METHODS, MODELS AND MEANS OF INTERACTION WITH
THE CAR USING OBD-2 DIAGNOSTIC SYSTEMS

Abstract. Today, the car has become an integral part of our lives. Especially in big cities. Someone has their own car, someone uses a taxi. But the fact remains one thing - we are faced with cars every day. Now the car gives a person not just the opportunity to move comfortably around the city. It actually gives the motorist complete freedom in his actions. He does not need to depend on public transport, schedule, shortcomings of the route, infrastructure, etc. Keywords: car, on-board computer, computer diagnostics, errors, mileage, OBD2.

The car allows to get rid of various restrictions not only in the city, but also outside it. If a person owns a car, he can travel freely between cities or even countries.

A car is not just a means of moving from point A to point B, as many people think. Now the car performs a huge number of different functions, from movement to the subject of image.

At the moment, automakers offer cars for all needs. Ordinary sedans for the needs of the average person. Universals for families who need a large trunk. Compact hatchbacks for young people looking for a compact and agile car. Crossovers of different sizes for people looking for maximum practicality. Minivans
for large families, or even minibuses. In short, now the market presents a variety of cars for the needs of certain segments of the population.

The mechanical engineering industry is developing very fast. There are cars on the market that use alternative fuels, such as electricity or hydrogen.

Manufacturers are trying every day to develop new and new inventions that make life easier for motorists. Various technologies are being developed, such as adaptive headlights or a fully controlled chassis.

With the advent of the car market of a company like Tesla, began to actively develop the direction of autopilot. That is, there is not much time left before cars will no longer need any human intervention in the driving process.

But all of this applies mostly to premium cars, which can be afforded by very wealthy people, who make up a small part of all motorists.

**Aim.** Today, the car has become an integral part of our lives. Especially in big cities. Someone has their own car, someone uses a taxi. But the fact remains one thing - we are faced with cars every day.

Now the car gives a person not just the opportunity to move comfortably around the city. It actually gives the motorist complete freedom in his actions. He does not need to depend on public transport, schedule, shortcomings of the route, infrastructure, etc.

The car allows to get rid of various restrictions not only in the city, but also outside it. If a person owns a car, he can travel freely between cities or even countries.

A car is not just a means of moving from point A to point B, as many people think. Now the car performs a huge number of different functions, from movement to the subject of image.

At the moment, automakers offer cars for all needs. Ordinary sedans for the needs of the average person. Universals for families who need a large trunk. Compact hatchbacks for young people looking for a compact and agile car. Crossovers of different sizes for people looking for maximum practicality. Minivans for large families, or even minibuses. In short, now the market presents a variety of cars for the needs of certain segments of the population.
The mechanical engineering industry is developing very fast. There are cars on the market that use alternative fuels, such as electricity or hydrogen.

Manufacturers are trying every day to develop new and new inventions that make life easier for motorists. Various technologies are being developed, such as adaptive headlights or a fully controlled chassis.

With the advent of the car market of a company like Tesla, began to actively develop the direction of autopilot. That is, there is not much time left before cars will no longer need any human intervention in the driving process.

But all of this applies mostly to premium cars, which can be afforded by very wealthy people, who make up a small part of all motorists.

**Materials and methods.** Analysis is a method of scientific research by decomposing an object into components, while synthesis is a combination of parts obtained during the analysis as a whole. Methods of analysis and synthesis in scientific work are organically interconnected and can take different forms depending on the properties of the object under study, the purpose of the study, the degree of knowledge of the object, the depth of penetration into its essence.

The method of idealization is the mental construction of objects that do not exist in reality or that are practically impossible. The purpose of idealization: to deprive real objects of some of their inherent properties and to endow (mentally) these objects with certain unrealistic and hypothetical properties.

The study begins with the development of the program. A research program is a document that regulates all stages, stages of preparation, organization and conduct of a specific study. The research program contains theoretical substantiations of methodological approaches and methodical methods of studying a certain phenomenon or process.

Mathematical modeling is used. Mathematical modeling involves several successive steps. This is the compilation of a mathematical model of the research process based on the collected data or the use of a ready model of the research process based on the collected data, or the use of a ready model with adjustment of basic and auxiliary factors, which in many cases simplifies and speeds up research.

**Results and discussion.** First of all, it should be noted that all data from the
car will be transmitted using a special adapter ELM327 [1], which connects via the OBD-2 port and transmits all data via Bluetooth.

To get started you need to perform initialization commands, here are the main ones you need to get started:

- **ATZ** - Resets the adapter to the factory settings.
- **ATL0** - Disable line breaks.
- **ATE1** - Echo on
- **ATH1** - Headers on
- **ATSTFF** - Set the timeout to maximum.
- **ATDP** - [Describe the current Protocol] The scanner is able to independently determine the protocol of the vehicle to which it is connected.
- **ATSP0** - [Set Protocol h] Command to select the protocol in automatic mode [2].

Based on the above commands, you can generate an initialization string. It will look like this:

Special PID's commands are used to read diagnostic data. PID (Parameter id's) - codes used to query the performance of certain car sensors.

The main pads support all cars that have an OBD-2 port. There are also sets of commands for certain makes and types of cars. In our case, the study focuses on basic car diagnostics, so we use a basic set of commands.

Each car supports a certain set of floors. That is, when working with a particular car, you need to operate with a certain set of basic in order not to send the car requests that it does not support [3]. To do this, you need to fulfill a special request, to which the car will return all the floors that it supports. This should be done immediately after the connection is established.

All queries and answers to them are executed in hexadecimal.

To install all supported floors, run a special command with the following code - 0100.

Suppose the car returned the following value - BB1E3211. Next, we translate the result into the binary number system.

BB1E3211 (16)> 1011101100011110001100100010001 (2)

Using the general floor table shown in Figure 1, determine which ones are
Based on these data, we can determine that our car supports the following types: 01, 03, 04, 05, 07, 08, 0C, 0D, 0E, 0F, 13, 14, 17, 1C, 20.

Now we will use only supported commands to increase productivity.

This is usually not the whole list of floors, but only a small part of them, given as an example.

Car errors can also be different and there are separate commands for them. example:

– 03 - To display saved error codes
– 0A - To display constant error codes.

As with other teams, car errors come in coded form, respectively, as in other teams, they need to be decoded to obtain the necessary information.

After the car responds to the request, you will need to decrypt its response and find the appropriate code in the database, and then display all the information about the error.

**Conclusions.** As a result of the article, a scheme of research was developed on the basis of which a software system will be developed, which will provide opportunities to use OBD-2 technology to diagnose the car. It will also contain the functions of the on-board computer, collect statistics.

The practical significance of the obtained results is that the model of interaction of the car with the help of OBD-2 technology with the program proposed in the article is a theoretical basis for the development of a system analogous to the on-board computer of the car.
CURRENT ISSUES AND PROSPECTS FOR THE DEVELOPMENT OF SCIENTIFIC RESEARCH

References: