY

The information that vehicles provide to their drivers is critical to their reliable operation. This study presents an IoT-based vehicle monitoring concept aimed at increasing uptime and reliability. It includes the architecture of the proposed system, which collects information from the vehicle's CANBUS network and additional sensors. All information is transmitted to a cloud database via GPRS and/or WiFi connectivity, where the data is analyzed.

STRUCTURE OF THE IOT-BASED VEHICLE MONITORING SYSTEM

The proposed electronic device is developed based on the ESP32 microcontroller, including peripheral devices such as the communication module IC TJA1050 CAN bus Transceiver, which is serially connected to the microcontroller through I2C communication. It retrieves data from the car's CANBus network, and the GPRS module, transmission of the downloaded data to the WEB server, a TFT display for data visualization and two power supply units, a DC-DC converter based on LM7805 for a stable 5VDC power supply and voltage regulators voltage AP2112 step-down voltage from 5VDC to 3.3VDC to power the device's microprocessor.

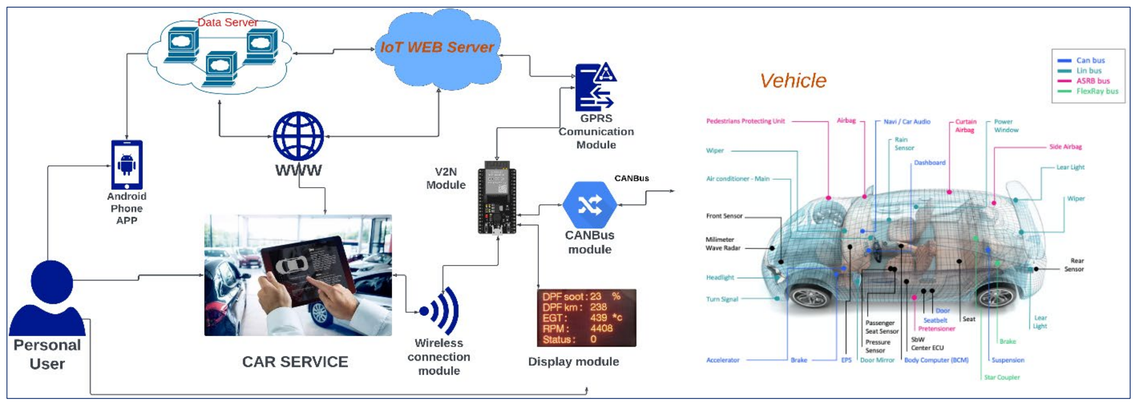

Fig. 1. Architecture of the proposed vehicle monitoring system

USE-CASE SCENARIOS OF THE SYSTEM

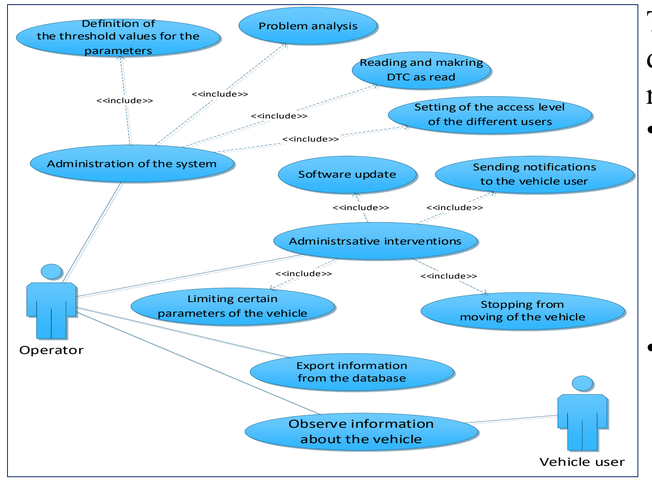

Fig. 2. Use-case diagram of the proposed system

Two types of actors can be defined, depending on their function and access rights:

- Operator/Administrator – responsible for administration of the system, manipulation of certain vehicle parameters, monitoring of the current state and analysis of the vehicle.
- Vehicle user – his function is limited to observing the information about the current condition of the vehicle

OPERATION ALGORITHM

The operation algorithm of the proposed vehicle monitoring system is developed (Fig. 3). The whole range of applications of the system are systemized with the help of a use-case diagram. The proposed electronic system can also present important information to the driver's attention via its graphical user interface.

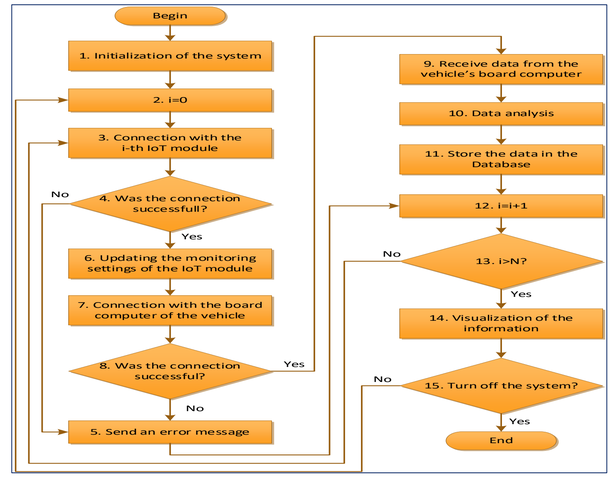

Fig. 3. Flowchart of the operation algorithm

CONCLUSIONS

This study presents an IoT-based concept for vehicles monitoring, aimed at increasing the fault-free operation time and reliability.

The proposed electronic system can also present important information to the driver's attention via its graphical user interface.

The proposed IoT system could be used in different scenarios, such as providing additional information to the driver, monitoring the exploitation of company-owned vehicles by a trusted service, drive notification when a problem or potential problem occurs, etc.

ACKNOWLEDGMENT

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