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Application of Intelligent Systems in Cars

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ABSTRACT: The continuous evolution and development of the world in which we live in vis-à-vis the entire transport industry is constantly demanding endless and rapid advancement in vehicle performance and efficiency. This crucial and imperative need in our transportation system is not only important but also extremely essential for the present and future of road network, vehicle and user sustenance. Improvement in road and vehicle transport technology has continued to redefine the current expectations and subsequently future prospects of sustainable transport and traffic management. In this paper, the current trends and applications of Intelligent Transport System (ITS) on cars and infrastructure is discussed and reviewed. Furthermore this paper also introduces future development in ITS technology including advancement in combination of sophisticated control and communication ITS solutions and the current trends in wireless and satellite vehicle navigation system, while also exposing the existing challenges of ITS solutions.

Keywords: Intelligent transport system (ITS), Dealership-service center (DSC), car, diagnostics.

Introduction

In modern conditions of development of science and technology, the use of the latest technologies and equipment is an obvious competitive advantage. Therefore, the use of modern systems and mechanisms has become common in various industries, especially in such complex areas as aerospace and automotive. In the last decade, rapid development of Informatization has been taking place, covering all stages of production processes: creation, production, sales and maintenance of cars. All this allows us to talk about the information revolution, where one of the main directions was the creation and implementation of telemetry and intelligent transport systems. Its is an intelligent transport system that provides the implementation of information processing functions and the development of optimal solutions for control actions, using, among other things, telematicstools. Now the parameters of the fuel level in the tank, speed, engine speed and temperature can be transmitted to the monitoring system directly from the vehicle's on-Board computer. Intelligent driver assistance systems they include, for example, an electronic engine management system, a remote vehicle diagnostics system, security systems, and a number of others. These systems are designed to improve the safety and convenience of driving [2].

The quality and efficiency of repairs and maintenance largely depends on the availability of spare parts, free posts and workers, as well as on the degree of efficiency of logistics processes. In these conditions, it is of great importance to develop a concept and scientifically based approaches to the creation and implementation of an intelligent service planning system based on vehicle condition data obtained from vehicle sensors. To do this, in addition to collecting and transmitting data, it is necessary to process them, on the basis of which to predict failures. Today, many leading car manufacturers are implementing an intelligent driver assistance system for the production of a new model range. Each company has its own advantages in this direction. Systems of such manufacturers as: DAF [3], Scania [4], MAN [5], Mercedes-Benz [6], a KAMAZ [7]. All these systems aim to reduce the maintenance costs of fleet owners.

1. Conceptual scheme of the proposed Intelligent System

To improve the reliability of vehicles, it is necessary to timely identify temporary losses for the customer. This is impossible without a clear interaction of the service system with the logistics and production. First of all, data about a possible failure is sent to a single database (EDB), which is used for storing and analyzing information. After that, the information is sent to the dealer-service center(DSC). Based on the received data, the DSC decides on the required number of spare parts, on the basis of which it sends an application to the logistics center. Then the DSC informs the vehicle owner about the need for maintenance AND agrees on a convenient time for its passage. An intelligent system for Service Planning stores, updates and processes real-time information about the current technical condition of each node or unit. Thanks to this system, fleet owners can receive statistical data on its technical condition and, based on this, make decisions about improving the quality and efficiency of their enterprise and the performance of the fleet.

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All data is structured in a single database and sent to the manufacturer to further improve the design of the car and increase its uptime

Figure 1. Conceptual diagram of an Intelligent system for Service Planning

For more information about the proposed Integrated Information Environment, see our previous work [8].

2. Service Planning

To date, serviced cars can be of two types with and without an on-Board diagnostic system. All possible organizational schemes of car diagnostics, with their advantages and disadvantages, are considered in our previous article [9]. Maintenance planning for conventional vehicles that do not have an on-Board diagnostic system is based on failure statistics: failure distribution graphs are plotted, which allows us to assume the approximate date of failure of a particular vehicle unit. In this case, the car enters the DSCS in an already faulty state, and depending on whether there are free posts and employees, the car owner will have to wait for a certain time. After the car arrives at the post, highly qualified specialists carry out diagnostics of the car. If there is no need for spare parts in the warehouse, the car owner has to wait until the part is delivered and only then complete the repair.

If there is no need for spare parts in the warehouse, the car owner has to wait until the part is delivered and only then complete the repair. If the vehicle has an on-Board diagnostic system, after receiving data from the sensors, the electronic control unit records them. In more detail, the process of on-Board diagnostics and calculation of the remaining life of each vehicle before the fault is described in our article [10]. The system then sends a message to the DSCS. The system checks the availability of spare parts in the database. If you need details if it is not available in stock, then an order is generated and sent to the Logistics center. After the item arrives at the warehouse, the owner of the car is informed about the upcoming repair and discuss with him the terms of maintenance. This algorithm (Fig. 2) minimizes downtime during maintenance.

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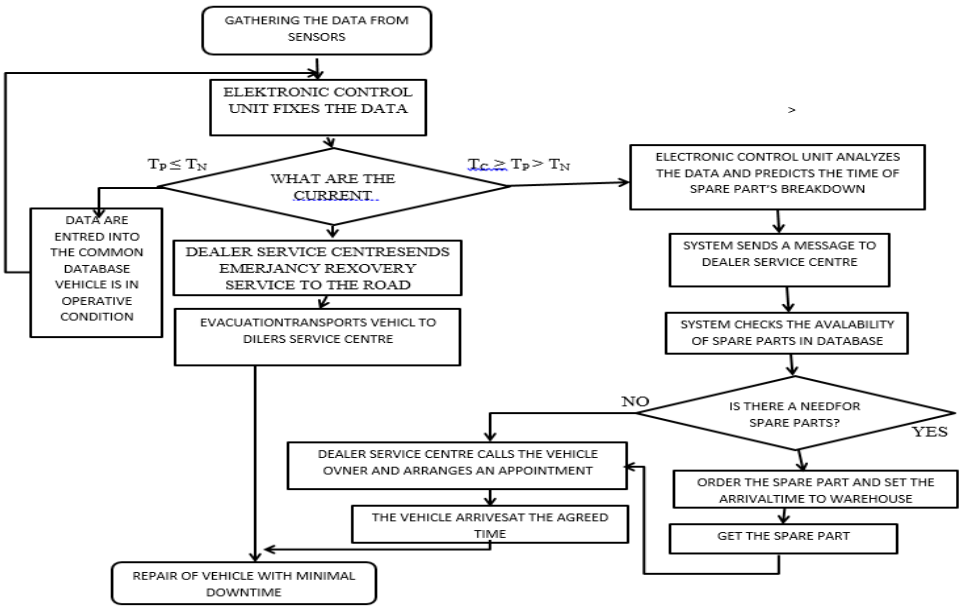

Figure. 2. The algorithm vehicle service on-Board Diagnosis

3. Conclusion

The owners of trucks are mainly transport companies, whose income directly depends on the reliability and performance of the car. Since a long downtime due to a technical malfunction of the car leads to financial losses, only those car manufacturers that can guarantee their customers a long time to failure, as well as an effective service system, can be competitive in the market. Implementing an Intelligent Service Planning System will allow you to: (1) automakers reduce the number of failures by improving their products at the design and production stages; (2) DSCS – planning vehicle maintenance and repair, predicting the load of service stations, and planning the supply of spare parts.

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