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Editorial Introduction

Sign Systems and Technologies in Forensic Science

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Abstract
The problem of forming a terminological apparatus, the ratio of natural and artificial languages in Forensic Science are extremely important. Language as a system of means of expressing and transmitting information about material and ideal objects and phenomena in forensic science is not sufficiently researched but has recently received much attention in scientific literature. The collected papers study the verbal means of expression - the development and clarification of the conceptual apparatus, the formation of compound terms, or the use of abbreviations. Also, the emergence of new terms is reconstructed, and possible directions of activity are proposed to adapt the language of the forensic expert to the purposes of the judicial process. The interest in non-verbal sign-systems is equally strong, starting with the „electronic tongue," which permits the visual representation of the composition of microscopic quantities of substances for criminological purposes. There are discussions also of photographs and portraits as a set of visual signs, of face-recognition as a sign identification system, of holograms, graphics, models. The means of expression in forensic science are constantly changing, which is due to the rapid development of science and technology, changes in technologies used by experts and investigators in the performance of procedural actions. Forensic technologies are becoming more complicated, responding to the challenges of the present age by borrowing major achievements from other sciences in the process of solving and investigating crimes. The use of new technologies leads to the development of forensic capabilities in the investigation and disclosure and linguistic representation of crime.

Keywords: Forensics; Sign System; Technology

Abstract
Проблемы формирования терминологического аппарата, соотношения естественного и искусственного языков в криминалистике чрезвычайно важны. Язык как система средств выражения и передачи информации о материальных и идеальных объектах и явлениях в криминалистике начинает исследоваться. Изучаются как вербальные (происходит развитие и уточнение понятийного аппарата, использования сокращений, обоснование появления новых терминов, выявляются направления по адаптации языка судебного эксперта), так и невербальные (электронный язык, позволяющий визуально представить состав микроскопического количества вещества в криминологических целях, фотография как семиотическая система, лицо как знаковая система идентификации, голограммы, графики, модели и др.). Средства выражения в криминалистике и судебной экспертизе – постоянно меняющаяся система, что обусловлено стремительным научно-техническим прогрессом, изменениями в технологиях, используемых экспертами и следователями при совершении процессуальных действий. Судебные технологии усложняются, отвечая на вызовы современности, заимствуя основные достижения наук. Использование новых технологий ведет к развитию возможностей судебной экспертизы в расследовании и раскрытии, а также лингвистическому представлению преступлений.

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Sign Systems and Technologies in Forensic Science

The language of science is a complex multi-level system of signs used to perform operations with information: its fixation, processing, storage and transmission. The sign acts as a means of cognition of the surrounding world. In forensic science, sign systems have been known for a long time, but serious research began only in the second half of the twentieth century, and they are associated with the use of game theory, cybernetics, symbolic logic and a number of means of other sciences in forensic science. They are important for the formation of the terminological apparatus of science, on the one hand, and the establishment of the truth in the implementation of practical actions, on the other hand.

The terminology of forensic science is a set of terms and special signs that have developed in the development of science and serve to express special concepts and ultimately form the language of forensic science. It is expressed by certain signs and acts as a means and a way of implementing scientific thinking through the use of a combination of verbal (concepts, terms) and non-verbal (photographic, hologram, graph) signs.

The development of sign systems in forensic science is implemented simultaneously in several directions.

One of the interesting ones is the interaction of forensic science and semiotics in the study of theoretical and methodological issues of forensic science. The direction is not new, but in recent years there has been a particular interest in it. There are discussions about main objectives of forensic semiotics and its importance to the study of crime. Canadian polymath Marcel Danesi (2017) proposed to introduce a new discipline of Forensic Semiotics that is located in a grey zone between natural science and hermeneutic approaches (Hutton, 2016). Researchers propose to consider clues as information and criminal investigative processes as inferential, and the process is influenced by background knowledge эксперта и context (e. g., the scene of crime or the criminal law) (Sørensen et al., 2017).

Another developing area of the language of forensic science in connection with the total digitalization of all spheres of life is the use of sign systems of cybernetics, with the help of which the tasks of a forensic expert are formalized using information technologies. Special algorithms and methods of computer technologies are offered for “reading” and obtaining the information necessary for a forensic expert as quickly as possible. (Al-Jadir et al., 2018), languages of digital investigation platform are being developed (Sun, et al 2021).

Systems of symbolic logic, including fuzzy logic, are actively used to create models and algorithms for investigating certain types of crimes, conducting specific examinations, and deriving conclusions in an explanatory manner (Pasko & Terenchuk, 2020). Such systems are actively used in the investigation of cyber crimes, the analysis

of digital data, the reconstruction of crime events. (Soltani & Seno, 2019), and the analysis of evidence (Karafili et al., 2018).

Today, the development of technology not only enables the reading of latent signs such as, for example, fingerprints, deposited on different nonporous surfaces like stainless steel (Pavitra et al., 2020) or damaged fingerprints (Fattahi & Mejri, 2021). It also increases the accuracy of interpretation, such as the origin of a sample of soil (Mayes et al., 2009; Pitts & Clarke, 2020), and it makes objects "talk" that never before could claim the role of evidence, such as insects (Amendt et al., 2004; Moreau, 2021).

This special issue of "Technology and Language" examines the cases of interpreting the language of material objects that have undergone changes under conditions of fire, establishes patterns of change in material objects and traces that have undergone thermal exposure, and proposes technologies for obtaining reliable information in the study of traces during fire-technical examinations (Latyshov et al., 2021). New technologies for the analysis of chemically complex organic materials offer a new language for representing the composition of a substance. The results of the study (Kochemirovskaya & Kochemirovsky, 2021) include the development of new types of matrices for the electronic tongue, which make it possible to visually represent the composition of a microscopic quantity of a substance for criminological purposes.

Artificial languages in forensic science are also discussed in respect to modeling as a special language that allows reproducing the events of a crime using various methods, including digital technologies, and "telling the story" of what happened (Menshikov, 2021).

The problem of "translating" the conclusions obtained by the expert into a language suitable for the investigator and the participants in the trial is raised, which arises due to the fact that the expert, as a person with special knowledge, uses the system of linguistic means that is accepted in his specialty. Based on practical experience, measures are proposed to adapt the language of the forensic expert for the purposes of the judicial process (Isaev, 2021).

A study of the Automated Expert Workplace as a tool of modern expert technologies was carried out that allows solving many problems arising in the production of forensic examinations, processing and storing evidence, which not only combines various digital solutions for interpreting the results of an expert study, but also allows presenting all stages of an expert's work for court and create documents in the required form (Latyshov, 2021).

The advancement of digital technologies is taking the possibilities of using visual language in Forensics to a new level. Many objects under study can be analyzed in the form of photographs or videos using appropriate software tools. On the other hand the widespread use of digital imaging devices for surveillance and entertainment (mobile phones, compact cameras, etc.) has increased the number of images being recorded and has multiplied the opportunities to analyse them for traces of criminal activities (Milliet et al., 2014, p. 473). Technologies for identifying persons on such sources of visual information are of particular importance for forensic science. The face becomes the

central way of representing a person, replacing fingerprints (Leone, 2021) that have played this role since the late 1910s, replacing Bertillon's system, which was a collection of body measurements (Laws, 2020). Problems and opportunities in the field of visual identification of a person are discussed in this issue under the heading of "Portrait Expertise" (Khairusov, 2021).

Interestingly, the face, as an iconic visual sign of human representation, allows the result to be "verified" by non-specialists, while evolving DNA identification methods make it difficult for trial participants to understand the results. In general, in many cases, there is a misunderstanding of the statistical digital results presented by the expert, and currently there is a discussion about the need to standardize the Forensic Science Expert Opinion (Casey, 2020; Kaye, 2019).

To be sure, digital photography appeals to the non-specialist but requires the understanding of a specialist as a technology that records and reads signs on multiple levels during various expert activities (Telyatitskaya, 2021).

Forensic technologies are becoming more and more complicated, which is associated with the development of science and technology and the borrowing of major achievements from other sciences in the process of solving and investigating crimes.

Since at present every scientific discipline is significantly influenced by modern information technologies, forensic research gradually incorporates a wide range of digital techniques and methods that allow with a high degree of reliability to detect and record specific traces of various social activities that are considered dangerous to life and human health or to the security of the state as a whole (Ali et all, 2018).

New problems in the field of forensic science are associated not only with the development of the latest technological systems, but also with the fact that criminal communities widely and effectively use in their illegal activities a variety of advanced technical means such as programs for transferring funds of cardholders or techniques for the creation of counterfeit currencies (Ignatov, 2020).

Responding to such specific challenges, forensic science is forced to develop a system of technological approaches that allow it to uncover new types of crimes as well as crimes that use new technologies, including AI. As such, forensic science is developing a system of technological approaches to identify the traces of criminal activity in various media, at crime scenes, and in the digital space of a modern developed society. (Metcalf et al., 2017; Doty & Lednev, 2018).

Considering the issues of forensic technologies, it is important to designate the essence of this concept. An overview of approaches to the definition of the concept is presented in the article by Yulia Dyablova (2009). Forensic technology is characterized as a necessary and effective set of techniques and methods for effectively obtaining and studying traces of criminal activity that determine the involvement of a particular person in the commission of a crime. Thus, forensic technology concerns two important aspects of crime investigation. First, the technology of forensic research involves the practical consolidation and fixation of traces and results of criminal encroachments.

Secondly, it contributes to the formation of new theoretical approaches to the study of criminal phenomena.

The technology of forensic science can be presented as a process that involves the complex collection of material evidence, their consolidation in criminal procedural documents, and further sequential forensic examinations. The great variety of technical means and scientific methods allows forensic science to establish the objective circumstances and characterize the central elements of criminal activities and represent them in a system of signs.

Technology is playing an increasingly important role in Forensics today and does most of the "talking" in the process. Researchers currently discuss the problem of the reliability of "machine evidence" (Laguardia, 2020), sometimes calling the machine an "accuser" rather than a faithful witness (Sites, 2018). Forensics is thus proving to be an area where a correct understanding of the language of technology becomes critical.

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