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Time efficient literature research using an online seismic attribute database

C.G. Eichkitz[1] & J. Amtmann[1]

[1)]Joanneum Research Forschungsgesellschaft mbH, Institut für Wasser, Energie und Nachhaltigkeit, Roseggerstraße 17, 8700 Leoben, Österreich
christoph.eichkitz@joanneum.at; johannes.amtmann@joanneum.at

Workflow for building a Seismic Attribute Database

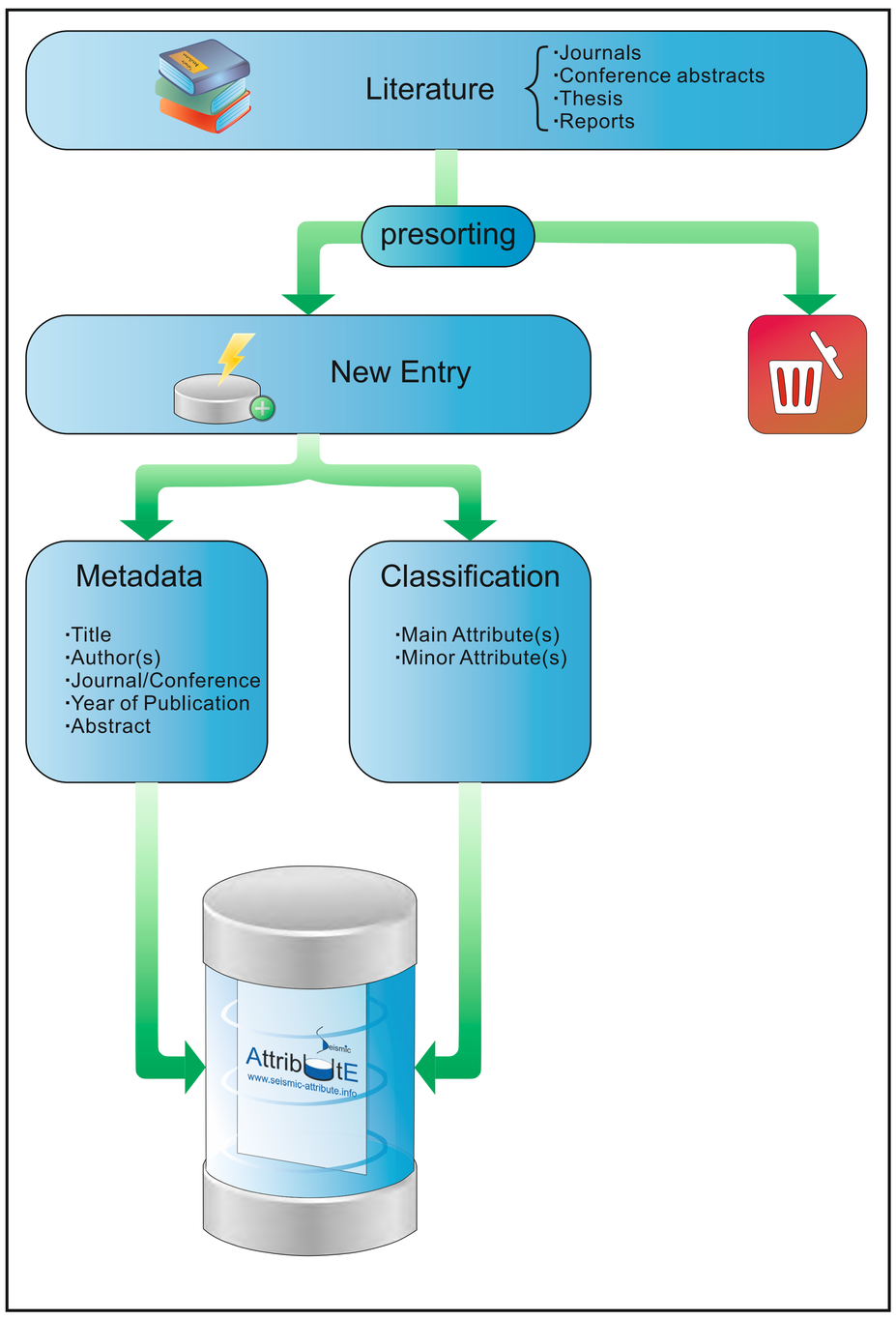

Figure 1: Workflow for assembling the seismic attribute database. In the first step various journals and conferences are scanned and a pre-sorting of seismic attribute relevant articles is performed. All articles that meet the requirement to deal with seismic attributes are added to the database. For all new entries the metadata (title, author(s), journal, conference, year of publication, abstract) is typed into the database. Additionally, we store the link to the article source. Then each and every article is read and classified according to our keyword list. The keyword list consists at the moment of 12 main attribute keywords (e.g. coherence, curvature, features, complex trace attributes, …) and 152 minor attribute keywords (e.g. cross-correlation based coherence, semblance-based coherence, most positive curvature, instantaneous frequency, …). Among the 152 minor attribute keywords also features or fields of application (e.g. channels, faults, fracture, facies, …) are used for classifying the articles.

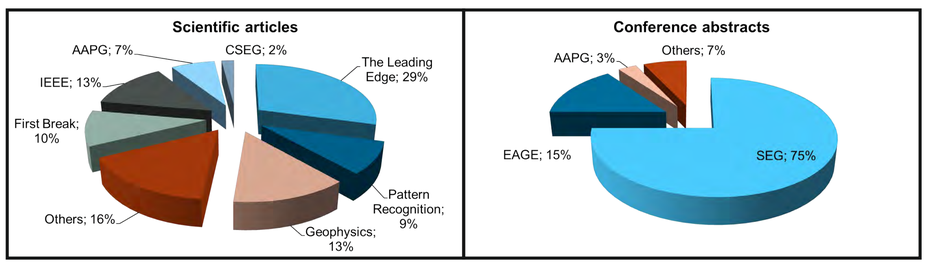

Figure 2: Percentage distribution of articles in journals (a) and conference abstracts (b). In the current version of the seismic attribute database journal articles are evenly distributed between the various journals. For conference abstracts a clear tendency towards SEG conferences can be observed.

One important issue for such a database is building suitable queries. In our initial MS Access database (Amtmann et al., 2012a, 2012b, Eichkitz et al., 2012) we used five different types of queries. Each of these query types was either looking for single attributes, the combination of one single attribute and one single feature, or for strings in the metadata. But at that time it was not possible to combine several attributes, features, and strings at once. This version was also not user-friendly as using another query type also meant to switch query pages. The output of this initial database were tables that contained the first author, the title, the year of publication, and the hyperlink of all articles containing the selected keyword or string. With this output table it was then possible to go either directly to the journals homepage to download the selected paper, or it was possible to export a reference list of selected articles in First Break standards.

The initial seismic attribute database required for every user to have MS Access installed on his system, which most people don't have. Also the procedure of working with different query pages is not very user-friendly. Therefore, we decided to convert our database to a more user-friendly version with just a single query page and a web-based system, which makes it online accessible whenever and wherever.

The query in the web-based version is now on one single page that includes string search in the metadata in combination with all main and minor attribute keywords (Figure 3). The main and minor attribute keywords are displayed as a tree chart. The result of this query is a reference list with all articles that contain the selected keywords and string. This reference list can then be exported in BibTex file format (*.bib) or the hyperlinks for each hit can be used to get to the journal's homepage.

Seismic attribute interpretation is an essential part in interpretation of seismic data. Commercial software packages offer a variety of seismic attributes and the amount of seismic attributes described in scientific articles is overwhelming. For seismic interpreters it is often difficult to keep track of the variety of seismic attributes, their capabilities, and their application. In the course of a research project we accumulated and read many scientific articles dealing with seismic attributes and their application. These articles need to be sorted and stored in an efficient way. Therefore, we have decided to develop a seismic attribute database that contains metadata of the various articles as well as a keyword system that allows quick querying for given situations.

The workflow for assembling the database consists of three basic steps (Figure 1). The first step is a principal literature research. This literature research includes scanning of various journals and conferences for attribute-relevant articles. In this process a pre-sorting of articles is performed. This means that all articles are rejected (symbolized by a trash icon in figure 1) that are not dealing with seismic attributes at all or where the application of seismic attributes is only a minor part.

The second step in assembling is integration of relevant metadata of each scientific article. Metadata are the title, full name of author(s), year of publication, journal or conference where the article was published, volume, issue, pages, and the full abstract. Additionally, we store the hyperlink to the article source.

The third step in assembling the database is the most time consuming step in the workflow. Each article needs to be read in detail and then classified according to our keyword system. The keyword system consists of 12 main attribute classes (Figure 2) and 152 minor attribute keywords. As an initial step we decided to keep close to the works by Taner (1994, 2001), and Chopra and Marfurt (2005, 2008) and performed adaptions where necessary. The twelve main attribute classes include for instance coherence, curvature, features, or complex trace analysis. The minor attribute keywords are refinements of the twelve main attribute classes. For each main attribute class several minor attribute keywords are defined. As an example, for the main attribute class coherence we have nine minor attribute keywords, which include cross-correlation based coherence (Bahorich & Farmer, 1995), semblance-based coherence (Marfurt et al., 1998), eigenstructure-based coherence (Gersztenkorn & Marfurt, 1999), or least squares-based coherence (Bednar, 1995). The initial seismic attribute database was MS Access based. Now, we have transferred the system to be web-based, which makes the database more comfortable as MS Access need no longer be installed on the users system. As the MS Access database also the current web-based version of the seismic attribute database includes 750 articles from 65 different journals and 55 different conferences.

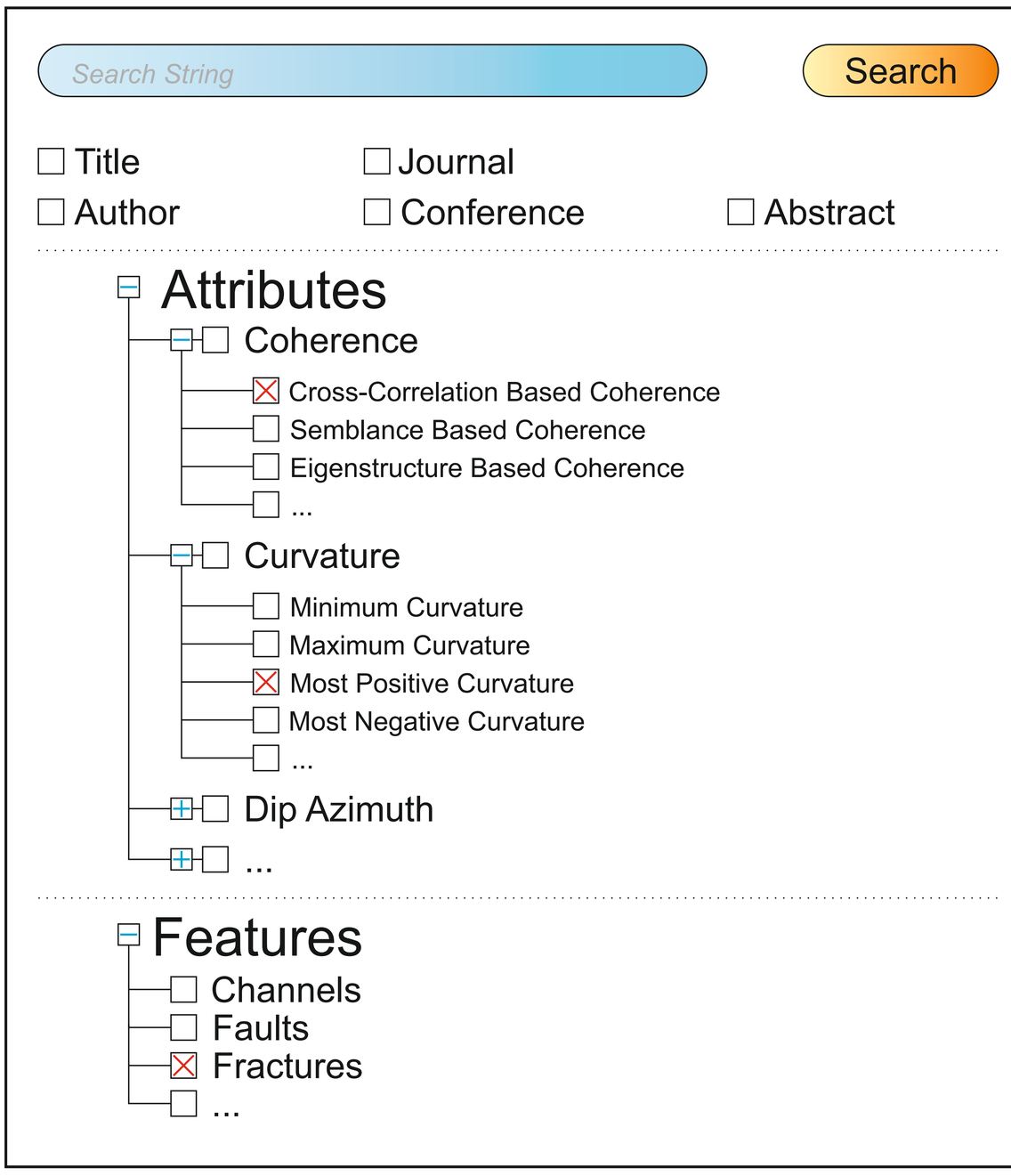

Figure 2: Search page of the web-based seismic attribute database. The defined keywords (attributes and features) are displayed as a tree chart. Users can search for combinations of attributes and features. In addition it is possible to search for strings within the metadata (title, authors, journal, conference, abstract) and thus limit the search to specific journals or authors.

Literature

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