Chapter 41
Artificial Haemostasis System for Modern Information Retrieval With 3D Result–Mining

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ABSTRACT

The Human, existed since millions of years and consequently, be inspired from the physiological phenomenon of the human body organs is something really interesting. This is the origin of the authors' new bio-inspired technique, called artificial haemostasis system (AHS), based on the haemostasis phenomenon that prevents and stops bleeding in case of external haemorrhage. Aiming at contributing to web searching they have applied their AHS to solve the problem of information retrieval following four steps: multilingual pre-processing (pre-haemostasis) to transform each text into a vector and ensure the service of multilingual search; The texts vectors pass through three filters: the primary information retrieval (primary haemostasis), the secondary information retrieval (secondary haemostasis) and the final information retrieval (fibrinolysis) using a selection step (plasminogen activation) to evaluate the relevance of each document to the query; the authors' experiments were performed on MEDLARS collection in order to show the benefit gained from using such approach compared to the classic one validated by a set of evaluation measures (recall, precision, FNR, FPR, f-measure, ROC, accuracy, Error, sensibility, and TCR); Finally, a result-mining step to see the results in graphical form with more realism, where the 3D cub method is largely preferred by the user than the cobweb method; The results of the system, are positive compared to the results provided by a conventional method and a set of bio-inspired techniques existed In literature (Simulating annealing (SA), Social worker bees (SWB), and Artificial social cockroaches (ASC)).

1. INTRODUCTION AND PROBLEMATIC

Currently, researchers and engineers are often faced with technological problems NP-hard of increasing complexity, which require big resources (hardware and software) to solve them. These problems arise in various fields such as image processing, robotics, transportation, data mining, and operational research....etc. The first part of our work is designed for the development of a new system inspired by the functioning of a physiological phenomenon called haemostasis, which provides protection against blood loss for stopping the haemorrhagic. It is realised following successive steps (primary haemostasis, secondary haemostasis, and fibrinolysis).

The last changes in the world had seen the advent of new information technologies and communication such as the internet and social networks. The information has become a pillar of our civilization, no one can escape it and we find it everywhere. The power of information is so important that the electronic support of data becomes now a tool of mass dissemination, most of the data are presented in unstructured format (textual documents) that has become dominant in the web. Nevertheless, find the desired document is not an obvious thing, especially with the number of data resources available in the digital society.

For example, we are confronted with a lot of documents and asking a human to obtain documents which hold the query "artificial intelligence", human will read all the documents one by one and classify them into two categories (relevant documents and irrelevant) this is generally a real boring process. The tools for information retrieval have been produced to allow better access to data, it is at this stage where is positioned the context of the second portion of our study.

An information retrieval system (IRS) is a set of model and process, allowing the responses to the queries of users by selecting a subset of pertinent documents from a collection of documents, to meet the needs of a user. The actual search engines based on classical methods are not satisfactory concerning the quality of results returned suffering from several limitations and drawbacks. We will detail these limits with a set of solutions and new services in the next points by using the AHS technique as an information retrieval system:

- **Choice of Parameters:** The majority of information retrieval systems are based on the parameters (distance measures and texts representation methods). A poor choice of those parameters may cause a degradation in the research performance as the works presented in (Bouarara[1], 2014);
- **The Quality of Results:** The major limit, where the classical methods based on a simple functioning do not perform well against this challenge. They return a lot of:
  - **Relevant Misclassification:** The document really relevant and the system classified them as irrelevant;
  - **Irrelevant Misclassification:** The documents really irrelevant and the system classified them as relevant;
- **Multilingual Research:** The conventional information retrieval system selects only the documents with language similar to the query. For E.g. we put the query "mining" in Google. Mining means "fouiller" in French. In this case Google will only look only for English documents that contain the word mining and ignores the documents with other languages despite that mining and "fouiller" have the same meaning. To address this problem, we'll use the Google translation API and added a service that asks the user if he wants to make a multilingual search or not and what are the research languages he wants to search. If the user chose only two languages (French and

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