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DIGITAL FORENSICS IN JOURNALISTIC INVESTIGATIONS AS A TOOL FOR TRACKING HIDDEN PROCESSES

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Abstract. *The article is devoted to the hidden aspects of the functioning of digital processes, which become the object of analysis within the framework of journalistic investigations. The purpose of the article is to analyze the role of digital forensics in journalistic investigations as a tool for identifying and interpreting hidden processes in the digital environment. To achieve the goal, the following methods of scientific analysis are used in the course of the study: analysis and synthesis, generalization, comparative method, structural-functional approach, as well as elements of system analysis. The results highlight scientific novelty, which consists in combining digital aspects of collecting hidden data with a phased analysis of these processes that remain outside the scope of public observation. As a result of the study, it was established that tracking hidden processes in journalistic investigations is carried out in phases and is based on a combination of digital and analytical tools. At the initial stage, anomalies are detected in open data, public registers and media flow, which allows forming preliminary hypotheses about hidden mechanisms. Next, a targeted collection of large arrays of documents and multimedia materials is carried out using automated tools for structuring and highlighting key objects. At the analytical stage, authenticity verification, source comparison, and spatio-temporal verification of materials are applied, after which the results are integrated into a logically connected process model suitable for public presentation. Knowledge and adherence to these ecsteps allows in practice to strengthen the methodology of journalistic investigations and reduce the risks of erroneous conclusions.*

Keywords: *forensics, journalistic investigations, digitalization, data collection.*

Introduction

In modern practice of journalistic investigations, a situation is increasingly observed when key evidence exists not in the form of direct testimony, but in the form of digital traces: documents, platform logs, transactions, and network connections. As A. Al Ibrahim notes, working with such data sets changes the very logic of investigation, as the journalist must not only collect facts, but also recreate hidden processes that are formed in an algorithmically controlled environment [1]. This means that establishing the truth increasingly depends on the ability to analyze digital structures, and not only on access to individual sources.

In practice, this is manifested in investigations based on large collections of files obtained through leaks or public disclosures of data. G. Wiedemann believes that without automated information extraction pipelines, journalists cannot effectively work with multilingual and unstructured document corpora, in which key connections

between individuals and events are hidden [9]. In such cases, it is precisely the tools borrowed from digital forensics and data analysis that allow us to move from a chaotic array of information to a logically constructed picture of processes.

In parallel, the role of multimedia materials as a basis for public exposures is growing, particularly in cases of violence, human rights violations or environmental crimes. As K. Gates notes, the analysis of videos from different sources is becoming a central element of the reconstruction of events, requiring spatio-temporal verification and comparison with other digital traces [3]. Combined with automated data collection tools, which, according to the observations of B. Cifliku and H. Heuer, are already being used to speed up investigative processes, this forms a new practical reality in which the journalist increasingly works as an analyst of digital evidence [2]. It is at this point that the combination of technology and investigative logic becomes clear why digital forensics is gradually becoming an indispensable tool for identifying hidden socially significant processes.

Literature Review

The topic of digital forensics and investigative journalism is widely represented in the scientific literature, and significant contributions to its development have been made by the following researchers: A. Al Ibrahim [1], B. Cifliku [2], H. Heuer [2], K. Gates [3], A.F. Gomes [4], S. Marinho [4], G. Horsman [5], N. Sunde [5], H.M. Jamil [6], S.Y. Rubaiat [6], A.A. Khan [7], A.A. Shaikh [7], A.A. Laghari [7], H.M. Lee [8], N. Hanson [8], G. Wiedemann [9], S.M. Yimam [9], C. Biemann [9], L. Wuergler [10]. The representation of the topic in various scientific directions indicates its interdisciplinary nature and the gradual convergence of approaches of journalism, forensics and computational social sciences.

Practical aspects of the use of digital tools in journalistic investigations are considered in detail in the works of H.M. Jamil and S.Y. Rubaiat [6], B. Cifliku and H. Heuer [2]. Applied technological solutions for working with large corpora of documents are presented in the work of G. Wiedemann, S.M. Yimam and C. Biemann, who describe a multilingual information extraction pipeline for investigative journalism [9].

The theoretical foundations of digital forensics and its procedural organization are covered in a systematic review by A.F. Gomes and S. Marinho [4], G. Horsman and N. Sunde [5]. In these works, the emphasis is on process modeling, standardization of stages and the role of the human factor in decision-making.

The issue of the interaction of investigative journalism and forensics is revealed in the works of A.A. Khan, A.A. Shaikh and A.A. Laghari, who describe digital forensics as a tool for detecting illegal activities in complex technological environments [7], as well as in the study of K. Gates, devoted to the transformation of media evidence in the process of media forensic interpretation [3]. Conceptual approaches to the definition of investigative journalism and its procedural specificity are presented in the works of L. Wuergler [10], H.M. Lee and N. Hanson [8].

The analysis of the mentioned literature shows that, despite the presence of a significant number of studies, the combination of digital aspects of collecting hidden data with a phased analysis of those processes that remain beyond the limits of public observation and actually form the hidden part of social mechanisms remains insufficiently covered. In this regard, further research using analysis, synthesis, generalization, comparative and structural-functional approaches will reveal the stages of detection and interpretation of such hidden processes within journalistic investigations using digital forensics tools.

The purpose of the article is to analyze the role of digital forensics in journalistic investigations as a tool for detecting and interpreting hidden processes in the digital environment. To achieve this goal, the study will perform ***three tasks***: first, to analyze the features of digital forensics and its main components; second, to reveal how journalistic investigations and forensic approaches are combined in working with digital evidence; third, to describe the stages of detection and analysis of hidden processes within investigative activities.

Research Results

Digital forensics was formed as a response to the growing role of digital technologies in everyday life and criminal activity. While classical forensics works with material traces (objects, biological samples, spatial traces), digital forensics

focuses on data that exist in the electronic environment: files, logs, metadata, network traces, cloud storage and mobile devices [7]. Such a change in the object of study also leads to a change in methods, since digital traces are unstable and easily modified during normal operation of devices. According to A.A. Khan, A.A. Shaikh and A.A. Laghari, digital forensics covers the full cycle of working with digital evidence: from its identification to presenting the results in a form suitable for procedural use [7]. This means that attention is focused not only on the technical extraction of information, but also on preserving its evidentiary value throughout the investigation. In classical forensics, these stages are also present, but they are associated with physical objects, rather than digital copies that can be reproduced many times without visible traces of interference.

G. Horsman and N. Sunde believe that digital forensic investigation should be considered as a combination of strategy, analytical solutions, physical operations with information carriers and ongoing risk management [5]. They draw attention to the fact that the same data can be interpreted differently depending on the experience of the specialist and the context of the case [5]. This distinguishes digital forensics from the idea of a purely technical procedure and emphasizes the role of analytical thinking in working with digital evidence.

An essential feature of digital forensics is the distribution of information sources. Data can be stored on local devices, in corporate networks or in cloud services that are physically located in other jurisdictions [7]. As K. Gates notes, modern investigations increasingly rely on video and audio recordings from surveillance cameras, mobile phones, body cameras and drones [3]. However, the mere fact of the presence of a recording does not mean the presence of evidence. The recording becomes evidence only after analytical processing, synchronization with spatio-temporal data and comparison with other sources of information [3]. Thus, media data become part of a broader digital reconstruction of events.

An important component of modern digital forensics is automated support for analysis. According to G. Wiedemann, working with large document corpora requires tools for automatic entity extraction and building connections between them [9].

Therefore, it is possible to identify key characteristics of digital forensics, which reflect both the technical and analytical components of the process, and they are systematized in Table 1.

Table 1 – Characteristics of digital forensics

Characteristic	Content
Identification of digital traces	detection of relevant data on devices, networks, and cloud environments, including hidden and deleted files [7]
Preservation and integrity of evidence	control over data immutability and adherence to the chain of custody during the copying and storage of information [7]
Analytical interpretation	formulation of hypotheses and reconstruction of event sequences based on files, logs, and metadata [5]
Risk management	identification of critical stages where errors may occur, along with adjustment of the investigation strategy [5]
Multimedia data analysis	spatiotemporal verification of video and audio materials from various technical sources [3]
Algorithmic support	automated extraction of entities and relationships within large volumes of textual data [9]
Multisource information	integration of technical, network, and user data within a unified analytical model of events [3]
Documentation of results	generation of reports and visualizations for further expert or public review [7]

Summarized by the author based on sources: [3, 5, 7, 9]

Thus, digital forensics forms a set of tools for working with hidden digital processes, which creates a methodological basis for its further use in journalistic investigations as a way to identify complex and non-obvious social connections.

The combination of journalistic investigations and forensics is manifested primarily in the change in the role of observation. It ceases to be just a fixation of an event “here and now” and turns into a source of repeated analysis. As K. Gates notes, in the digital environment, it is not live observations that are of decisive importance, but saved recordings, which after archiving acquire new functions: they can be compared, checked, and edited in time sequences [3]. In journalistic practices, this means a transition from one-time collection of information to working with accumulated arrays of traces, which brings the investigation closer to the logic of forensic analysis.

At the same time, a recording is not automatically evidence. Media material must undergo analytical verification, and only after that it can be used to argue public

conclusions [3]. These are several interrelated actions:

- confirmation of the origin of the file;
- establishing the time and place of filming;
- comparison with alternative sources.

In journalistic investigations, these steps are implemented through metadata analysis, comparison of different versions of events and involvement of expert assessments, which actually reproduces the forensic verification procedure. That is why evidence in journalism is increasingly based not on the authority of the source, but on the reproducibility of analytical procedures [3].

In this context, what K. Gates describes as media forensics is taking shape, that is, the practice of systematic analysis of digital and multimedia traces for the reconstruction of events [3]. The investigation takes on the features of media archaeology. It is important to note that most of the data already exists in the public or semi-public space, and the journalist's task is not to create new evidence, but to make sense of existing digital traces.

Media forensic approaches are also actively used outside the editorial office. They are used to record human rights violations, environmental crimes and the consequences of military actions through the analysis of video, satellite images and network data [3]. In these cases, the materials may not be immediately integrated into judicial procedures, but they form a public body of evidence used in international reports and advocacy campaigns. This practice creates a counter-forensic dimension, where it is important not only to establish the fact, but also to critically understand how the evidence is formed and who controls the interpretation of events [3].

In parallel, these same tools are integrated into documentary journalism, where analytical procedures are combined with narrative forms of presenting the material. Reconstructions of events often include synchronized video fragments, movement maps, and timelines, which allows us to show not only individual episodes but also the logic of the development of processes [3]. This format increases audience involvement, but at the same time increases the requirements for accuracy, since any error in verification can transform the analytical reconstruction into media speculation.

The use of narratives of observation in combination with digital analytics creates the effect of presence and at the same time forms a sense of evidence, but it is here that the tension between documentation and media interpretation arises [3]. The integration of forensic logic with journalistic narrative occurs at the level of procedures: data is collected, verified, compared and only then included in the public narrative. In such a model, the journalist no longer simply transmits what he saw, but reconstructs hidden processes based on digital traces and makes them understandable for public discussion, which determines the specificity of modern investigations [3].

Information gathering in journalistic investigations is aimed primarily at identifying hidden processes that are not visible within the framework of ordinary news observation. It is not only about individual events, but about stable schemes, connections and recurring patterns that are masked behind formally legal or routine practices. According to L. Wuergler, the key feature of investigative activity is precisely the specific process of working with information, which goes beyond the standard collection of comments and press releases [10]. In this sense, the journalist does not simply record facts, but purposefully constructs a research trajectory to identify structural mechanisms that remain hidden from the public.

The stages of journalistic investigations are formed as a sequential transition from primary observation to in-depth data analysis and hypothesis testing. As H.M. Lee and N. Hanson note, the investigation begins with the identification of a problematic situation or anomaly that is not explained in official sources, after which the journalist proceeds to an active search for documents, testimonies and digital traces [8]. This approach allows you to gradually go beyond the superficial description of events and focus on cause-and-effect relationships that explain how hidden processes in the sphere of politics, economics or social institution's function. An important role in modern investigations is played by working with large amounts of digital information, which can come from both official open registers and data sources or document archives. G. Wiedemann believes that it is at the stage of the initial analysis of file corpuses that an idea of possible storylines and key objects of the investigation is formed [9]. Automated tools help to structure unorganized data, but the interpretation of the results

remains the task of the journalist, who must assess the context and relevance of the identified connections. In parallel with the technical analysis of data, information is verified by comparing different sources, which allows minimizing the risk of erroneous conclusions. As B. Cifliku and H. Heuer emphasize, even under conditions of active automation, human verification and editorial control remain the key stage, since algorithms are not able to fully assess the social and legal consequences of publishing material [2]. That is why the stages of information collection in investigations are not linear, but involve a constant return to previous steps and correction of the research strategy.

The general logic of these actions can be presented as a sequence of stages of information collection to identify hidden processes, which are systematized in Table 2.

Table 2 – Stages of information collection in journalistic investigations of hidden processes

Stage	Content
Initial observation and hypothesis development	identification of anomalies, recurring issues, or contradictions in the open information space that may indicate hidden processes [8]
Defining the research focus	formulation of key questions and boundaries of the investigation, taking into account the social relevance of the topic [10]
Collection of documentary and digital data	acquisition of files, registries, correspondence, databases, and multimedia materials from both open and closed sources [9]
Initial structuring of information	grouping of documents, extraction of entities, and construction of preliminary connections between the objects of investigation [9]
Analytical verification of hypotheses	comparison of different sources to find confirmations or refutations of initial assumptions [8]
Additional collection of targeted data	focused search for missing information to fill identified gaps [10]
Final verification	validation of material authenticity prior to publication, including legal and editorial review [2]

Summarized by the author based on sources: [2, 8, 9, 10]

The issue of the reliability of the collected information requires special attention, especially given the digital nature of most modern evidence. As A. Al Ibrahim notes, in the context of the spread of synthetic media and generative models, the risk of manipulation increases significantly, which requires journalists to pay increased attention to the procedures for verifying the authenticity of materials [1]. Deepfakes, altered metadata, and fabricated documents can be used to discredit individuals or

entire institutions, so insufficient verification of data creates the risk of defamation and loss of trust in the investigation.

In this context, the principle of triangulation, i.e. confirmation of facts from several independent sources, acquires particular importance. Even in the presence of convincing digital materials, a journalist must take into account the possibility of technical forgery and contextual distortion of information [1]. That is why the combination of digital analytics with traditional verification methods, including interviews and work with experts, remains a necessary condition for responsible coverage of hidden processes in the public space.

Conclusions

Thus, digital forensics is characterized by working with electronic traces, monitoring the immutability of data, analytical reconstruction of events, constant risk assessment, examination of video and audio materials, the use of automated tools for processing large amounts of information, combining disparate sources and preparing evidentiary reports for further verification and public presentation.

The combination of journalistic investigations and forensic approaches occurs through the use of recorded media data as analytical material, the transfer of records to the status of verified evidence, the application of verification procedures and spatio-temporal comparison, as well as through the integration of technical analysis with a narrative explanation of events for the audience. In this process, the journalist plays the role of an interpreter of digital traces, combining the research logic with the communicative function of public disclosure [7].

The disclosure of hidden processes is carried out through a sequential transition from identifying problematic signals to forming a research focus, involving documentary and digital materials, their preliminary ordering, checking assumptions, targeted selection of additional information and final verification before publishing the results.

References

1. Al Ibrahim A. Investigative Journalism in the Age of Artificial Intelligence:

From Evidence to Impact. Independent Academic Publication, 2025. URL: https://www.academia.edu/145027486/Investigative_Journalism_in_the_Age_of_Artificial_Intelligence_From_Evidence_to_Impact

2. Cifliku B., Heuer H. "This could save us months of work" - Use Cases of AI and Automation Support in Investigative Journalism. CHI EA '25: Proceedings of the Extended Abstracts of the CHI Conference on Human Factors in Computing Systems, 2025, №29, 1–8. URL: https://doi.org/10.1145/3706599.3719856

3. Gates K. Media Evidence and Forensic Journalism. Surveillance & Society, 2020, 18(3), 403-408. URL: https://ojs.library.queensu.ca/index.php/surveillance-and-society/article/view/14090/9354

4. Gomes A.F., Marinho S. Forensic journalism: A systematic literature review. Journalism, Sage Publications, 2024, 26 (9) URL: https://doi.org/10.1177/14648849241261182

5. Horsman G., Sunde N. Unboxing the digital forensic investigation process. Science & Justice, 2022, 62 (2). URL: https://doi.org/10.1016/j.scijus.2022.01.002

6. Jamil H.M., Rubaiat S.Y. Online Digital Investigative Journalism Using SociaLens. In: Delir Haghighi, P., Greguš, M., Kotsis, G., Khalil, I. (eds) Information Integration and Web Intelligence. iiWAS 2024. Lecture Notes in Computer Science, 2025, vol 15343. URL: https://doi.org/10.1007/978-3-031-78093-6_9

7. Khan A.A., Shaikh A.A., Laghari A.A. Digital forensics and cyber forensics investigation: Security challenges, limitations, open issues and future direction. International Journal of Electronic Security and Digital Forensics, 2022, №1(1). URL: https://www.researchgate.net/publication/355183549_Digital_Forensics_and_Cyber_Forensics_Investigation_Security_Challenges_Limitations_Open_Issues_and_Future_Direction

8. Lee H.M., Hanson N. What is investigative journalism? Story-based inquiry: a manual for investigative journalists, 2011, 7-12. URL: https://unesdoc.unesco.org/ark:/48223/pf0000193096

9. Wiedemann G., Yimam S.M., Biemann C. A multilingual information extraction pipeline for investigative journalism. ArXiv, 2018. URL:

https://arxiv.org/abs/1809.00221

10. Wuergler L. Identifying investigative pieces: A multi-step method. Journal of Applied Journalism & Media Studies, 2023, 24(14), 1754-1774 URL: https://doi.org/10.1080/1461670X.2023.2209814