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ANALYTICAL REVIEW OF EXISTING VEHICLE DIAGNOSTIC SYSTEMS

Abstract

The article emphasizes the importance of carefully choosing an application that will provide accurate and timely diagnostics so that the driver can prevent possible malfunctions and keep the car in good condition. Special chip-based adapters transmit data from an electronic control unit (ECU) to a smartphone, where they are analyzed by applications. The author highlights the most popular diagnostic applications such as ScanMaster Lite, OBD AutoDoctor and EOBD2 Facile, describing their functionality, advantages and disadvantages. It is noted that many applications suffer from interface problems, difficulty of use and the need to purchase paid versions for full access to the functionality. Some of them are poorly optimized, which leads to freezes and slow command processing. In addition, many applications are highly targeted, which limits their compatibility with certain car brands.

Key words: On-board electronics, diagnostics, adapters, applications for automotive diagnostics, diagnostic application functionality

Introduction. Technological progress in the automotive industry does not stand still, and now drivers have the opportunity to monitor the technical condition of their car directly from their smartphone.

Modern cars are equipped with on-board electronics that monitor the status of various functional modules of the car. Although some new car models have their own diagnostic software, drivers often prefer to use universal adapters and modern software to get more detailed information about the condition of their car.

Computer diagnostics of a car is the process of checking and testing electronic systems and actuators that affect the operation of on—board systems and ensure the correct functioning of the car. It allows you to identify malfunctions in electronic systems and create a diagnostic map for further repair and elimination of problems with automotive electrical equipment and actuators. The car has built-in self-diagnosis systems, which are necessary for controlling the actuators, as well as for constant monitoring and testing at the stages of starting and running the engine [1].

Theoretical analysis. Self-diagnosis systems play an important role in informing the driver about the condition of the car, identify possible defects and malfunctions, and monitor service intervals, reminding them of the need for regular maintenance. However, not all cars manufactured in our country are equipped with such systems and appropriate connectors for connecting diagnostic equipment. Any repair should begin with an accurate diagnosis, because without a clear definition of the causes of malfunctions, high-quality repairs are impossible. Routine computer diagnostics is an important part of car operation, which allows you to avoid constant repairs and other problems. Computer diagnostics provides the most complete and accurate data on the condition of the car [2].

The diagnostic process is usually divided into several stages:

Information reading — at the first stage, all data for troubleshooting is recorded.

Data verification — the information received is analyzed, its reliability is evaluated, which allows you to check the serviceability of circuits and sensors.

Real—time Monitoring (Data Stream) - system components and sensors are tested in real time.

At the final stage, the results are analyzed and conclusions are drawn about the condition of all

vehicle systems, the presence and nature of malfunctions. It is important that the diagnosis is carried out by a professional with engineering knowledge and understanding of the processes in the car.

Today, diagnostic equipment is divided into several categories:

General and local — in terms of coverage of diagnostic objects.

Universal and specialized — according to the type of interaction with the object.

Automated and manual — according to the degree of automation.

Timely diagnosis saves time and effort, as troubleshooting requires more time and resources. Therefore, modern cars are equipped with both built-in on-board and external diagnostic tools. All diagnostic systems are conditionally divided into:

Stationary (bench) — used in specialized services, connected to an electronic control unit, read and interpret error codes.

On—board diagnostic software helps to reduce harmful emissions and requires a special scanner to be connected.

The diagnostic tester, connected via a connector to the electronic systems of the car, allows you to read the parameters and fault codes, which are then decrypted by specialists [3].

There are many programs and applications in the world of automotive diagnostics, but special attention is paid to those that work in conjunction with adapters based on the ELM327 chip. This is a popular and universal solution for self-operative diagnostics at home. Applications for monitoring the technical condition of the car allow drivers to monitor parameters such as engine temperature, fuel level, tire pressure and many others in real time.

To use all the features of the diagnostic software, the driver will need a special adapter that connects to the electronic control unit (ECU) of the car. This adapter serves as a link between the vehicle's on-board electronics and your device with the installed diagnostic program. Its task is to convert data from automotive sensors into a format that is easily recognized by analytical software.

It is important to note that the adapter and the scanner for car diagnostics are different devices. Adapters only read and translate data into a language understandable to an external device, whereas scanners are devices of a higher professional order that have more functionality [4].

Each application for monitoring the technical condition of the car has its own characteristics and offers a different set of functions. Some applications may offer basic diagnostics and monitoring of basic parameters, while others may offer more in-depth analysis and additional features such as tips on vehicle operation and maintenance.

It is worth noting that car owners should carefully choose applications for monitoring the technical condition of their cars. It is important to choose a reliable and proven application that can provide accurate and timely data on the condition of your car.

There are many applications available on the Android platform for computer diagnostics of cars, which are easy to find on the Internet or on online platforms. However, many of these programs may seem complicated and inconvenient to most users due to the difficult navigation and interface.

Let's look at several popular auto-diagnosis apps to understand their strengths and weaknesses.

ScanMaster Lite is an OBD2/EOBD compliant application that supports many features and error codes even in the free version. It works with ELM327 adapters and has a Russian-language interface, allowing you to display data in the form of graphs. Among the disadvantages are the lack of support for diagnostics of domestic cars and limited decoding of fault codes in the free version. Users also note that some commands are processed slowly, and the graphs sometimes "hang up".

OBD Auto Doctor is a free application with support for the ELM327 adapter and GPS functions. Its strengths include the ability to read data from multiple electronic units, work in GPS mode, convenient widgets, manual command entry and real-time data display on graphs. The disadvantages include a long download of the application, a long connection to the car and an overloaded menu with unnecessary information [5].

E OBD2 Facile is an application for diagnosing the main parameters of a car using ELM327 and OBD2 adapters. Among the advantages are a fast Bluetooth or Wi—Fi connection, stable operation and a database of more than 5,000 error codes. However, some code removal functions are

only available in the paid version, and the application is quite energy-intensive, which leads to a rapid discharge of the device [6].

There are also specialized applications developed for specific car brands, such as ELMScan Toyota, EconTool for Nissan, FocccusScan and others. They have a narrow focus and are not suitable for other brands, which limits their use. There are also many fully paid applications on the market, such as hobDrive and Torque Pro.

Conclusions. Many automotive equipment diagnostic applications have similar disadvantages. Firstly, their work is often unstable due to overloaded interfaces and a large number of functions, which leads to long loading and slow command processing. In addition, most of them are either partially or completely paid, and functionality is often limited to specific car brands, which reduces the versatility of use.

Another problem is the difficult navigation through the menu: to find the right function, the user has to search for the right section for a long time, as developers, trying to make the application multifunctional, sometimes add redundant options. Poor optimization leads to the fact that the image may "hang", and commands are executed with a delay. It is also important that many programs do not support the Russian language, which makes their use difficult for Russian-speaking users [7].

Applications for monitoring the technical condition of the car are a useful tool for every driver. They help drivers to be aware of the current condition of their car, which in turn helps to avoid unexpected problems and keep the car in excellent condition.

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ҚОЛДАНЫЛАТЫН КӨЛІК ДИАГНОСТИКАЛЫҚ ЖҮЙЕЛЕРІНЕ АНАЛИТИКАЛЫҚ ШОЛУ

Түйін

Мақалада жүргізуші ықтимал ақаулардың алдын алу және көлікті жақсы күйде ұстау үшін дәл және уақтылы диагностиканы қамтамасыз ететін қолданбаны Мұқият таңдаудың маңыздылығы көрсетілген. Чипке негізделген арнайы адаптерлер деректерді электрондық басқару блогынан (ECU) смартфонға жібереді, онда оларды қолданбалар талдайды. Автор scanmaster Lite, OBD сияқты ең танымал диагностикалық қосымшаларды бөліп көрсетеді АвтоДоктор және EOBD2 Facile, олардың функционалдығын, артықшылықтары мен кемшіліктерін сипаттай отырып. Көптеген қосымшалар интерфейс мәселелерінен, пайдаланудың күрделілігінен және функционалдылыққа толық қол жеткізу үшін ақылы нұсқаларды сатып алу қажеттілігінен зардап шегеді. Олардың кейбіреулері нашар оңтайландырылған, бұл командалардың қатып қалуына және баяу өңделуіне әкеледі. Сонымен қатар, көптеген қосымшалар тар бағытталған, бұл олардың белгілі бір автомобиль брендтерімен үйлесімділігін шектейді.

Кілттік сөздер: Борттық электроника, диагностика, адаптерлер, автомобиль диагностикасына арналған қолданбалар, диагностикалық қолданба функциялары

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АНАЛИТИЧЕСКИЙ ОБЗОР СУЩЕСТВУЮЩИХ СИСТЕМ ДИАГНОСТИКИ ТРАНСПОРТНЫХ СРЕДСТВ

Аннотация

В статье подчеркивается важность тщательного выбора приложения, которое обеспечит точную и своевременную диагностику, чтобы водитель мог предотвратить возможные неисправности и поддерживать автомобиль в хорошем состоянии. Специальные адаптеры на базе чипа передают данные с электронного блока управления (ЭБУ) на смартфон, где они анализируются приложениями. Автор выделяет наиболее популярные приложения для диагностики, такие как ScanMaster Lite, OBD Авто Доктор и E OBD2 Facile, описывая их функциональные возможности, достоинства и недостатки. Отмечается, что многие приложения страдают от проблем с интерфейсом, сложностью использования и необходимостью приобретать платные версии для полного доступа к функционалу. Некоторые из них плохо оптимизированы, что приводит к зависанию и медленной обработке команд. Кроме того, множество приложений узконаправленны, что ограничивает их совместимость с определенными марками автомобилей.

Ключевые слова: бортовая электроника, диагностика, адаптеры, приложения для автомобильной диагностики, функционал диагностических приложений.