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Improvement of crime scene examination and reduction of cognitive deficit – the need to implement a new imaging and dimensioning technique

Crime scene examination always takes place at the interface of science and art, which permeate and complement each other.
Józef Gurgul

Summary

The contribution of forensics to the effective fight against crime must be significant. Since its inception, it has been inspired by scientific achievements, which, in turn, entailed the systematic development of forensic research, the effects of which improve the activities on the crime scene, which is the richest source of information about the crime and the offender. The role of the scene examination is very important. Its course and results are documented in a protocol of examination, technical documentation is prepared if necessary. It is this type of documentation that constitutes an indispensable reference material for the investigative authority. The catalogue of technical solutions and devices for the recording of scene examination activities continues to expand. It has already been proven that the use of 3D scanning technology to capture the appearance of the scene brings numerous benefits.

Key words: crime scene, modern technologies, crime scene documentation, 3D scanning technology

The dynamic development of science and technological progress are not only allies of forensics, but also of criminals. New areas and forms of crime as well as modernized techniques of committing crimes are emerging. The response of law enforcement agencies must therefore be adequate. Hence, continuous improvement of technical and tactical methods of crime detection is a matter of paramount importance. The principles of forensic science should be to ensure that the development of technology, science, as well as specific actions are effective, purposeful and mutually consistent (Hanausek, 2005), which is in the interest of the judiciary. It is worth recalling that forensic science is based on the assumptions of effective and purposeful human activity. These assumptions were developed by praxeology, from which discipline forensic science has drawn the principles of optimization, effectiveness and purposeful targeting of activities. They are applied both in terms of tactics and technology, as well as methodology and forensic strategy (Hanausek, 2005).

Practice shows that the crime scene is a rich source of information about the crime and the offender, i.e. it has a huge information potential. Many years ago, Tadeusz Hanausek vividly named the scene the cradle of forensics (Hanausek, 1971). The relevance of crime scene examination was appreciated as early as in the eighteenth century, when Cesare Beccaria, in his fundamental work "*On Crimes and Punishments*" wrote: "*real crimes, in many cases, leave numerous traces and consequences resulting from the acts*". (Beccaria, 1959). The lawyer and philosopher Jeremy Bentham recommended that the judges go to the crime scene and examine it in person. In this way, they were to verify witnesses' testimonies about the course of the event. He also pointed to savings in time and expenditure (Wojtasik, 2006). The statement that the appearance of the scene, written in the court's consciousness, is a useful instrument for verifying the testimony of witnesses, should be regarded as rational and timeless. In the times of science-based forensics,

an outstanding criminologist, Edmond Locard, played an important role in forming views on the importance of crime scene examination, considering it to be the basic way of learning objective truth (Locard, 1937). Despite the perpetrator's caution at the crime scene, he/she is not able to avoid leaving even small traces (changes), which, in turn, may prove to be crucial for the reconstruction of the course of events. This view can be, in a sense, visualized by recalling the words of Michelangelo Buonarroti: "*Do not underestimate small things, because perfection depends on small things, and perfection is not a small thing*". (Kotarbiński, 2000). To sum up, all forensic activities carried out at the scene are important in the process of searching for the truth about the event that took place therein (Hanausek, 1997). Their results allow to reconstruct the event, its course and mechanism, and may also help in verifying the available information about this place and the event. The detective value becomes highlighted at a later stage, i.e. after a thorough examination of the scene, including traces and objects left therein. The gathering of all information that is characteristic for the perpetrator and his/her modus operandi needs to be initiated already during the examination of the crime scene and material evidence. According to Józef Gurgul, they reflect the physical and mental characteristics of an unknown person, creating a quasi-fotograph of this person (Gurgul, 1999). Identification of an offender often depends on an immediate and efficient crime scene examination (Waltoś, Hofmański, 2018).

From the forensic point of view, the examination of the scene should be considered a key activity. It should be the starting point for further technical and tactical activities. In the whole set of activities comprising forensic investigation of the scene, the central position is occupied by scene examination – an activity consisting in direct sensory assessment of a section of space or a room (Hanausek, 1997). It is not only about visual insights, but also about using other senses, i.e. hearing, smell and touch (Waltoś, Hofmański, 2018). The amount of information gathered during examination determines to a large extent the directions of further activities of law enforcement authorities, so it crucial to properly record the examination activities. In view of the fact that scene examination is included in the category of unique procedural activities, meaning that it is carried out only once, this is a relevant issue. The principle of documenting activities (one of the principles of forensic science) requires all forensic activities to be documented. The methods and means of this documentation are different. The basic form of documenting activities carried out within the framework of criminal proceedings is a protocol. The course and results of the activities can also be recorded by means of appropriate equipment, which is discussed below. Due to the importance of this documentation, especially from the evidentiary point of view, it cannot be neglected in any case. It needs to be useful and communicative, to ensure that the course of activities is faithfully reflected. In Article 143 § 1 of the Code of Criminal Procedure the legislature specified that documenting scene examination requires the form of a protocol. It is the basic document in terms of maintaining procedural forms and making specific arrangements. A properly drawn protocol constitutes, in the course of subsequent proceedings, a fully admissible documentary evidence. Therefore, it should be drawn up in such a way that the court can conclude about the particular event and its circumstances on its own (Kulicki et al., 2009). In other words, the protocol must contain a clear statement of the existence or non-existence of the facts in question it must be legible. Unfortunately, from the point of view of future investigative and evidentiary activities, the protocol is not an ideal form of recording the course and results of scene examination. Descriptions are often selective, contain ambiguous terms, and it is difficult to eliminate the tendency to subjectively interpret the meaning of the facts perceived. *Systematically and in various ways, the art of recording needs to be improved* – says Józef Gurgul and immediately admits himself that he was probably never able to draw up an exemplary protocol (Gurgul, 2017). A verbal description does not appeal to the imagination, it does not give an illustrative idea of a given place. This is due to a number of factors (Leciak, 1999), whose discussion remains beyond the scope of this article.

Crime has a certain logic, which is reflected in the place where it was committed. The task of the procedural authority, which is responsible for the course and results of scene examination, is to document it, which has already been mentioned above. The position of the lead investigator is connected with the burden of exercising the right, and this always means the obligation to use a given competence, as needed (Cieślak, 1971). *Although acceptable from the point of view of criminal procedure, limiting the documentation only to the examination protocol is very risky, as the photographic image definitely brings us closer to the procedural principle of directness, which states that evidence needs to be recorded in its natural form* – believes Jan Wojtasik[1]. The legislature has provided for other ways of documenting the activities. The Code of Criminal Procedure sets out (laconically) certain rules relating to the recording of the course and results of these activities with the use of image or sound recording equipment. Therefore, from the content of Article 147 § 1 of the Code of Criminal Procedure it follows that the course of the activities may be recorded with the use of another device recording image or sound, and the participants should be warned before the device is

[1] http://www.janwojtasik.pl/%20http:/www.janwojtasik.pl/teksty/starsze/68-fotografia-kryminalistyczna.html [accessed on: November 2018].

started up. The basic tactical rules of scene examination and documentation are contained in Guidelines No. 3 of the Commander-in Chief of the Police of 30 August 2017[2]. Pursuant to § 45 (1), a scene examination protocol and, if necessary, other relevant technical and additional documentation, which may be drawn only during the examination, shall be prepared. This refers to the technical documentation, which constitutes an appendix to the examination protocol. The type of such documentation (also called accessory documentation) is decided by the judicial authority. The requirements to be met by technical documentation have not been defined with due precision. The rules of its preparation have been developed by forensic theory and practice. Generally speaking, the components of technical documentation visualize the course of activities, make it possible to record (and then reconstruct) the situation at the scene, and it will not be an exaggeration to say that they replace – although not literally – long, complex, and sometimes ambiguous descriptions characteristic of the examination protocol, as has already been mentioned. It is these attachments that serve to objectivise the interpretation of the situation on the scene. When analyzing photographs, sketches, scans, recordings, one can often notice traces (and objects) which have not been given due attention so far. For a judicial authority, technical documentation is an indispensable review (illustrative) material. Many conclusions can be drawn from the location, size and manner of leaving traces and objects, which are useful e.g. for building investigative hypotheses and planning activities aimed at detecting the perpetrator. From the perspective of both investigative and evidentiary activities, it cannot be overestimated. For this reason, despite the lack of statutory requirements, the course and results of scene examination should be recorded visually. This issue is beyond discussion. One should keep in mind the advice given by Józef Gurgul's that investigative and forensic documentation cannot be treated as a formal annex to the case file. He considers it even worse when, regardless of the type of place of the event, the examiner limits himself to standard (routine) forms of capturing the appearance of the scene, i.e. to photographs and sketches (Gurgul, 2000). Both types of documentation must form a coherent whole and only then can a complete image of evidentiary circumstances be obtained.

The legislature assigned to forensic science such responsibilities as the description of methods, tools and devices to be used for efficient and effective scene examination. The catalogue of technical solutions for recording activities at the scene is long, but preference is given to photographs, sketches (handwritten, scaled) and video recordings. Usually measuring tapes, measuring trolleys and, laser distance meters are used for dimensioning. Tachimeters are gaining in popularity, i.e. optical measuring devices bringing about an improvement in the form of three-dimensional spatial measurements, although the measurement itself performed manually (Piotrowski, Białobrzycki, 2016). In the context of modernization of scene recording techniques, it is also necessary to mention 360° photography. The photographs of an object are taken by setting it on a programmable rotating platform, which, when started, takes a pre-programmed number of photographs. It is the number of photographs taken that influences the quality of recording of a given object – a trace. When a room is to be photographed, a special rotating tripod is used, which allows to take a series of photos of individual fragments of the room or open area. The result is a stop- motion animation called a rotary presentation[3]. While it is not yet possible to announce the twilight of traditional methods of scene recording and dimensioning – these methods are still in practical use and the nearest future will not bring radical changes in this area – however, it is expected that they will be gradually replaced by more advanced solutions (Zubańska, Kowalski, 2015). From a praxeological point of view, this process is inevitable.

In criminal proceedings, crime scene examination is often fundamental for the whole case, therefore, it is in the interest of both the judicial authority and forensics to improve the recording of examination activities. Progress is necessary, inter alia, because it reduces the cognitive deficit. In order to reconstruct the course of the event in accordance with the facts, it is necessary to know the condition of the object, i.e. the scene at the moment of examination and the information derived, inter alia,, from traces and objects revealed and secured during the examination (Kędzierska, 2011). The appearance of crime scene is very important, therefore it is of paramount importance to determine the condition of the place being examined – it is a task for forensics. It is worth stressing that the arsenal of equipment and techniques to be used during the examination continues to grow. Certainly, the thesis made many years ago by Józef Gurgul, that there is no indication that the interest in the subject of scene examination will be exhausted, is still valid. The complex nature of examination will be the subject of investigation by judicial authorities, forensicists, forensic pathologists, theoreticians and practitioners (Gurgul, 2003). Progress in forensics is a consequence of the development of technology in general. Forensics constantly draws inspiration from various scientific achievements, and this, in turn, entails the systematic development of forensic research. Its results improve, among others, the activities carried

[2] Guidelines No. 3 of the Commander-i-Chief of the Police on the performance of certain investigative activities by police officers of 30 August 2017 (Journal of Laws of the Police Headquarters of 2017, item 59).

[3] https://topshow3d.net/?gclid=EAIaIQobChMIqvvJmP_k3gIVEOh3Ch3kNgc9EAAYBCAAEgIh5PD_BwE [accessed on: November 2018].

out at the crime scene. Although forensicists are well acquainted with restraint of doctrine representatives and decision-makers towards any new solutions (offered to them by forensics), the awareness that the reconstruction of the course of the event turns out to be an effective way of learning about it and the knowledge acquired constitutes an antidote to the so-called perfect crime (Biederman, 2006), encourages them to overcome this resistance and put new methods into practice. For a long time (counted in years), interests of forensics has been directed towards 3D scanning. The role of this technique in technical documentation of crime scene examination deserves to be defined as meaningful. When it comes to dimensioning the scene itself, manual measuring tools can be replaced by 3D techniques, e.g. a 3D range finder (such as the Leica 3D Disto scanning range finder[4]) is a device that allows determining the coordinates of the measured points. In this way, the shapes and sizes of the objects to be measured can be determined quickly. These devices can be easily opearated, which is important in practice. Contactless 3D scanning enables simultaneous recording of the appearance of the place, as well as its dimensioning, including determination of the distance between individual traces and objects. The dimensioning and recording of the location of objects does not require direct access, which translates into an increased level of work safety at the crime scene (Betlejewski, 2011). Moreover, it needs to be stressed that the fewer people at the scene, the less likely it is to contaminate the evidence (this is particularly important in the case of biological traces). Potential restrictions on objectivity and precision of recording the appearance and dimensioning of the scene are eliminated. Both indoors and outdoors, the scanner can be used to accurately determine the scanning area. The benefits should also be seen in the fact that the registration is done in real time and it is detailed – there is basically no possibility of making a measurement error. The above is important in the case of e.g. traffic accidents, where the length of the braking or wheel blocking track, the location of damaged elements, the condition of the surface have a significant impact on the reconstruction of the course of the event, which is carried out as part of the expert's opinion. Detailed registration of the condition of the place containing bloody traces at the moment of scene examination determines the possibility of reconstruction of the course of the event. The analysis of such traces and elucidating the mechanism of their occurrence is one of the ways of determining possible crime scenarios. A very important stage of the analysis is to get acquainted with the spatial distribution of bloody traces. Therefore, already at the stage of examination, the following characteristics should be taken into account: the number of bloody spots, their location in space, the distribution of spots in relation to each other, their size, appearance and type of the substrate on which they were revealed (Dąbrowska et al., 2013). Traditional methods of trace registering boil down to taking photographs, which are often imperfect. Literature reports indicate that the documentation from scene examination, carried out with an aim of reconstructing the course of the events, frequently contains mistakes in terms of certain protocol entries, as well as the photographic documentation. Improper selection or lack of detailed photographs, especially in combination with imprecise description in the protocol, makes it impossible to give an opinion on the mechanism of formation of bloody spots (Walczuk et al., 2014). As results from the research carried out, the use of the latest image recording tools (with regard to both the place and traces) enabling the introduction of an additional third dimension, accelerates and simplifies the analysis of the secured material by an expert[5]. Most of the data originating from the crime scene is available at any time in the form of a three-dimensional image and therefore, at any stage of the investigation, it is possible to return to the scene, check and verify measurements, check compliance with the description in the protocol or the position of traces and objects in relation to each other. HDS 3D scanners allow to record and archive all spatial data, both 2- and 3-dimensional. The use of a 3D scanner to record activities on the crime scene eliminates the need to make forensic sketches (which is a time-consuming activity) and, partially, the photographic documentation, the quality of which repeatedly does not withstand criticism. Even when assuming, idealistically, good quality photographs of the crime scene, certain limitations of the photographic documentation cannot be eliminated. Generally, a number of allegations are made towards crime scene examination practices, including comments on the poor quality of the technical documentation. For example, in the course of her research, Monika Całkiewicz analysed 200 criminal cases concerning crimes against life. As far as the technical documentation is concerned, almost 90% of the illustrative photographs were not taken correctly. According to the author, this pertains only to the preparation of photographic documentation, while its quality remains a secondary concern. Moreover, none of the sketches related to the cases examined have been drawn in a completely correct way either. The

[4] https://leica-geosystems.com/pl-PL/products/disto-and-leica-lino [accessed on: November 2018].

[5] For more information on this subject, see: Project no. O ROB 0006 03 001 R*econstruction of the course of the event based on the appearance of bloody traces* financed by the National Centre for Research and Development as part of competition No. 3/2012 for projects in the scope of research and development in the area of national security and defence, http://clk.policja.pl/clk/badania-i-projekty/projekty-badawcze-real/w-toku [accessed on: October 2018].

most common mistakes concerned the drawing of lines by hand without maintaining the scale. It was impossible to read any distances from such sketches, and since they were not inferable from the records in the examination protocols, it was not possible to determine where the traces and material evidence relevant to the resolution of the case were located. Moreover, none of the sketches indicated the directions of the world (Całkiewicz, 2010). Similar conclusions can be drawn from the research conducted by Violetta Kwiatkowska-Wójcikiewicz concerning the scene examination practices in cases of burglary theft, which were discontinued due to the failure to detect the perpetrator. A total of 832 case files relating to 1066 burglary cases were examined and 988 crime scene examinations were carried out (Kwiatkowska-Wójcikiewicz, 2011). It seems that further reflections on errors in the technical documentation concerning crime scene examination are unnecessary. It is essential to take actions and, above all, adopt solutions that will lead to the elimination of such deficiencies.

The scanner not only enables documentation, analysis, reconstruction and three-dimensional visualization of the crime scene, but also provides state-of-the-art support for both forensic technicians and experts, as well as (and perhaps in particular) judicial authorities. The framed image of the original condition of the scene is of paramount importance for the investigative authority, as well as (and perhaps in particular) for the court, which in practice is unable to see the original appearance (Kwiatkowska-Wójcikiewicz, 2011), which will be discussed below. This is important in relation to the types of events already mentioned, as well as those that involve the use of firearms, catastrophes (road, rail, air), explosives and explosive devices, or terrorist attacks. In turn, when examining the scene located in a particularly hard-to-reach area (e.g. mountainous terrain), or an area characterised by a complex situation (terrorist attacks in urban areas), aerial recording of the scene seems to be an optimal solution, e.g. using a quadrocopter drone equipped with a camera and a flight controller. An example of such a set is the Quadrocopter Phantom 2 Vision+ fitted out by the Military Police, extended to include subassemblies allowing to increase the range of operation, functionality and imaging capabilities (Klepczyński, 2017). Generally, the use of a drone to document the scenes of catastrophes or communication events should become a standard in the near future. Recording from a height and from a different perspective brings better results than digitally processed panoramic photography (Frankowski, Dębski, 2018). It should be emphasized that the use of 3D scanning technology may bring many benefits also in murder cases due to the multiple possibilities of interpreting the results of examination in the further course of criminal proceedings (Juszka, 2013). Reduced recording time, greater accuracy of measurements, capturing of more details and the possibility of virtual return (at any time) to the crime scene – all these are relevant arguments (Koźmiński et al., 2010; Klepczyński, 2017; Piotrowski, Białobrzycki, 2016). The twilight of photographic documentation, sketches or recordings cannot yet be announced under any circumstances. For certain scenes, the photographs and sketches of good quality – this is a no-exception rule – still fulfil their purpose. However, it is inevitable that the latest achievements in the field of visualization and dimensioning of the scene of the event will be gradually implemented as a standard method of recording the examination activities.

3D scanning has yet another functionality that is worth a few sentences. Namely, in the course of the scene examination, a 3D scanner can be used to capture images of certain types of forensic traces. Thanks to scanning, it is possible to record and save in a file e.g. traseological traces (in the form of imprints), mechanoscopic traces (in the form of fractures, cracks, tears), as well as dactyloscopic traces. Within this scope, forensics should pay attention to high-resolution technologies allowing to quickly create digital 3D models of real objects, such as the ones used in 3D HDI (High Definition Imaging) scanners. These scanners are available in different models. An object (e.g. a crime scene trace) can be scanned directly, without physical contact and with high accuracy. Very real, yet still distant is the perspective that, in the future, such devices will change the approach to securing certain types of forensic traces; this will certainly be the subject of many studies.

New methods of recording and dimensioning the crime scene will in no way replace the examination as such, but will improve its particular stages, and significantly enrich the cognitive value of the documentation. Conducting an examination without practical knowledge and application of theoretical and practical achievements of forensics leads astray. Why is it so? Let us refer briefly to the problem of judicial cognition. One of the canons of judicial cognition is a desire to maximize the judge's objectivity. It consist in limiting the physical directness of learning the truth in favour of the formalised so-called procedural directness. The judges are doomed to see the world through the eyes of witnesses, defendants and experts. It is not surprising that the defendants and witnesses often deliver blurred, variable or contradictory memories of the past events before the eyes of the court. Meanwhile, modern forensics has solutions that enable the judicial authority, especially the judge, to make better use of the basic distant senses. In other words, the imperfections of human cognition can be minimized (Owoc, 2004). Continuing the answer to the question posed above, one should now refer to one of the principles of forensics, namely the fighting principle. The basic assumptions of a fighting principle have been developed by praxeology (which has already been mentioned) – science dealing with efficient actions in relation to all forms of activity

consisting in the conscious realization of the objectives set. According to the outstanding philosopher and ethicist, Tadeusz Kotarbiński, efficiency is the basic criterion of good work. In his opinion, practical (efficiency) evaluation boils down to questions about the effectiveness and economic efficiency of actions undertaken. An effective action is the one that leads to the effect intended as an objective (Kotarbiński, 2000). As part of the fighting principle, the judicial authority is obliged to take all measures necessary to apprehend the crime perpetrator and prove his guilt as soon as possible (Kasprzak et al., 2006), whereas the crime scene is an important stage of a crime.

In relation to the written protocol, the recorded image and sound play a supportive role. This does not deprive the recording of its legal significance as a control measure that can be used to supplement the protocol owing to the possibility of playing back the recording, at any time and verbatim. However, the implementation of new solutions into practice cannot be devoid of reflection, based on both technical and legal aspects. The implementation of 3D scanning technology for forensics, with the assumption that it will be used for registering and dimensioning the crime scene, is also conditioned by the technical specification of the device. Important factors include: the size of the scanning area, i.e. the space within which a particular device can operate, and the size of the point cloud that the 3D scanner can generate and save; scanning speed; the conditions (atmospheric) under which the scanner can operate – not all scanners can cope with severe weather conditions; software tailored to the needs of forensics (nomenclature relating to traces and objects, ability to generate forensic sketches); counting the primary scan checksum. The mobility of the device is also important. The application and use of technical means must be subject to conditions guaranteeing to the maximum extent possible the authenticity and completeness of the recordings and identification of participants in a given activity (Leciak, 1999). In other words, the provisions of the Regulation of the Minister of Justice on recording images or sound for procedural purposes in criminal proceedings of 11 January 2017 (Journal of Laws of 2017, item 93) should be complied with. As concerns the possibility of introducing a 3D scanner to the crime scene, the abovementioned Guidelines No. 3 of the Police Commander-in-Chief have a provision stating that the type of technical documentation prepared during the examination is determined by the authority conducting the activity. The legislature also referred to the examination of the crime scene with a complicated situation and a complex organisational model. The documents relevant in this case are: *Procedures to be followed by the Police when organising and carrying out an examination of the crime scene*[6] and *Methodology for examination of the sites of terrorist offences and catastrophes as well as identification of victims' bodies*[7]. The second document refers, inter alia, to the selection of forensic methods and means, which take into account the extent and effects of the event, as well as the number of studies conducted in connection thereto. It is worth highlighting such priorities of crime scene examination as: registering the scene and objective reconstruction of the course of the event. Chapter 13 entitled: "*Selection of the method of examination and documentation*" states that activities at the crime scene begin with an initial examination, which includes, among other things, recording of the existing situation without making any changes through the use of, among others, ground-based 3D scanning techniques. On the other hand, in Chapter 22 entitled: "*Equipment necessary to carry out an examination of the sites of terrorist offences or catastrophes*", in the section devoted to equipment and means for revealing and securing forensic traces, material evidence and documenting the findings, the following are listed: a digital camera, a professional camera with a set of lenses, a flash, a camera stand, video cameras and devices enabling the use of ground-based 3D scanning techniques.

To sum up, let us recall that the examination activity serves the purpose of recording the appearance of the crime scene, collecting materials useful for verifying testimonies and explanations, reconstructing the course of the event, determining the modus operandi, obtaining data necessary to conduct tests as part of expert's opinion, as well as resolving some important legal and material issues, including a person's accountability or necessary defence (Wojtasik, 2006) – these are the facts. The reconstruction of the event has a great cognitive value. When the principle of directness has limitations, the role of technical documentation, especially at the stage of court proceedings, cannot be overestimated (Kwiatkowska-Wójcikiewicz, 2011). The inclusion of the latest achievements in the field of visualization and reconstruction of 3D objects in the catalogue of methods of recording the appearance of the crime scene is a real need, which is confirmed by the experience gained so far from their use, as already mentioned above. This concerns the development (or continuation) of methods of crime scene documentation, which are already in use have the approval of the judicial authorities and the doctrine. The 3D scanning method combines measurement and image recording, which allows for its implementation into forensic practice to a fairly wide extent (e.g. for visualization and measurement of traces). Let us repeat once again that reduced recording time, greater accuracy of measurements, capturing of more details and the possibility of virtual return (at any time) to the crime scene – these are convincing arguments

6 Annex to the letter of the Commander-in-Chief of the Police No. Ad1078/2001 of 7 August 2001.

7 Annex to the letter of the Deputy Commander-in-Chief of the Police No. Aom-1369/2012 of 24 October 2012.

(Koźmiński et al., 2010). The need for swift action should be taken seriously (e.g. during the examination of the murder scene), without prejudice to the principle of accuracy. In practice, however, the application of new techniques and methods is, for various reasons, staggered over time. Among the reasons are the economic aspects (significant costs of the technology in question) and well as doubts as to the substantive aspects of a specific solution. In addition, the degree of technological advancement causes that the operation of certain equipment mentioned throughout this article requires appropriate training. The knowledge and skills of the operator are of key importance. In any case, it is also necessary to maintain a balance. The effective conduct of the examination is governed by the principle of economics of operation, which states that one should always strive for a balance between the magnitude of the forces and resources deployed and the expected effects. With regard to the examination activities, this principle is expressed in carrying out only such activities and in a way that is reasonably justified and produces results corresponding to real needs. The selection of personnel should be dependent on the type and effects of the crime, as well as the area to be examined. In the case of using a 3D scanner, the principle of economics of operation is expressed in the establishment of a smaller examination group and in shortening the activity itself. According to Józef Gurgul, two significant factors of cognitive success in criminal proceedings should be advocated, i.e. identification of prosecutors, police officers, experts and specialists – professional in every respect – with the ideals of the justice system, and the technical equipment, means and methods used by these entities on the crime scene *sensu largissimo* (Gurgul, 2003). The techniques discussed change the reality of documenting the examination activities, and contribute to their improvement.

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