Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 120 (2017) 296–303

Procedia Computer Science

www.elsevier.com/locate/procedia

9th International Conference on Theory and Application of Soft Computing, Computing with Words and Perception, ICSCCW 2017, 24-25 August 2017, Budapest, Hungary

Estimation the confidentiality degree of classified information on the base of expert information processing

Ramin Rzayev[a]*, Afet Suleymanova[b], Sevinj Babayeva[a]

[a]*Institute of Control Systems of Azerbaijan National Academy of Science, Baku AZ1141, Azerbaijan*
[b]*Baku State University, Baku AZ1141, Azerbaijan*

Abstract

There are considered the prerequisites required as a prior condition for the timely establishment of an adequate level of the confidentiality of classified information to be included in future documents. For assigning the confidentiality stamp, it is suggested to use expert conclusions from remote sources and for relevant data processing relative to classification of expert estimations and its following aggregation it is proposed using the fuzzy inference.

Peer-review under responsibility of the scientific committee of the 9th International Conference on Theory and application of Soft Computing, Computing with Words and Perception.

*Keywords:*Classified information; confidentiality factor; expert conclusion; fuzzy inference.

1. Introduction

It is known that classified information that is not recorded on any medium is the most secure. Threats of valuable information appear immediately when a thought (or desire) arises about the necessity of its documentation. Therefore, the protection system of classified information should begin to function not after its publication (or signing), but in advance, i.e. until the first signs of the future document are printed on a virgin medium. Before the realization of the idea of creating a document, following questions are initially decided: whether this information is classified and, if so, what level of confidentiality it must be assigned to. List of classified information and classified

* Corresponding author. Tel.: +994-50-877-72-06.
E-mail address: raminrza@yahoo.com

1877-0509
Peer-review under responsibility of the scientific committee of the 9th International Conference on Theory and application of Soft Computing, Computing with Words and Perception.
10.1016/j.procs.2017.11.242

documents of the enterprises, requirements of the partners, contract specifications have to underlie of assigning to document the fretboard of privacy. At the same time, document marking system does not guarantee the safety of information, but it allows clearly organize the work with documents and, in particular, to form a system of personal access to documents.

Existing approaches to the procedure for determining the degree of confidentiality of classified information to be included in future documents (CI) are based on the application of heuristic knowledge (in particular, the system of preferences) of chief safety officer(CSO) responsible for assigning the confidentiality stamp. However, the procedure for identifying contextual knowledge, the system of preferences of CSO is very complex and, therefore, requires the involvement of a consultant in the process of evaluating, synthesis, and selecting a solution from a variety of alternatives. The experience of the consultant ensures the purposefulness of the CSO thinking and the strictness in the structure of the estimates received from him. As a result, CSO has the opportunity to synthesize and identify the most valid variants of the best solutions in a sense from the set of feasible ones.

2. General statement of problem

Identification of the data, knowledge, and system of preferences of CSO for assigning confidentiality stamp of classified information to be included in future documents (CSCI) is carried out by collecting expert information, the volume of which (in the end) is very significant. At the same time, the expert information content regarding the confidentiality of information that needs to be received and processed, the greater the higher the dimension of the set of assessment criterions and the information content to be identified for its confidentiality. In addition, the development of universal forms covering the circulation of documents in economic, technical, social, managerial, and other types of activities is impossible. Consequently, in this case, the permanent participation of a consultant directing the sequence of CSO's reasoning in the process of knowledge capturing is required, and it leads to a violation of the principle of confidentiality and the necessary documentary information. Moreover, the task solution of assigning the CSCI in the non-automatic mode does not allow organizing the collection and operative processing of the initial information, even from several experts. Therefore, the development of an automated information system decision-making support on the CSCI in documents from different fields of activity under existing conditions of a high level of ICT makes it possible to significantly accelerate the implementation of this procedure and, accordingly, improve its quality. In the process of decision-making on GCS, many expert estimates of the CSCI, as a rule, are expressed by all possible terms, which according to Zadeh (1973) can be described by fuzzy sets with using appropriate membership functions. To order the estimated alternatives, and hence fuzzy sets, reflecting their degrees of preference it is applied various fuzzy methods that by Zadeh (1974) differ from each other in the ways of compression and constructing the chain of fuzzy relations. Thus, for analytical support of relevant data processing relative to CSCI assigning it is proposed using the fuzzy inference.

3. Classification of assessments the influence of confidentiality factors on the privacy level of the classified document

Estimation of the CSCI degree is a multi-criteria procedure, implying the using of the composition rule of aggregating the assessment for each confidentiality factors (CF) of information: x_1 – *economic significance*; x_2 – *scientific significance*; x_3 – *price significance*; x_4 – *official level*; x_5 – *interest of foreign countries in information*; x_6 – *treatment of publication of same information in foreign countries*. Therefore, to evaluate this influence, five criterion concepts are chosen as: u_1 – INSIGNIFICANT; u_2 – APPRECIABLE; u_3 – SIGNIFICANT; u_4 – CONSIDERABLE; u_5 – VERY LARGE, which characterize the degree of influence on the level of sensitivity of the classified document. In other words, (u_1,u_2, u_3, u_4, u_5) is a set of criterions by which the significance of CF is classified. Then, to classify the assessment of the influence on the level of sensitivity of the classified document it is possible to make with using a sufficient set of fuzzy rules of the form: "If ..., then ...", and based on them, to establish the appropriate grading scale for future assessments. Therefore, the following consistent implicative judgements are chosen as the basis:

r_1 – "If the given document contains the CFx_1, x_2 and x_3, then their cumulative influence on the level of sensitivity of the classified documentis significant";

r_2 – "If, in addition to condition of r_1, the factor x_6 also takes place, then total aggregate influence on the level of