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BACHELOR'S THESIS

Brno, 2020   Radek Ondryáš

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JAZYKOVÉ CHARAKTERISTIKY ÚVODNÍCH SEKCÍ V ODBORNÝCH ČLÁNCÍCH V ELEKTROTECHNICE

LINGUISTIC FEATURES IN RESEARCH ARTICLE INTRODUCTIONS IN ELECTRICAL ENGINEERING

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

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Cílem práce je prozkoumat způsoby, jakými jsou uspořádány úvodní sekce odborných technických článků, a jazykové prostředky, které jsou pro jejich jednotlivé části charakteristické.

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Biber, D., & Connor, U., & Upton, T.A. (eds.) (2007): Discourse on the move: Using corpus analysis to describe discourse structure. Amsterdam: John Benjamins.

Bhatia, V. K. (2004): Worlds of written discourse. A genre-based view. London: Continuum.

Hoey, Michael (2001): Textual Interaction: An Introduction to Written Discourse Analysis. London and New York: Routledge.

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V Brně dne ....

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Abstract

In this thesis we use analytical framework proposed by Swales to analyse scientific articles from the field of electrical engineering to examine their structure and linguistic features. Each of the texts is segmented into discourse units called moves, each move represents a portion of text which serves a communicative function. Moves are then sorted according to Swales' model, analysed and lexical signals are highlighted. If possible, moves are divided into smaller units called steps. Our analysis coincides with Swales' model in nearly all points, the only exceptions being few steps which do not occur in the texts from electrical engineering since they are not of importance in this field. An alternative point of view on research articles is provided by patterns described by Hoey, which unlike Swales' framework were designed for texts in general rather than specifically for the genre of research articles. Despite their differences, the analysis presented in this paper shows that there is big overlap between Swales' framework and Hoey's patterns.

Key words

discourse analysis, move analysis, language signals, engineering articles, patterns

Abstrakt

V této práci použijeme analytický rámec navrhnutý Swalesem k analýze vědeckých článků z oboru elektrotechniky, abychom mohli zkoumat jejich strukturu a lingvistické prvky. Každý text je rozdělen na takzvané tahy („moves"), neboli jednotky textu, které reprezentují část textu se stejnou komunikativní funkcí. Tahy jsou pak rozřazeny podle Swalesova modelu, analyzovány a jsou v nich vyznačeny lexikální prvky. Pokud možno, tahy jsou dále rozděleny na menší jednotky zvané kroky („steps"). Naše analýza se shoduje se Swalesovým modelem skoro ve všech bodech. Jedinými výjimkami byly některé kroky, které se v elektrotechnických textech nevyskytovaly, jelikož pro tuto vědní oblast nejsou důležité. Alternativní pohled na vědecké články je poskytnut vzorce textu („patterns") popsanými Hoeym. Tyto vzorce na rozdíl od Swalesova modelu byly navrhnuty pro všeobecné texty spíše než specificky pro žánr výzkumných článků. I přes jejich rozdíly ukazuje analýza, prezentována v této práci, že se tyto metody navzájem výrazně překrývají.

Klíčová slova

Diskurzivní analýza, tahová analýza (move analysis), jazykové signály, elektrotechnické články, vzorce

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Introduction

The research on the linguistic characteristics has mostly been carried out from two major perspectives, the first one being discourse studies of language use which are done in a quantitative manner, meaning that they focus on the corpus as a whole and disregard the existence of individual texts and their aim is to analyse the overall patterns of distribution and use (Biber et al, 2007: 10). The second major perspective is qualitative research, which uses fewer texts but analyses their individual structures instead of analysing the corpus as a whole. A good example of such approach, quoted in Biber (2007:10), is Mann and Thompson's volume (1992) in which they analyse a single fundraising letter, showing how the discourse structure and organization of a single text can be analysed from different perspectives.

According to Biber, there have been surprisingly few studies which have attempted to combine the two aforementioned perspectives, resulting in a very limited knowledge about general patterns of discourse organization across larger samples of texts from certain genres (Biber et al, 2007: 11).

In this paper, we will use corpus-based analysis on a corpus of articles taken from three scientific journals dealing with electrical engineering to examine the structures and other linguistic features used in the introduction sections.

The general structure of this paper is as follows: a phenomenon is theoretically described, following this theoretical description is author's own analysis of the articles from corpus with examples.

Theoretical background

There are two possible ways to carry out a corpus-based discourse structure description, these are bottom-up research approach and top-down research approach. The bottom-up approach was developed only recently, and it uses computer programs to separate texts in the corpus into individual discourse units based on vocabulary repetition (Biber et al, 2007:16-17).

On the other hand, the top-down approach starts by developing an analytical framework which is then used to segment the texts from the corpus into discourse units, this is accomplished by identifying a part of discourse which servers a particular communication function (Biber et al, 2007:13).

There have been several discourse structure theories developed by text linguists in the 1980s and 1990s. The theory used in the current paper is 'Move analysis' developed by Swales in 1981 and 1990. In this theory, text is described as a sequence of moves, with each move representing "a text segment made up of a bundle of linguistic features (lexical meaning, propositional meanings, etc.) which give the segment a uniform orientation and signal the content of discourse in it" (Nwogu, 1997:122). Moves might consist of elements called 'steps' which in sequence realize the move to which they belong (Biber et al, 2007:14-24).

In 1990 Swales proposed a Create a Research Space (CARS) model, which shows the preferred sequence of moves and steps which are predictable in research article introductions. In 2004 Swales created a revised model for research article Introductions to better reflect the variability of the realization of the three move types in various sub-genres of research article introductions (Biber et al, 2007:25-28). This model is shown below in Table 1 below.

Move 1:	Establishing a territory (citations required) via Topic generalizations of increasing specificity	
Move 2:	Establishing a niche (citations possible) via:	
	Step 1A:	Indicating a gap
	Step 1B:	Adding to what is known
	Step 2:	Presenting positive justification
Move 3:	Presenting the present work via:	
	Step 1:	Announcing present research descriptively and/or purposively

Step 2:   Presenting research questions or hypotheses
Step 3:   Definitional clarifications
Step 4:   Summarizing methods
Step 5:   Announcing principal outcomes
Step 6:   Stating the value of the present research
Step 7:   Outlining the structure of the paper

Table 1: *Swales' revised model for research article Introductions (Swales, 2004:230-232 in Biber et al, 2007:28)*

An alternative point of view, one that was not specifically designed to accommodate academic writing, is provided by Hoey, who describes "culturally popular patterns of text organization" as a way for writers to communicate with the reader, Hoey denotes them culturally popular as they do not have a universal status, rather they appear within particular cultures (Hoey, 2001, 119). Hoey describes several patterns, out of which two are applicable to research article introduction sections and will be examined further in this paper, these patterns are Problem-Solution pattern and Gap in Knowledge-Filling pattern.

While Swales' model is designed to be used within the genre of research articles, Hoey's patterns are present in a wide variety of texts. For instance, Hoey states that the Gap in Knowledge-Filling pattern is mostly present in academic papers and detective stories (Hoey, 2001, 162) which are vastly different types of writing. Taking into account that Hoey's patterns are used in a wide variety of texts, it provides an interesting comparison with Swales' model to see if these two approaches are comparable or possibly if there is an overlap between them.

Corpus

The corpus used for this paper consists of scientific articles from three different scientific journals from the field of electrical engineering, these journals are: International Journal of Electrical Power & Energy Systems, Electrical Engineering and Computers & Electrical Engineering. Articles were selected across last four years of publications and the criteria based on which the papers were chosen were that the articles are from the field of electrical engineering and that the introduction section is no longer than 700 words in order to allow for more efficient analysis and processing.

The use of tenses

Since this paper only deals with the lexical aspect of research articles, their grammatical side will not be mentioned unless it is of importance for the move-step analysis. With only the Introduction section of the papers being examined, present tense is the default tense used with past tense appearing only scarcely in the texts. In the sections where past tense was used, it was either used to describe past events which lead up to current research or the current state of the field of expertise. Examples of this tense usage are shown below.

In the following example, we can see that the past tense is used to report statistical data which relates to the topic of the paper.

> In the United States, the installed generation capacity of photovoltaic (PV) generation systems exceeded 10GW in 2013 [1,2]. *(A voltage deviation-memorizing reactive power controller for renewable energy sources, Article 16)*

Extract below shows the use of past tense to discuss the recent development of electromagnetic compatibility problems.

> Within the recent years, EMC problems became the main industrial concern. *(Conducted electromagnetic interference: theoretical and experimental investigation, Article 19)*

The following excerpt is the last example of past tense usage in this section and it shows the tense being used to describe historical development which affected the field of research of which the paper is part of.

> With the advent of computing came a growing dependency on smartphones that went beyond the communication purpose they were originally intended for. *(Emotion recognition using mobile phones, Article 22)*

Swales' revised model for research article Introductions

When it comes to the introduction section of research articles, Swales (2004) identifies 3 main moves which constitute the section. Each of those moves will be briefly described in this section, including their purpose in the text, the signals which typically occur in these moves and their common vocabulary. In Swales' revised model for research article Introduction (2004) moves 2 and 3 consist of several steps, which will also be addressed when describing the moves to which they belong.

Move 1: Establishing a territory

The goal of this move type is to provide the reader with the background knowledge of the area of the research article. This is typically achieved by providing knowledge that is already known in the professional community, be it historical background, information from previous articles in the field of expertise or possibly even statistical data to indicate trends in development.

Move 1 is characterized by numerous citations of previous works which relate to the current research and also with references to common knowledge within the field which is necessary for understanding the background of this paper. The most common signals of this move alongside citations are prepositional phrases and temporal adverbials (Haupt, 2014,34).

The following example of Move 1 shows the usage of the signals associated with this move.

> The idea of power systems generation has derived from isolated generators feeding their own load to huge interconnected systems spanning entire countries [1,2,18,19]. The power transmission can be realized through overhead lines or underground cables lines [3–5]. Throughout Europe, the expansion of EHV transmission networks is being largely checked by strong public opposition to the construction of new overhead lines (OHL), such difficulties being often compounded by infrastructural congestion [3]. The cable lines together with mixed ones can lessen sensibly

many route problems by virtue of their adaptability in the territory and have become a recurring topic in the technical literature [6,7].

(An efficiency experimented wind turbine emulator linked to transmission line model 380 kV, Article 6)

We can see that there is a frequent use of citations which help establish the necessary knowledge needed to fully understand the research carried out in the article. Additionally, we can see that a prepositional phrase "Throughout Europe" is used in this paper.

Move 2: Preparing for the present study

This step focuses on possible weaknesses in the existing literature and/or unaddressed research questions (Biber, 2007, 77). In Swales' revised model for research article Introduction (2004) this move is formed by three steps, two of which exclude each other. However, in the analysed articles only two out of three steps were observed, the step 1B: adding to what is known was not present in any of the analysed papers and will therefore not be featured in following description of steps of move 2.

Step 1A: Indicating a gap

This step introduces a gap in existing research, or a problem related to the research which will be addressed in the paper. This gap can be used as a justification and a motivation for the creation of the paper.

There are several signals for this step found in the corpus, the most common one being the world "however". In other articles this step is signalled by various phrases expressing the lack of knowledge in certain fields. Some examples of these phrases are for example "the published results are either vague or controversial" , "the existing literature (…) is insufficient", "some classical algorithms have been neglected as their applicability to condition monitoring was not acknowledged" or "Nevertheless, not many of them are related to block transformer".

The following example shows a possible way of indicating a gap.

Although there are commercial 3D software packages, this still demands extensive time and effort for modeling and solving stray losses in CTC cables at a scale that can respond to the market.

(Calculation of stray losses in continuously transposed conductor

cable transformer windings by multi-slice methodology, Article 2)

In this excerpt, we can see that a problem with availability of technology is indicated by the phrase "this still demands extensive time and effort".

The following text points out a problem which the article aims to solve.

> The fast advancement and improvement of the Internet has <u>brought security problems to systems which is progressively becoming a extraordinary issue</u> and has been a concentration in the ebb and flow exploration. *(A novel network security algorithm based on improved support vector machine from smart city perspective, Article 15)*

A problem is indicated which arose with the advancement of the Internet, specifically the phrase "security problems to systems which is progressively becoming a extraordinary issue" indicates a problem which the paper is trying to solve.

Step 2: Presenting positive justification

Last step belonging to move 2: Preparing for current study based on Swales' model, possible benefits which could arise from the paper are pointed out in this step.

A few phrases can be identified in analysed literature which signal this step, these include: "the study is of significance", "can be in certain cases superior", "Such technology could support application", "public users could also collect" or "prevention from those effects becomes compulsory".

The following example showcases the usage of this step with the phrase "is of significance."

> In addition, <u>the study</u> of positive polarity corona performance <u>is of significance</u> in the case of the ice-covered conductor based on the author's previous research [15]. *(Influence of freezing water conductivity on the positive corona performance of soft rime ice-covered conductor, Article 4)*

The highlighted phrase implies that the author's previous research has discovered a gap that will be addressed in the current paper.

The extract below shows a multitude of possible ways in which the research could be beneficial, this signalling is achieved by the underlined phrases.

> By capturing a user's current emotions, <u>a device could</u> intelligently personalize the user's experience. <u>Such technology could</u> support application in many domains such as social media, healthcare, etc. Social networks, such as Facebook and Twitter, <u>would be able to</u> respond differently to users based on their current emotional state. <u>This could allow</u> social networks, for example, to block a user from accessing their services, or send them help if they were in a severely distressed state. <u>Another application in social media can be</u> immediate feedback. A post on twitter or Facebook <u>can be</u> automatically flagged if the majority of viewers responded negatively to it. <u>Another area of application</u> is healthcare where users can keep track of their own psychological health. <u>The application enables them</u> to determine, for instance, sudden shifts in mood, or changes in mental health allowing a person to seek help if needed [2]. Finally, through a web service, <u>public users could also</u> collect demographics about the emotional state of a populace. Not only that, but medical organizations <u>can also infer</u> correlations between geographical conditions, context, and psychological wellbeing of individuals in that region. *(Emotion recognition using mobile phones, Article 22)*

In this text the author lists a number of useful benefits which would be possible with the proposed research as indicated by phrases/sentences such as "device could intelligently personalize the user's experience", "This could allow social networks, for example, to block a user from accessing their services, or send them help if they were in a severely distressed state." or "Another area of application is healthcare where users can keep track of their own psychological health." All of these parts directly indicate what would be possible if emotion recognition became widespread as indicated in the paper.

Move 3: Presenting present research

Last step of Swales' model for article Introduction deals with the present study in 7 steps. However, similarly to move 2: Preparing for current study, not all of the steps proposed by Swales were observed in analysed articles, specifically there was no occurrence of steps 2 (Presenting research questions or hypotheses) and 3 (Definitional clarifications) (Swales, 2004, 230, 232 in Biber et al., 2007, 28) in the analysed articles.

Step 1: Announcing present research

In this step, a description of the article is provided and/or the aim of the article is mentioned.

The most common signal of this step is phrase "In this paper" or alternative versions of this phrase such as "in this research" or "in this case study". Other common signals are "is presented here" or "is proposed here" when talking about the result of the paper.

The following text showcases a typical example of the usage of Step 1: announcing present research

> In this paper, problems such as optimum GOP size required, complexity of video decoding, and preservation of video quality are investigated. Main focus is to find the optimum number of frames to be used in each GOP for enhancing the decoding efficiency and minimizing distortion. *(Performance optimization of real-time video decoding, Article 14)*

We can see that the most common signal of the currently discussed step - "in this paper" is used together with list of issues that "are investigated". The main focus of the research is then outlined.

The extract below shows the usage of signal phrases which include the word "propose".

> As current solvers based on heterogeneous systems cannot consider efficiency and stability when solving a large-scale tridiagonal matrix, this paper proposes a strong, comprehensively performing tridiagonal 2 solver combined central processing unit with graphics processing unit (T-SCG) solver that integrates a SPIKE framework, a simplified SPIKE algorithm, and a

diagonal-pivot algorithm to ensure numerical stability. In addition, three optimization mechanisms <u>are proposed</u> for the solver's GPU component to improve its overall performance. *(Research on tridiagonal matrix solver design based on a combination of processors, Article 23)*

In this text we can see different signals used compared to the previous example, specifically "this paper proposes" and "three optimization mechanisms are proposed". These phrases are used to specify the outcome of the paper.

Step 2: Presenting research questions and step 3: Definitional clarifications

Step 2 provides an overview of the research question that the author attempts to answer in the paper. Step 3 provides brief clarifications of definitions used in writing the paper.

These steps were not present in any electrical engineering articles in the corpus as their presence is not as important as in other scientific fields.

Step 4: Summarizing methods

This step from Swales' research model was present only a few times in analysed articles due to the fact that this step is not as important in electrical engineering texts as it would be for example in biochemistry.

An overview of some of the methods which were used to conduct research proposed in the paper is highlighted in this step.

In certain occurrences of this step, the word "methods" was used to list the procedures used, but in other cases context was more important to determine this particular step.

In the following extract the signals "method" and "is used" are used as primary signals for this step.

<u>In this method</u>, only the magnitudes of current signals are measured at the relay location, which means that data synchronization is not required. On the other hand, local measurement is used <u>in the presented method</u> and therefore, a reliable communication channel is not required to exchange the data from SVC and receiving end to the relay location. The

distributed parameters model of the transmission lines <u>is used</u> to obtain the accurate fault location. *(Accurate fault location algorithm for shunt-compensated double circuit transmission lines using single end data, Article 1)*

We can see a description of the procedures used in the research, signal phrases "In this method, only the magnitudes of current signals are measured", "local measurement is used in the presented method" and "model of the transmission lines is used to obtain" and the fact that this part of the text is about the methods used signals that this text is part of the current step.

The example below lists algorithms which were presented in the paper.

<u>The algorithms are presented for:</u> (1) redistributing loads (user demand) in shared areas of adjacent cells; (2) the dynamical reconfiguration of the network topology based on overloaded cells; and (3) swapping the positions of UAVs with their 1-hop neighbors. *(Dynamic self-reconfiguration of unmanned aerial vehicles to serve overloaded hotspot cells. Article 12)*

While this excerpt doesn't include the previously mentioned signal "methods", we can see that it talks about procedures used in the study.

Step 5: Announcing principal outcomes

As is the case with the previous step 4, this step also is not as frequent as other steps of move 3 due to the fact that announcing outcomes is more important in researches that conduct laboratory tests or experiments than in electrical engineering. The purpose of this step is to provide a brief overview of the outcomes of experiments or tests before their proper explanation in the main body of the text. Signals for this step include phrases such as "the results of the modelling show" or "achieved results indicate".

The following example shows the results of calculations performed in the paper.

<u>The results</u> of the modeling <u>show</u> that for all types of unbalanced faults with high fault resistance and in the presence of SVC, the accuracy of the presented method is high and its error rate is below 0.14%. *(Accurate fault location algorithm for shunt-*

compensated double circuit transmission lines using single end data, Article 1)

This extract starts with a signal phrase "the results show" and ends with the summary of method accuracy and error rate results, briefly evaluating the results.

The section below points out to a possible benefit based on the outcome of the research.

> It is shown that substantial improvement of the distance protection operation may be reached with introduction of the zero-sequence current and appropriate settings of the protection algorithms. *(Distance protection of block transformer units, Article 17)*

We can see that an improvement is possible based on new protection proposed in the paper. Signal phrase in this section of text is "It is shown that… improvement… may be reached".

Step 6: Stating the value of the present research

This step is used to point out the specific contribution of the article to the professional field. The main signal of this step observed in analysed literature is the word "contribution" and phrases including the word such as "the important contribution of this article" or "(this paper), which contributes by proposing".

The example below shows several options how the importance of the present research can be stated.

> The important contribution of this article is presented in the relevant data regarding harmonic distortion that occurs while not obtaining high-quality electricity. To this end, once we understand the data, it is possible to improve the electricity quality by applying a regulation technique with the help of power electronics. *(Distance protection of block transformer units, Article 17)*

We can see the aforementioned phrase "the important contribution of this article" and also phrase "once we understand the data, it is possible to improve the electricity quality" which both together function as signals for this step.

Step 7: Outlining the structure of the paper

The last step of Swales' model for research article Introduction provides an overview of the structure of the rest of the paper, listing chapters and shortly describing the content of those chapters. The most commonly used phrase which signals this step is "The rest of this paper is organized as follows." Other variations of this phrase include for example "This paper is presented as follows" or "The paper is organized as follows".

The example below showcases the most common structure of this step together with the most common signal at the beginning.

> <u>The rest of the paper is organized as follows</u>: <u>Section 2</u> showcases recent research in this area. <u>Section 3</u> explains the proposed mechanism of the initial deployment of UAVs, the three algorithms discussed before and the various assumptions that are taken. <u>Section 4</u> explains the simulation environment, parameters, and results. Finally, <u>Section 5</u> concludes the paper. *(Dynamic self-reconfiguration of unmanned aerial vehicles to serve overloaded hotspot cells, Article 12)*

As we can see, the most common structure of this step consists of a signal phrase "The rest of this paper is organized as follows" at the beginning, followed by a list of sections, providing a brief summary of each of them.

The following extract indicates an alternative structure for this step.

> It is divided into three parts corresponding to three coupling modes, which are the galvanic coupling, capacitive coupling and inductive coupling. For each part of the chapter, a theoretical introduction is given and a test device illustrating the theoretical part is implemented. *(Conducted electromagnetic interference: theoretical and experimental investigation, Article 19)*

A different approach to outlining the structure is shown here. Rather than listing all sections and giving a brief overview of each one of them, the chapters are listed and then a general overview of what all the chapters consist of is mentioned.

The following example provides unique version of the structure of this step which is not present in any other of the articles in the corpus used for this analysis.

This paper includes five parts. <u>The first part explains the purpose of the research.</u> The second part introduces the structure of the GPU and typical tridiagonal solving algorithms, such as Thomas, cyclic reduction (CR), and SPIKE, laying the 2 groundwork for the improved solver. The third part shows how the proposed T-SCG solver combines the SPIKE framework with the simplified SPIKE algorithm. The fourth part covers the optimization of the T-SCG solver with three different methods. The last part outlines the experiments used to prove the performance of the T-SCG solver. *(Research on tridiagonal matrix solver design based on a combination of processors, Article 23)*

In this excerpt of the text we can see that the list of parts included in the article starts with "The first part explains the purpose of the research." The inclusion of first part of the article, which is Introduction section is unique as it references the part of the article which the reader is currently reading. Every other article starts the list of chapters/parts with the second section as it is not necessary to reference the current section.

Signals used in corpus articles

Table 2 below displays a list of signals used to facilitate each individual move and step. These signals were taken from all articles present in the corpus, if a signal was present in the corpus multiple times in an identical form, it is listed only once.

Move	Step	Signals
Move type 1		Temporal adverbials (In recent years; in the 18th century; in the past; in the past few years; in 2012; in 2013; within the recent years; over the past 40 years; in 2011) Prepositional phrases (Throughout Europe; by means of; on the principle of; in more ways; in certain cases; by utilizing; in such scenarios; by mounting; for age detection; for speeding up; by describing; in a real time)
Move type 2	Indicating a gap	however; nevertheless; is still to be developed; a disadvantage; still demands time; literature is insufficient; results are vague or controversial; multiple papers have been reported but only few dealt with; although; drawback; is not sufficient; algorithms have been neglected; remains a challenging task; security problems; methods neglect to consider; have not taken into account; do not solve the basic problem
	Presenting positive justification	study is of significance; may present a good service; could allow
Move type 3	Announcing present research	in this paper; have been proposed; were conducted; is studied; are discussed; in this research; is studied and analysed; the paper presents; is described; analysis is carried out; this paper proposes; is introduced; is employed; is presented; is provided in this paper; this study provides; work presented here; in this paper problems are investigated; we conduct researches; points have been addressed; in this case study; this paper presents
	Summarizing methods	in this method; method; the algorithms are presented for
	Announcing principal outcomes	the results show; achieved results indicate; it is shown
	Stating the value of the present research	paper contributes by proposing; which can be used to; this paper's objective is to
	Outlining the structure of the paper	the paper is presented as follows; in the second paragraph; in second part; the rest of the paper is organized as follows; in the second section of the paper; the remaining part of the paper is organized as follows; the remainder of the paper is organized as follows; this paper is organized as follows; this paper includes five parts

Table 2: *List of signals used in the articles from the corpus*

Alternative perspective

As described by Hoey (2001), the culturally popular patterns of text organization are templates or sequences of question that text writers use to communicate with reader.

The Problem-Solution pattern

Arguably the most common pattern (Hoey, 2001, 123), the Problem-Solution pattern highlights the fact that when the writer of a text presents a problem in the text, the reader expects a solution to the problem to follow. Hoey describes four parts of the text that participate in the problem-solution pattern: situation, problem, response and positive result or positive evaluation. Situation is a part of the text that does not yet indicate the presence of a pattern, instead it provides background information about the subject of the text. The problem highlights the issue in the text that alerts the reader to the presence of a pattern, specifically upon reading the problem, the reader expects a solution to be presented. Response is where the writer provides the solution to the previously described problem with the last part of the pattern being positive result or positive evaluation of the response (Hoey, 2001, 124). However, positive result or positive evaluation is not present in research article introduction sections as they provide an overview of the whole paper with the evaluation being presented at the end of the article rather than at the beginning.

The following text is an example of the Problem-Solution pattern and the parts it consists of.

> Its main advantage resides in the fact that it does not require an exact mathematical model of the system, it can handle an arbitrary complex nonlinearity and moreover, it is robust. <u>However</u>, a <u>disadvantage</u> of this control scheme is that the value of fuzzy output is commonly obtained by 49 fuzzy rules, as proposed in [13]. This requires a high-speed microprocessor to obtain good results and makes it an expensive solution. <u>To avoid this problem</u>, a fuzzy logic controller based on only four linguistic rules is proposed in this paper. The robustness of the proposed controller to motor parameter variations is verified. The schematic diagram of an indirect field-oriented control (IFOC) drive for DSIM using conventional PI and fuzzy logic controllers is shown in Fig. 1.

We can see that the first sentence is the Situation, as it simply provides the background which does not yet make the reader think a problem is there to be solved. However, the next sentence introduces a problem signalled by the words "however" and "disadvantage". The solution to this problem is provided shortly afterwards, it is clearly signalled by the phrase "to avoid this problem" which even mentions that there was a problem to be solved or avoided. As previously stated, there is no evaluation or result of the solution provided in the introduction section, but it is mentioned that "The robustness of the proposed controller to motor parameter variations is verified" indicating that an evaluation will be provided in the paper.

Gap in Knowledge-Filling pattern

A pattern that is often used in academic papers, the Gap in Knowledge-Filling pattern is similar to the Problem-Solution pattern with the difference being whether the author is trying to solve a problem or fill a gap in knowledge, with this in mind the structures of these patterns are nearly identical. Hoey outlines that every attempt at filling the gap in knowledge is to be positively or negatively evaluated (Hoey, 2001, 163), this however is not possible in the introduction section of a research article as it simply establishes what the goal of the research is.

In this example we can see how the Gap in Knowledge-Pattern is implemented in a research article from the field of electrical engineering.

> Volt/var control has been applied in support of voltage control [18], [19]; <u>however</u>, to date, volt/var methods have <u>not taken into account</u> the voltage deviations that result from the power output fluctuations of RESs.
>
> In this paper, <u>we propose</u> a reactive power control method that reduces the voltage deviations caused by fluctuations in RES output. A conventional volt/var control method is used in tandem with the proposed method to reduce voltage deviations caused by other factors. To demonstrate the efficacy of the proposed method, from the perspective of preventing deviations from an

optimally scheduled operating point, the initial values of the output reactive power of the RESs in a power system were determined using particle swarm optimization (PSO). *(A voltage deviation-memorizing reactive power controller for renewable energy sources, Article 16)*

The author introduces a gap in knowledge using the phrase "to date, volt/var methods have not taken into account the voltage deviations" clearly stating that there is a gap in previous research, he then offers a solution to fill this gap stating "we propose a reactive power control method that reduces the voltage deviations caused by fluctuations in RES output" clearly addressing the gap outlined earlier. As with the Problem-Solution pattern, no evaluation is offered in the introduction section of the article.

Overlap of Problem-Solution and Gap in Knowledge-Filling patterns

When it comes to research papers, a gap in knowledge is likely to be considered a problem, therefore due to minimal structural differences between the Problem-Solution and Gap in Knowledge-Filling pattern, for the purpose of this paper, they will both be referred to as Problem-Solution pattern as the difference between them is negligible.

Occurrence of Problem-Solution patterns and their overlap with Swales' model

Patterns present	13
No patterns	5
Signals for patterns present, patterns not present	5

Table 3: *Pattern statistic from corpus*

From this table we can see that patterns described by Hoey are present in 13 out of 23 articles, indicating that the presence of patterns in research articles from electrical engineering is not unusual, rather they are present in more than half of the articles.

During the analysis it became evident that some overlap between Swales' model and Hoey's Problem-Solution pattern exists. We can see this overlap demonstrated in Table 4 below.

Pattern stage	Text	Move type	Step
problem	Although ABC shows a powerful ability in search and exploration, the experimental results demonstrate that it still has a drawback of slow convergence speed [11].	2	Indicating a gap
solution	For enhancing the performance of the original ABC algorithm and applying it to solve real world problems, this paper proposes two alternative updating equations which are commonly used in the ABC variants to accelerate ABC's convergence rate on the condition of guaranteeing its global search ability.	3	Announcing present research
problem	The H.264/AVC FHD video decoding process still remains a challenging task for current multicore processor architectures, especially in situations where the processor needs to provide real time performance with low cost implementations [1,2].	2	Indicating a gap
solution	In this paper, an optimization procedure is presented for FHD video decoding using group of pictures (GOP) level parallelism on multicore architecture. The strategy of implementing the real-time FHD decoding is to support video playback devices such as VLC player, media player and real-time FHD video conferencing.	3	Announcing present research
problem	Although ABC shows a powerful ability in search and exploration, the experimental results demonstrate that it still has a drawback of slow convergence speed [11].	2	Indicating a gap
solution	For enhancing the performance of the original ABC algorithm and applying it to solve real world problems, this paper proposes two alternative updating equations which are commonly used in the ABC variants to accelerate ABC's convergence rate on the condition of guaranteeing its global search ability.	3	Announcing present research

Table 4: *Overlap between Swales' model and Hoey's patterns*

In these 3 examples from the corpus, we can clearly see the overlap which occurs mainly between the problem from Problem-Solution pattern and move type 2, more specifically its move Indicating a gap (1A) as they focus on the same thing, which is highlighting an issue which the author of the paper can solve in his paper. Additionally, we can see the overlap of the solution part of Problem-Solution pattern with move type 3 and its first step Announcing present research. As was the case with the previous overlap, these parts of the text fulfil an identical role of providing the solution to the problem that was highlighted prior. In terms of the signals, we can observe that the linguistic signals highlighted in these articles are relevant to both Swales' model and Hoey's patterns.

Problematic features of analysis

During the analysis of the articles from the corpus, a few problematic features were encountered, which introduced elements which deviated from the expected results of analysis.

Move multifunctionality

Gesuato proposes four forms of textual complexity: discontinuous moves, multifunctional moves, recurrent move type and identical components (Gesuato, 2007: 9). Of those four, multifunctional moves, defined by Gesuato as "moves fulfilling two functions simultaneously" (Gesuato, 2007: 9) are most important for this paper.

Haupt suggests that move multifunctionality can be attributed to several overlapping causes: the position of the moves within the text, the implicatures they trigger, the choice of minimal text units and the affinity of moves which realize the same news structure category (Haupt, 2014: 271).

When encountering multifunctional moves, we are unable to clearly state to which move they belong based on the Introduction section only, without the context of the whole paper. However even with the full context provided by the entire article, we may be unable to assign moves into only one category and they remain multifunctional. Examples of this phenomenon are presented below.

> The frequency f of the voltage source is assumed to be in the interval from zero to 1 MHz and thus the displacement current can be neglected [2]. Underlined symbols denote phasors and

complex numbers. *(Current density in two parallel cylindrical conductors and their inductance, Article 8)*

This extract could be labelled either as move type 1 because it could be related to general knowledge of the subject and the established procedures of inductance calculations. However, this move could also be described as move type 3 in case the mentioned frequency limitations are used in current research and this passage therefore explains the conditions of calculations in author's paper.

Another example of move type multifunctionality can be seen in following extract.

> Whereas, there is still no practical, impersonal and unified corona inception criterion. The traditional visual method is limited by natural light and observer, the visual corona inception voltage is higher than the actual value even with light amplification devices [1]. *(Influence of freezing water conductivity on the positive corona performance of soft rime ice-covered conductor, Article 4)*

This text can be interpreted as move type 1 meaning that it just reports the lack of "unified corona inception criterion" and "traditional visual method is limited" as facts that are taken into account when doing a research in this particular field of expertise. The second possibility is this text being move type 2 in which case the aforementioned problems and limitations are gaps in previous researches which author's study plans to solve.

The following example can be identified as multiple steps within the same move (Move 3: Presenting present research).

> In this paper, in order to examine the impact of the tower grounding electrodes modelling on lightning overvoltages, electromagnetic transient calculations were conducted on three different cases: constant grounding impedance of the tower hit by the lightning stroke, frequency-dependent tower grounding impedance and frequency-dependent tower grounding impedance for the tower equipped with LSA installed at the lowest phase. *(Evaluating the overvoltage performance of an overhead line*

At the beginning of this part of the article, we can see the phrase "In this paper" which signals Step 1: Announcing present research. However, later in this text we can see a description of procedures which were undertaken, and this signals Step 4: Summarizing methods. Due to the density of information in this text, we are unable to properly divide it into 2 separate moves.

False signals

When analysing texts to determine whether or not they contain patterns, we may encounter a situation when a portion of texts appears to be part of a pattern, contains signals of that pattern, but is in fact not related to the pattern. Example of this phenomenon can be seen below.

> Since none of the abovementioned approaches is 100% efficient or the ideas described require a lot of effort and costly installations, an efficient and comprehensive approach to the problems with distance relay under-reaching for single-phase faults behind the in-zone transformer is still to be developed. In this paper the following points have been addressed. First, present solution performance for d and Y transformer side faults is investigated. Then a proposal of improvements for correction of through-transformer impedance measurement errors as well as development of settings recommendation for the new protection is discussed.
>
> It is shown that substantial improvement of the distance protection operation may be reached with introduction of the zero-sequence current and appropriate settings of the protection algorithms. *(Distance protection of block transformer units, Article 17)*

We can see that this part of the text outlines a gap in current knowledge, in this case it is signalled by phase "is still to be developed". This would point to the text being a part of

The Gap in Knowledge-Filling pattern. However, the rest of the Introduction section of this article does not address the gap in knowledge which is outlined here in this extract. Considering this, the purpose of this section of the text is possibly to inform the reader about the gap in knowledge rather than outlining the gap so that it can be filled later on in the article.

Another occurrence can be seen in the portion of text below.

> The basic idea of misuse of investigation is to detect the attack of a certain type or target in some way, and even identify the types of these attacks. In view of these signs, this method identifies attacks by describing the criteria for each known attack [1]. The <u>trouble</u> for identifying obscure assaults has become a <u>fundamental drawback</u> in the mark-based method. The primary objective of the anomaly detection method is to describe the typical activities of the manufacturing factual model. In this point, any deviation from this model can be viewed as an anomaly, and perceived as an assault [20]. When this approach is utilized, it can identify obscure assaults hypothetically, despite the fact happened now and again, the considered approach gives rise to high false assault rate. Given the general manufacture models in the past few years, people are keen to develop new manufacturing models [6], [10]. *(A novel network security algorithm based on improved support vector machine from smart city perspective, Article 15)*

This section of the article contains signals "trouble" and "fundamental drawback" indicating that the text is a part of Problem-Solution pattern, but similarly to the previous example, the author offers no solution in the rest of the analysed text, which means that the reason behind including this section of text is to provide information about the problem without trying to provide solution.

Conclusion

This thesis focused on using Swales' analytical framework to analyse articles from scientific journals from the field of electrical engineering to observe the linguistic features used. A corpus consisting of the Introduction sections of papers from three scientific journals was created and analysed using Move analysis. Due to the nature of Introduction section of scientific articles, present tense was regarded as the default tense used. However, there were a few occurrences of past tense which were analysed separately. The results of the analysis follow Swales' proposed structure with only a few exceptions, namely steps 2 and 3 of move 3 and step 2 of move 2 did not occur in the analysed texts. This is caused by the fact that the specific steps are not important in the field of electrical engineering as they are in other scientific fields.

The articles in the corpus were analysed for the presence of patterns described by Hoey with the patterns being present in over a half of the articles. While Swales' model was designed specifically to describe articles from the genre of research articles, Hoey's patterns are very general as they can be present in a wide variety of texts. An overlap between Swales' model and Hoey's pattern was examined and it was found that there is a noticeable overlap in terms of the function the text serves and also in terms of linguistic signals they use.

Two problematic features of text analysis were highlighted and described, namely move multifunctionality and false signals. Move multifunctionality is a phenomenon where a move (or a step) fulfils the role of multiple moves. False signals occur in Problem-Solution patterns, where a problem is introduced, but the author does not provide any solution.

Rozšířený abstrakt

Cílem této práce bylo zjistit, jakým způsobem jsou strukturovány úvodní sekce odborných vědeckých článků z oboru elektrotechniky a jakými lingvistickými prostředky jsou tyto struktury tvořeny. K dosažení tohoto cíle byla uplatněna kvalitativní analýza na korpusu složeném z odborných článků z oboru elektrotechniky. Pro tuto analýzu byl zvolen postup shora dolů, což znamená že od největších částí se postupuje k nejmenším, konkrétně od úvodních sekcí přes menší jednotky textu až k samotným jazykovým prostředkům.

Korpus článků, sestavený pro tuto práci, se skládá z 23 článků ze 3 odborných časopisů zabývajících se elektrotechnikou. Těmi časopisy jsou: Computers and Electrical Engineering, Electrical Engineering a Electrical Power and Energy Systems. Co se týče článků samotných, tak byly vybírány z posledních 4 let publikací a hlavními parametry bylo, aby tyto články byly z oboru elektrotechniky a délka úvodní sekce nepřesahovala 700 slov pro efektivnější analýzu. Úvodní sekce článků v korpusu byly posléze srovnány s analytickým rámcem. Pro tento účel byl vybrán revidovaný model pro úvodní části výzkumných článků, který vytvořil John M. Swales v roce 2004. Swales rozděluje úvodní sekce článků do 3 částí, zvaných tahy („moves"), což jsou jednotky textu, které mají společnou komunikativní funkci. Tyto tahy mohou mít menší části, pojmenované kroky („steps"), jejichž spojením jsou tvořeny tahy. V těchto nejmenších částech pak byly hledány signály neboli jazykové prostředky, které umožňují realizaci kroků a tahů.

První tah Swalesova modelu se stará o informování čtenáře, obsahuje všeobecné informace, které čtenář potřebuje, aby byl schopný porozumět zbytku článku. V této části článku jsou velmi často využívány citace zdrojů, které pomáhají popsat pozadí současného výzkumu. Signály typické pro tento tah jsou: využití citací, příslovečné určení času a předložkové vazby.

Druhý Swalesův tah slouží jako motivace pro autorův daný článek, toho je dosaženo třemi kroky: první z nich poukazuje na mezery v již existujícím výzkumu, druhý zdůrazní, jakým způsobem může být výzkum přínosný a třetí krok poskytuje nové informace k existujícímu výzkumu. Třetí zmíněný krok v článcích z korpusu nebyl nalezen ani jednou a nebyl proto podrobněji zkoumán.

Třetí a poslední Swalesův tah poskytuje informace o současné autorově práci a je realizován 7 kroky.

Krok 1 uvádí autorům výzkum, krok 2 ukazuje hypotézy nebo otázky pro výzkum, krok 3 obsahuje vysvětlené definice, krok 4 shrnuje použité metody, krok 5 prezentuje výsledky výzkumu, krok 6 zmiňuje význam výzkumu a krok 7 obsahuje popis struktury zbytku práce.

Kroky 2 a 3 v článcích v korpusu nebyly nalezeny ani jednou, jelikož se jedná o kroky, které nejsou tak důležité v oblasti elektrotechniky jako například v článcích, které jsou zaměřeny na lékařská témata nebo přírodní vědy.

Alternativní pohled na analýzu článků poskytují vzorce organizace textu, které navrhl Michael Hoey v roce 2001. Zatímco Swalesův model byl navržen konkrétně pro výzkumné články, Hoeyho vzorce organizace textu jsou aplikovatelné v široké řadě textů. Tento rozdíl nám umožňuje podívat se na výzkumné články z úhlu pohledu obecných textů. Hoey nazývá vzorce „kulturně populární vzorce organizace textu" („culturally popular patterns of text organization"), jelikož tyto vzorce se vyskytují v určitých kulturách i přes to, že nejsou nijak definované. Tyto vzorce jsou používány jako možnost autora textu komunikovat se čtenářem. Dva vzorce, které jsou aplikovatelné na výzkumné články z elektrotechniky byly podrobněji popsány a analyzovány, konkrétně jde o vzorec Problém-Řešení („Problem-Solution") a Mezera ve znalostech a její zaplnění („Gap in Knowledge-Filling").

Podstatou vzorce Problém-Řešení je, že když autor v textu představí problém, čtenář automaticky dále v textu očekává řešení. Hoey tento vzorec rozděluje na 4 části: situace neboli popis textu, problém, řešení a hodnocení řešení. Hodnocení poskytnutého řešení se v úvodních sekcích výzkumných článků nevyskytuje, jelikož řešením problému se zabývá celá práce a její zhodnocení lze nalézt v závěru, nikoliv v úvodu.

Mezera ve znalostech a její zaplnění je vzorec podobný vzorci Problém-Řešení, hlavním rozdílem těchto vzorců je jejich cíl, konkrétně jestli se snaží vyřešit problém nebo zaplnit mezeru ve znalostech.

Z výsledků analýzy je patrné, že tyto dva vzorce jsou si velmi podobné a v rámci úvodních sekcí výzkumných článků se překrývají, jelikož ve vědeckých článcích jde

mezera ve znalostech považovat za problém, který je nutné vyřešit. Z tohoto důvodu jsou pro potřeby této práce oba vzorce shrnuty jako vzorec Problém-Řešení.

Jak Swalesův model, tak Hoeyho vzorce se zároveň vyskytují ve zkoumaných článcích a zabývají se podobnými strukturami textu. Na základě čehož byly vyhledány a analyzovány jejich průniky. Tato analýza ukazuje, že se tyto dva pohledy překrývají velmi často, jde hlavně o překrytí Swalesova druhého tahu s Hoyeho problémem a Swalesova třetího tahu s Hoeyho řešením. Jak již bylo zmíněno, Swalesův druhý tah poukazuje na problémy, případně na mezery v existující literatuře, což odpovídá Hoeyho problému. Swalesův třetí tah, poskytující informace o článku, uvádí, jakým způsobem článek tyto problémy řeší, čímž plní identickou funkci jako Hoeyho řešení problému.

Během analýzy byly nalezeny dva druhy jevů, které se jevily jako problematické pro analýzu. Jedná se o multifunkční tahy („move multifunctionality"), kdy jeden tah může zdánlivě plnit funkci více tahů a není možné určit ke kterému tahu patří pouze na základě úvodní části článku. U analýzy vzorců se vyskytují případy falešných signálů („false signals"), kdy je v článku uveden problém, jsou přítomny signály problému, ale autor ve zbytku úvodu nenabízí řešení tohoto problému.

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