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ABSTRACT

In dealing with issues related to investigation and examination of road accidents, preference is usually given to measurements and quantitative assessments, while qualitative analysis and assessment are allowed. When carrying out expert studies, the source of the initial data is the results of an inspection of the place of the road accident, inspection of vehicles, photographs, diagrams showing traces and other objects bearing information

about the event. The actions of experts should help to increase the volume of information (re-examination, experimental modeling of tracks, request for additional data).

The article deals with theoretical aspects of expert heuristics, including purposes and possibilities of examination, the types of process models and their constituent elements. Examples of heuristic conclusions are presented in the analysis of damage to vehicles resulting from road accidents.

Keywords: road, road accident, expertise, heuristics, damage to vehicles.

Background. Each driver and each pedestrian while moving via street and roads are subject to a set of binding rules. While proceeding with expertise of the accidents with vehicles all the experts in Russia are governed by the Set of methodological and technical regulations in the field of expertise of the circumstances of road accidents. The set comprises all the documents approved by Scientific and methodological council of forensic road expertise and is recommended for use in expert activities in investigating circumstances of road accidents [1].

The effectiveness of investigation of road accidents directly depends on the timely conduct of the auto-technical expertise, the correctness of the questions posed to the expert, the completeness and reliability of the study and the conclusions [2–4]. Studies on this subject are regularly conducted by leading domestic and foreign scientists [5, 6]. The classification of autotechnical expertise shown in Pic. 1 allows to solve the entire set of tasks when investigating traffic accidents.

Expert heuristics is a direction in science that studies creative activity and methods used in teaching and discovering a new one. [Expert heuristics (greek εὐρίσκω – searching, discovering) are the methods to solve nonstandard expert tasks, which are not described in expert instructions, but are developed by an expert during an expert investigation – ed. note].

Objective. The objective of the authors is to consider heuristics in expert activity in investigation of road accidents.

Methods. The authors use general scientific methods, comparative analysis, scientific description.

Results. Heuristic methods allow to speed up the process of solving an expert task. Significant

interest in them arose in connection with the ability to perform a number of tasks with the help of technical devices, when the person himself does not represent an exact algorithm for solving [7].

Expert heuristics is connected with psychology, physiology of higher nervous activity, structural linguistics, information theory.

The main purpose of the heuristic is to build models of processes for solving a new problem [8, 9].

There are the following types of such models:

- a model of blind search, which relies on the so-called trial and error method;

- a labyrinth model in which the problem being solved is considered as a labyrinth, and the process of finding a solution is like wandering through a labyrinth;

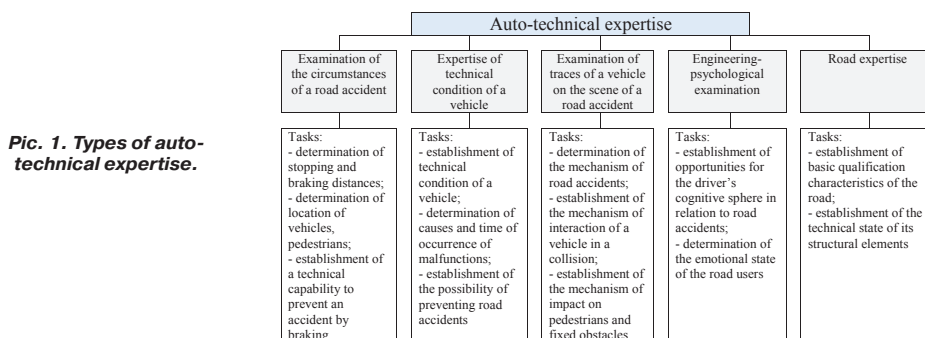
- a structural-semantic model, which is considered to be the most informative at present and reflects the relationships between the objects present in the problem.

The trial and error method is considered an innate method of human thinking. It is also called the method of searching for absolutely random variants. And it is understandable why this method does not have to be studied. There is no algorithm of thinking, we do not control the process of thinking, there is an almost chaotic search of options.

Formal-heuristic methods include methods for finding optimal solutions, not on the basis of rigorous mathematical, logical relationships, but on the experience of a person, his own knowledge and intuition.

The most widespread of heuristic methods are labyrinth and conceptual ones.

In accordance with the labyrinth model, the problem seems to man as «wandering» in search of possible ways to solve it. Not all paths lead to the desired goal, many of them lead to a dead end, from which one must be able to return to the place where the right direction is lost.



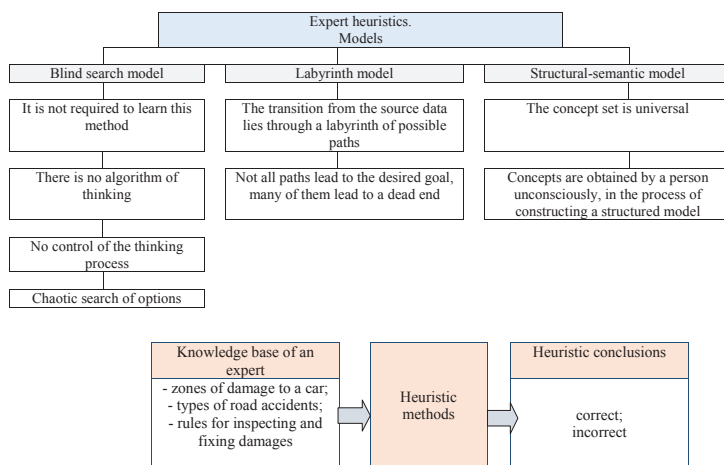
Pic. 1. Types of auto-technical expertise.

Table 1

Examples of heuristic conclusions in the examination of road accidents

Damage to vehicles	Heuristic conclusions	
The driver's door is deformed, the left rearview mirror is broken, multiple damage to the front left wing, the left headlight block is broken, the hood deformation with a slight shift to the right. The left additional repeater of the turn signal is broken, the left part of the bumper is split.	The vehicle was damaged, or in a collision, moving faster than the obstacle, or in a front collision. The car may have damage of the left mudguard, the frame of the radiator, the suspension of the left front wheel.	
The rear bumper is broken, the number of the state registration of the car is hit, there is a squashed dent on the rear door, the right rear headlight unit is damaged, a strong deformation in the direction of the rear right wing movement, a dent under the handle of the rear right door. The rear compartment of the car is pushed out – through the broken rear door glass.	The vehicle was damaged in a collision, while the driver of the vehicle, moving behind, applied emergency braking immediately before the collision. The hidden damages of the car include damage to the trunk lining, the rear floor, the rear right side member, the right side panel of the sidewall.	
The front bumper is broken, the radiator grille, the hood is heavily deformed to the right, the left wing is bent under the hood. The radiator is damaged, the left front headlight unit is damaged, the battery is damaged, the left front wheel is shifted, the left front wheel disk is deformed.	The vehicle was damaged in a cross collision. The car has a damaged front suspension, the geometry of the hood opening and the front spars is broken, it is possible to change the geometry in the openings of the front doors.	
The driver's door and the left rear passenger door are dented with a dent into the interior, rear glass is broken, the front and rear wings are damaged, the left additional turn signal is broken.	The vehicle was damaged in a cross collision (possibly at an unregulated intersection, approaching the obstacle on the right). At the car the skew of the left sidewall, deformation of the left threshold and a floor from the left side is possible. Damaged fittings of the left doors, including the electrical components of the vehicle (power windows).	
The rear bumper is broken, the rear door of the car is crumpled, due to the deformation of the body the rear doors do not close, the rear headlight blocks are broken.	The vehicle was damaged in a collision. It can have damage of the rear floor, the rear left side member, the skew of the rear left door.	
The rear right door is smashed, its glass is broken, the front right door and the right rear wing of the car are deformed.	The vehicle was damaged in the event of an impact on the obstacle (wood, post, etc.) by the right side. The vehicle has a broken opening of the rear right door, the middle right column may be deformed.	





Pic. 2. Composite elements of expert heuristics.

Pic. 3. Scheme of interaction in solving problems based on heuristics.

According to the supporters of the labyrinthine model of thinking, the solution to any creative task is reduced to a purposeful search in the labyrinth of alternative paths with an assessment of success after each step.

The conceptual method involves performing actions with concepts. Concepts are understood as generalized elements and connections between them. Concepts are obtained by a person, perhaps unconsciously, in the process of constructing a structured model. In accordance with the conceptual method, a set of fundamental meanings is universal and it corresponds to the mechanisms of calculation, transformation and formation of relationships available to a person. A person conducts a mental experiment with a structured model and generates a limited section of the labyrinth in which it is already easy to find a solution (Pic.2).

The heuristics is used in various fields [10–12], including, which is already important for us, in the analysis of road accidents and vehicle damage. Based on the available expert experience, the article presents the characteristic heuristic results inherent in car accidents (Table 1).

Conclusions. The examples given show that having a certain level of knowledge, qualification, training, experience of expert activity, using various heuristic methods, the expert is able to determine the causes of accidents, the direction of movement of vehicles, damage to cars and the likely injuries of the accident participants (Pic. 3). In this case, of course, we should not forget that the incompetence of the expert will lead to erroneous conclusions and will not allow us to objectively assess the circumstances of the incident.

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