Chapter 12
Applying Graph Theory to Detect Cases of Money Laundering and Terrorism Financing

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ABSTRACT

A technique to automate the generation of criminal cases for money laundering and financing of terrorism (ML/FT) based on typologies is proposed. That will help an automated system from making a decision about the exact coincidence when comparing the case objects and their links with those in the typologies. Several types of subgraph changes (mutations) are examined. The main goal to apply these mutations is to consider other possible ML/FT variants that do not correspond explicitly to the typologies but have a similar scenario. Visualization methods like the graph theory are used to order perception of data and to reduce its volumes. This work also uses the foundations of information and financial security. The research demonstrates possibilities of applying the graph theory and big data tools in investigating information security incidents. A program has been written to verify the technique proposed. It was tested on case graphs built on the typologies under consideration.

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INTRODUCTION

The project is motivated by the fact that its research area lies at the intersection of such important challenges of modern society as the transition to advanced digital intelligent technologies and big data processing, as well as a counteraction to terrorism and ideological extremism, technogenic, biogenic, sociocultural, and cyber threats and other sources of danger. In particular, this arises a problem of necessary formation of typologies (EAG-2, n.d.) and automation of searching and revealing schemes of suspicious activity in the field of combating ML/FT (AML/CFT) (EAG-1, n.d.). While solving the problem, the unique characteristics of these schemes demand new methodology and techniques in investigating them. Volumes of heterogeneous data to be analyzed in a short time have the explicit characteristics of big data. Since information on typologies should not become known in a criminal environment, its protection must be provided.

The significance of the project is determined by the technique proposed and its software implementation to automate the generation of new criminal schemes (for example, "Peso" and "commission scheme") based on the typologies but are not their exact copies. This feature has hampered the existing automated systems in the comparative analysis of the analyzed objects and links between them with the objects and their links in the typologies as to conclude whether they are exactly identical or not. The advantages of graphs and big data are also investigated and applied in the analysis and processing of financial investigations that should be protected. The project results may be of interest for further scientific research in the AML/CFT area (EAG-1, n.d.), and their practical significance may be proved in the applications of the proposed technique.

The scientific novelty of the research is that using the suggested technique based on the graph approaches, the schemes of criminal cases can be multiplied, bringing millions of all possible variants of one case to be processed later and analyzed for searching similar schemes with big data tools. Thus new rules for identifying ML/FT schemes could be created, and the automation of AML/CFT crime detection could be simplified.

Big Data Techniques in Investigating Money Laundering and Financing of Terrorism

In solving problems of information and financial security big data technologies can be used to receive and process huge data sets in a short time. In our case big data tools assume a huge gain in term of in time not only the collection but in sorting data, filling different databases, etc.

The main methods while working with big data (Barsegyan at al., 2008), without which the study of huge amounts of information will be problematic, can be listed as the following:

- Associative rules which reflect frequent dependencies (or associations) between objects or events. The dependencies found in the information array are represented in the form of rules and used to analyze the nature of data and predict an occurrence of events;
- Decision trees (classification and regression). The task of classification is to define an object class by its characteristics. The problem of regression, as well as the classification problem, can be determined from the studied property of the object; Unlike functions: the classical set of classes, and also the set of real numbers;