

**M A S A R Y K
U N I V E R S I T Y**

FACULTY OF INFORMATICS

**Conversion between First-person
and Third-person Narratives**

Bachelor's Thesis

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Brno, Spring 2022



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Declaration

Hereby I declare that this paper is my original authorial work, which I have worked out on my own. All sources, references, and literature used or excerpted during elaboration of this work are properly cited and listed in complete reference to the due source.

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Acknowledgements

Abstract

Keywords

NLP, text analysis and parsing, text generation

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1 Introduction

According to scientific estimates, the written word appeared around 3000 BC. The beginnings of the written word gave people the ability to put stories, which until then had only been spread orally, on paper (or its historical equivalent). And this is where the history of creative writing begins. During the millennia, the process of writing evolved. Thanks to the written language, a drafting process was enabled for storytellers.

With the invention of computers, much of the writing process has been automated. Today, we have: the ability to efficiently rewrite a text, functions as Find & Replace, editors that perform automatic grammar correction, webpages that allow people to collaborate online, word counters, and many other tools that affect the creative process of how the books are being written.

In my eighteen years of writing experience, I have spoken to hundreds of people from the writing community, watching the issues, ideas, and thought processes they – we – are dealing with during the drafting process. And there is a question often asked: *how* to write the story? In what person? Who should be the narrator? Sometimes, the writers even rewrite the text to the other person to be able to compare both versions. That made me ask myself another question: could computers also handle this problem?

This thesis aims to automate the process of person change and implement a tool that would convert a written text between first-person and third-person narratives. This conversion covers the grammatical aspects of these narratives. To achieve this goal, I have designed and implemented a rule-based system. That includes an implementation of a tool *RepnrasErIch*, proposing several conversion rules for both directions, and then implementing these rules into the tool. I am not aiming to create an application usable by ordinary users but to explore the topic of automatic narrative conversion, attempt an experimental implementation of proposed concepts, and evaluate its functionality on text data.

In the second chapter, I briefly summarize the existing solutions for my problem. In the third chapter, I introduce some essential terms of the narrative theory and describe the impacts of conversion on a given

text's narrative features. The fourth chapter offers an overview of the syntactic structures of Czech grammar in which narrative conversion is reflected. Chapter five contains an overview of the proposed rules accompanied by diagrams for illustration. In chapter six, I introduce the tool itself. I speak about external tools that I have used for the *RephrasErIch* implementation and then describe the system's design and some important classes.

To assess the tool's performance, I have evaluated it on text data. The evaluation process and its results are described in chapter seven. Afterward, I discuss the errors and the possibility (or impossibility) of solving those errors.

I conclude my thesis with a summarization of achieved results, suggestions for future work, and usage of the implemented tool.

2 State of the Art

So far, the task of the narrative mode conversion is largely unexplored. There are many open problems in the area of natural language processing (NLP), and text rephrasing, in general, is one of them. Besides, we have to face a specific challenge in NLP: several solutions to any NLP task are language-specific. Naturally, most of the research we can find on any topic is performed on English. Processing of the English language has several advantages: not only it is widely used and there is a lot of textual data written in English, but from a linguistic perspective, it is easy to process due to its simple morphology. In contrast, Czech is much more complex, and due to the number of speakers, there are not many researchers dealing with the natural language processing of the Czech language. Since I have chosen to work with Czech texts in this thesis, I have to face this specific challenge as well.

This leads us to the fact that there is no existing solution to this task for Czech. However, there are tools that solve at least some parts of the problem.

If we generalize the problem to any language, we find only few papers on this topic, as expected, all for English.

In this chapter, at first, I introduce the existing solutions for the English language, and then I take a look at the situation in the Czech processing.

2.1 Existing Solutions for English

As mentioned in the previous chapter, my motivation for this task is to create a tool for writers. However, previous work on this topic has mostly focused on a different goal: to convert the person in replies provided by virtual assistants (VA), such as Siri, Alexa, or Google Assistant. Due to the difference in the target application, these solutions address some problems that are irrelevant to our case and neglect several subtasks related to the creative writing process.

The system designed by Lee et al. [1] focused on spoken messages in VA-assisted conversations. To the best of our knowledge, this is the first attempt at point-of-view conversion. The authors have developed several models that can be classified by two main approaches:


rule-based and machine learning. The rule-based model works with a set of rules which describe how the grammatical conversion should be performed. The model relies on a classification model that provides Named Entity Recognition, which is already implemented in the VA. In addition, the model uses a Part Of Speech (POS) tagger and a constituency parser. Furthermore, several deep learning based models have been developed. These models were trained on data collection provided by Amazon Mechanical Turk workers. According to the evaluation results, the deep learning based models have better performance.

Recently, another effort for conversion has been published by Graneiro Moya and Oikonomu Filandras [2]. Their research also focuses on virtual assistant technologies. Unlike our work and the work of Lee et al. they focus on conversion in only one direction: third-person to first-person. They also worked with the two approaches and developed a rule-based model and a deep learning system. Their deep learning models show better results than the rule-based model, which served as a baseline here, as well.

2.2 Tools for Czech

In the introduction to this chapter, I explained that there is currently no solution to this problem for Czech. Nevertheless, I ~~will~~ briefly introduce a few tools that address more general problems.

2.2.1 Morphological analyzers

Morphological analysis is an essential part of natural language processing. In the context of narrative mode conversion, we cannot do without morphological analysis. For instance, we need to know the person of a word being processed, and a morphological analyzer can provide ~~us with~~ gs describing the grammatical categories of the word.

There are several tools in the Czech community providing morphological analysis.

Ajka is one of the first morphological analyzers for Czech. Currently, Ajka is no longer in development and has been replaced by the new morphological analyzer Majka. [3]

Majka is a fast morphological analyzer developed at Masaryk University. The implementation builds on the previous system, Ajka, but it is faster and more flexible. Majka is based on finite automata, and it works with a morphological database. At the moment, the author provides databases not only for Czech but also for other languages. The tool is able to assign lemmas and tags to the analyzed word form, generate all word forms of a given lemma and generate a word form based on the given lemma and tags. [4]

MorphoDiTa (Morphological Dictionary and Tagger) is a tool developed at Charles University that performs morphological analysis, morphological generation and tagging. [5]

2.2.2 Syntactic Analyzers

In addition to morphology, there is another linguistic level that we need to deal with in order to perform POV conversion: syntax. In order to rephrase a sentence, syntactic analysis is required. The syntactic analysis is preceded by morphological analysis. Let's take a look at some existing syntactic analyzers for Czech.

SYNT is a syntactic analyzer developed at the NLP Centre at Masaryk University. The tool is based on Czech meta-grammar, and it was designed for morphologically-rich languages.

SET (Syntactic Engineering Tool), also developed at the NLP Centre, is implementing a new approach to the syntactic analysis of Czech. This new approach is based on pattern recognition. [6]



3 Narrative Theory

Narratology, or narrative theory, is a literary science that has experienced considerable development over the last hundred years. The topic of narrative theory has been explored by literary theorists across Europe throughout the twentieth century. Consequently, many different typologies and proposals have emerged on how to view the topic of narrative and narrative mode and how to conduct narrative analysis. [7]

In this chapter, I introduce some basic narratological concepts. Next, I show a selected typology to demonstrate its relevance to this thesis and focus on the application of narrative theory to creative writing.

3.1 Forms of Narrative by Person

Person is a linguistic category of verbs, based on which the primary forms of narrative are distinguished. In addition to verbs, this form is also manifested in personal and possessive pronouns and some particular conjunctions. In other words, it is a mode of expression that answers the question of *how* we will write the story, grammatically speaking. [8]

First-person narrative is a mode of literary narrative in which the narrator tells the story in the first-person singular. Traditionally, first-person narrative reduces the narrator's omniscience to the subjective perspective, often given by the main character. [9]

Nevertheless, there are several modes of first-person narration. These modes differ in the level of subjectivity. [10]

Third-person narrative is a mode that is realized in the third person singular. Unlike the first-person narrative, the narrator is traditionally in the role of an objective observer. However, in modern literature, we can encounter different levels of objectivity. Therefore, the differences between the semantic aspects of first and third-person narratives

are suppressed. Consequently, the main distinction depends on the syntactic structures of these forms. [9]

Other modes of narrative also exist. There is the *second-person narrative*, which is a less frequent narrative mode. We can also encounter narratives given in plural, but these methods are rarely used.

3.2 System of Narrative Modes

From a number of narrative typologies, I decided to choose the system proposed by Czech linguist and literary theorist Lubomír Doležel. Doležel's system of narrative modes is captured in the tree diagram in figure 3.1.[10]

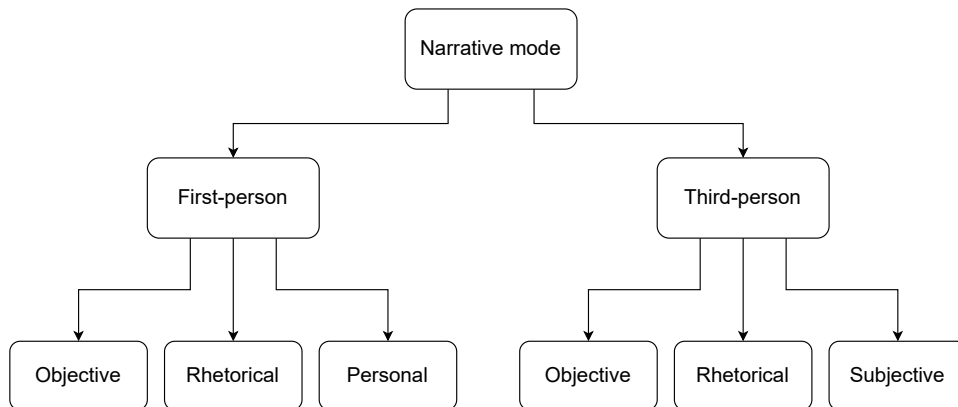


Figure 3.1: System of narrative modes by Doležel


In the section 3.1, I mention some degrees of subjectivity and objectivity of the narrator. The typology offered by Lubomír Doležel is built on the degree of subjectivity and the narrative ~~person~~ person. Similar classifications can be found in various creative writing methodologies [8] since the typology is graspable and intuitive for writers.

In this section, I describe the characteristics of these narrative types, and I demonstrate the differences in a short piece of Czech literary text.¹

3.2.1 Objective third-person narrative

This type of narrative mode is written in third-person, and the narrator is standing outside the story. The narrator can be considered an objective observer of the scene who describes what they see. They have no information about the emotions or inner thoughts of the characters. [8] In addition to that, the narrator is free of opinions, and it is not their place to make any judgments.

In the following paragraph, I present a slightly modified part of the short story, which illustrates the characteristics of the objective third-person narrative.

Matyáš pověsil kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu. Rozhlédl se po kavárně. U okna seděla dívka s chlapcem, drželi se za ruce. V rohu pod polici knih posedávala postarší žena začtená do jednoho z výtisků. A nakonec světlavá baristka silnější postavy a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. S nápojovým lístkem v rukou přistoupila k němu, beze slova mu ho podala a zase se vrátila na své místo za pultem, kde se s nezaujatým výrazem věnovala svému mobilu. 

As shown above, the narrator is in the role of a reporter. They give testimony about what the characters are doing and how the environment looks. However, the reader gets no mention of the thoughts of neither the narrator nor the characters described.

1. The text sample is taken from a short story collection *Nejkrásnější dárek* (*The most beautiful gift*) [11] and rewritten for demonstrative purposes. The author of the particular short story is the author of this thesis.

3.2.2 Rhetorical third-person narrative

The rhetorical third-person narrative shares several common features with the objective one, but it introduces a certain degree of subjectivity into the objective text. Nevertheless, this subjectivity comes from an anonymous narrator, not a particular character. [10]

*Matyáš pověsil kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu, **ačkoliv se mu na ní muselo sedět dost nepohodlně**. Rozhlédl se po kavárně. U okna seděla dívka s chlapcem, drželi se za ruce. V rohu pod polici knih posedávala postarší žena, která byla tak začtená do jednoho z výtisků, **že si nejspíš vůbec nevšimla, že někdo přišel**. A nakonec světlovlasá, **docela hezká** baristka silnější postavy a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. S nápojovým lístkem v rukou přistoupila k němu, beze slova mu ho podala a zase se vrátila na své místo za pultem, kde se s nezaujatým výrazem věnovala svému mobilu. **Zdálo se, že se nemůže dočkat, až jí skončí směna**.*

As we can see, the narrator makes several judgments in this version and expresses their opinions. However, they still do not know about the characters' inner thoughts, and the subjective expressions are only their assumptions.

3.2.3 Subjective third-person narrative

It is an extension of semi-direct speech (see Section 3.3), where the consciousness of the narrator and the consciousness of the character are combined. [12, p. 393] In addition to the narrator's opinions, the subjective third-person narrative offers insight into the characters' thoughts, feelings, and memories, as illustrated in the sample text below.

*Matyáš pověsil kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu. **Nesedělo se mu na ní moc pohodlně**. Rozhlédl se po kavárně. U okna seděla dívka s chlapcem, drželi se za ruce **a užívali si mladé***

lásky, jež trvala už celé čtyři měsíce. V rohu pod policí knih posedávala postarší žena, kdysi nešťastná alkoholička, začtená do jednoho z výtisků. A nakonec světlolasá baristka, silnější postavy, kterou ze srdce nenáviděla, a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. S nápojovým lístkem v rukou přistoupila k němu, beze slova mu ho podala a zase se vrátila na své místo za pultem, kde se v myšlenkách na domov věnovala svému mobilu.

3.2.4 Objective first-person narrative

The objective type of first-person narrative mode is sporadic. A narrator's desubjectification can appear unnaturally, and the first-person features are only grammatical. The narrator is in the role of an unbiased witness standing outside the story without any judgments. [10]

Matyáš pověsil kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu. Rozhlédl se po kavárně. U okna seděla dívka s chlapcem, drželi se za ruce. V rohu pod policí knih posedávala postarší žena začtená do jednoho z výtisků. A nakonec světlolasá baristka silnější postavy a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. S nápojovým lístkem s logem našeho města v rukou přistoupila k němu, beze slova mu ho podala a zase se vrátila na své místo za pultem, kde se s nezaujatým výrazem věnovala svému mobilu.

The text sample does not differ much from the text in objective third-person since there are few situations where the grammatical person could be manifested. To demonstrate it, I used the words *našeho města* (our city) to expand a sentence. Because of the absence of the narrator's representation, a reader would naturally consider the author as the narrator.

3.2.5 Rhetorical first-person narrative

As in the objective type, the narrator is passive in the story events. However, they expand the events with their views and opinions. Plus,

the passivity is not absolute. The narrator touches the story in some way — they have to receive information about the characters and the environment, get to the place of the story, etc. Nevertheless, they are not part of the narrated story line.[10]

*Matyáš pověsil kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu. Rozhlédl se po kavárně. U okna **přímo přede mnou** seděla **docela sympatická** dívka s chlapcem, drželi se za ruce. V rohu pod policí knih posedávala postarší žena – **myslím, že jí mohlo být tak sedmdesát** – začtená do jednoho z výtisků. A nakonec světlavlasá baristka silnější postavy a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. **Trochu mi připomínala učitelku ze školky**. S nápojovým lístkem v rukou přistoupila k němu, beze slova mu ho podala a zase se vrátila na své místo za pultem, kde se s nezaujatým výrazem věnovala svému mobilu.*

In this text sample, we can observe several judgments given by the narrator. It is also expressed that they are sitting in the same room as the characters. However, the short story is not about this narrator, and they figure only as a biased witness.

3.2.6 Personal first-person narrative

Personal type is the most commonly used type of first-person narrative mode. The narrator is an active part of a story, often the main character. They are free to give judgments and express their feelings. The personal narrative thus represents a kind of personal confession of one of the characters. [10]


Pověsil jsem** kabát na dřevěný věšák u vchodu, očima vyhledal modré křeslo ve tvaru kapky a sedl si na stoličku naproti němu. **Rozhlédl jsem** se po kavárně. U okna seděla **docela sympatická** dívka s chlapcem, drželi se za ruce. V rohu pod policí knih posedávala postarší žena – **myslím, že jí mohlo být tak sedmdesát** – začtená do jednoho z výtisků. A nakonec světlavlasá baristka silnější postavy a tvářemi tak rudými, jako by to byla ona, kdo právě unikl náruči prosincové noci. **Trochu mi připomínala učitelku ze

školky. S nápojovým lístkem v rukou přistoupila **ke mně**, beze slova **mi** ho podala a zase se vrátila na své místo za pultem, kde se s nezaujatým výrazem věnovala svému mobilu. **Bylo mi jasné, že se nemůže dočkat, až jí skončí směna.**

Note that the story is told from Matyáš's point of view in this sample. This fact makes a major difference from rhetorical narratives.

3.3 Types of Speech

Speech is a report of what some character has said. In this section, I give a brief overview of the types of speech.

Direct speech report corresponds precisely to what another character has said in the original speech. [13] Usually, the direct speech in the text is marked by graphical signs, such as quotes. Example: „*Já se nikoho nebojím,*“ usmála se Jorika. 

Unmarked direct speech is direct speech without graphical signs. Example: *Já se nikoho nebojím, usmála se Jorika.*

Indirect speech shifts the perspective to the narrator, who can use their own words and recast the original text as their own. [13] Example: *Jorika mi s úsměvem řekla, že se už vůbec nikoho nebojí.*

Semi-direct speech is a middle ground situation between direct and indirect speeches. It involves the original report but with an incomplete person shift. [13] Example: *Jorika se usmála, nikoho se nebojí.*

3.4 Omniscience and Other Levels of Knowledge

In addition to the extent to which the narrator is objective, narrative theory can also ask how far the narrator's knowledge extends and what authenticating power it has. In this section, I outline three levels of this knowledge.

3.4.1 Personal knowledge

In the context of personal knowledge, I consider the first-person narrative. This narrator communicates only those events that they know from personal experience. Otherwise, they name their source of information. It makes sense, then, that they have an intimate knowledge of their own psychology, but the inner world of the other characters is inaccessible to them. [10]

3.4.2 Limited Omniscience

Limited omniscience is usually encountered in the third person. In these paragraphs, I explain limited omniscience in the subjective third-person narrative.

In this technique, the author chooses several characters to whom he has access. Their omniscience is limited to some (usually main) characters, but they know nothing about others. [8]

3.4.3 Complete Omniscience

The omniscient narrator can usually be found in the third-person narrative. The principle is based on a narrator standing above the story who can see the minds of all characters. [8]

However, even a narrator in a personal first-person narrative can usurp the authority of the omniscient narrator. It is then a kind of "super-character" who does not have to limit themselves to personal experience and has access to all events and information. [10]

3.5 Impacts of Conversion to Narrative Terms

I find it valuable to consider the effect that conversion will have on the narrative characteristics of a literary text. I have presented several degrees of narrator subjectivity and omniscience. This section shows several case situations of how a change of person impacts these characteristics.

Objective omniscient third-person

In the first example case, let the narrator be objective and omniscient and let the text be written in third-person narrative. The impacts of conversion to the first person might be the following:

- Objective narrator who is part of the story. That results in a particular form of objective first-person narrative with an involved narrator.
- Omniscient character who knows information about events they should not. Although they do not see into the minds of the other characters (or their own), they give testimony to actions and places they may not have been present.

This leads to an unconventional text form, which can seem like a fascinating literary experiment or a writer's malpractice.

Subjective omniscient third-person

In this case, the impacts would be similar to the previous. In addition, one of the characters would be reading the thoughts and emotions of the others.

Personal first-person

Let the text be written in personal first-person narrative and assume that the narrator communicates only their own view of the world and events. The conversion leads to:

- Subjective third-person narrative
- Limited omniscient narrator

In this case, the output is a fairly common form that we can often encounter in books.


Rhetorical third-person

As the last example to illustrate the impacts on the narrative, I have chosen a conversion from a rhetorical third person. In this case, the knowledge of the narrator is not considered. The following outcome of this conversion might be surprising:

- The rephrased text is in the personal first-person narrative since the character is actively involved in the story.
- The exciting thing about this conversion is that the character takes on the views and ideas of the narrator. This can affect not only the characteristics of the text but also the story itself.

Impacts on the speech

Finally, I briefly summarize how the conversion should affect different types of speech.

-  **Indirect and semi-direct speech** should be treated like the rest of the text – rephrased during conversion.
- **Direct speech** should be ignored during conversion. Nevertheless, this is very challenging for unmarked direct speech.

4 Syntactic Structures in the Narratives

4.1 Verb and its Person in Czech sentence

Present indicative tense is formed by one verb. The ending of a verb depends, among other things, on the person. I show the conjugation on an example in Table 4.1.

Table 4.1: Present tense conjugation in Czech

person	singular	plural
First	já píš <u>u</u> (<i>I write</i>)	my píš <u>eme</u> (<i>we write</i>)
Second	ty píšeš (<i>you write</i>)	vy píš <u>ete</u> (<i>you write</i>)
Third	on píše (<i>he writes</i>)	oni píš <u>ou</u> (<i>they write</i>)

Future tense has two possible forms: it can be only one verb in the future tense or construction of a verb *být* (*to be*) in the future tense and an infinitive of the verb.

In both cases, a verb in the indicative form changes its form depending on the person.

Past tense exists only in compound form in the Czech language. The compound tense is made up of an auxiliary verb and a participle.

The auxiliary verb is a verb *být* (*to be*), and it agrees in person and number with a subject.

The second part of the combination is a past participle, and it carries the meaning. This part agrees in gender and number with a subject.

Nevertheless, the auxiliary verb is not used in the third person.

I show an example of conjugation of verb *psát* (*write*) in Table 4.2.

Passive voice is composed of the auxiliary verb *být* (*to be*) and a passive participle of the main verb. Multiple auxiliary verbs can appear in one sentence: one verb to express the passivity and one to express the past.

Table 4.2: Past tense conjugation in Czech

person	singular	plural
First	já jsem psal (<i>I wrote</i>)	my jsme psali (<i>we wrote</i>)
Second	ty jsi psal (<i>you wrote</i>)	vy jste psali (<i>you wrote</i>)
Third	on psal (<i>he wrote</i>)	oni psali (<i>they wrote</i>)

Conditional Mood is constructed similarly to the past tense. The difference is the auxiliary verb. The conditional mood is composed of *conditional auxiliary* and a participle. Unlike the past tense, the auxiliary is expressed even in the third person.

An example is in Table 4.3.

Table 4.3: Conditional mood conjugation in Czech

person	singular	plural
First	já bych psal (<i>I would write</i>)	my bychom psali (<i>we ...</i>)
Second	ty bys psal (<i>you would write</i>)	vy byste psali (<i>you ...</i>)
Third	on by psal (<i>he would write</i>)	oni by psali (<i>they ...</i>)

4.2 Special Conjunctions

By special conjunction, I mean conjunction that changes its form based on the person it refers to. This includes conjunctions *aby* and *kdyby*. The forms are conjugated like the conditional auxiliaries.

4.3 Personal and Possessive Pronouns

Besides the verbs and conjunctions, pronouns are also relevant to the narrative. For each person, we have different pronouns whose inflection depends on multiple grammatical categories.

5 Conversion Rules

5.1 First-person to Third-person Rules

In First-person → Third-person conversion direction, I have proposed four rules. These four rules cover:

- Personal pronouns replacement
- Possessive pronouns replacement
- Replacement of contidional, present and future verb forms, conjunctions
- Auxiliary verbs replacement or deletion

In this section, I describe each of these rules.

5.1.1 Personal pronouns

This rule covers the conversion of a personal pronoun *já* (*I*) and its forms. The pronoun can be replaced by:

- another pronoun – *ona* (*she*) / *on* (*he*)
- noun – usually a proper noun, given as the protagonist's name

In both cases, the replacement must be in a corresponding form to keep a sentence grammatically correct.

The rule is illustrated in a diagram 5.1.

5.1.2 Possessive pronouns

In addition to personal pronouns, possessive pronouns must also be converted. The process is similar to the previous one. The goal is to convert a possessive pronoun *mŭj* (*my*) and its forms to possessive pronouns *její* (*her*) / *jeho* (*his*), or the possessive form of a proper noun. Considering the limits given by the morphological analyzer, I have decided not to include the second type of replacement. Therefore all the possessive pronouns would be replaced by possessive pronouns.

The rule is illustrated in a diagram 5.2.



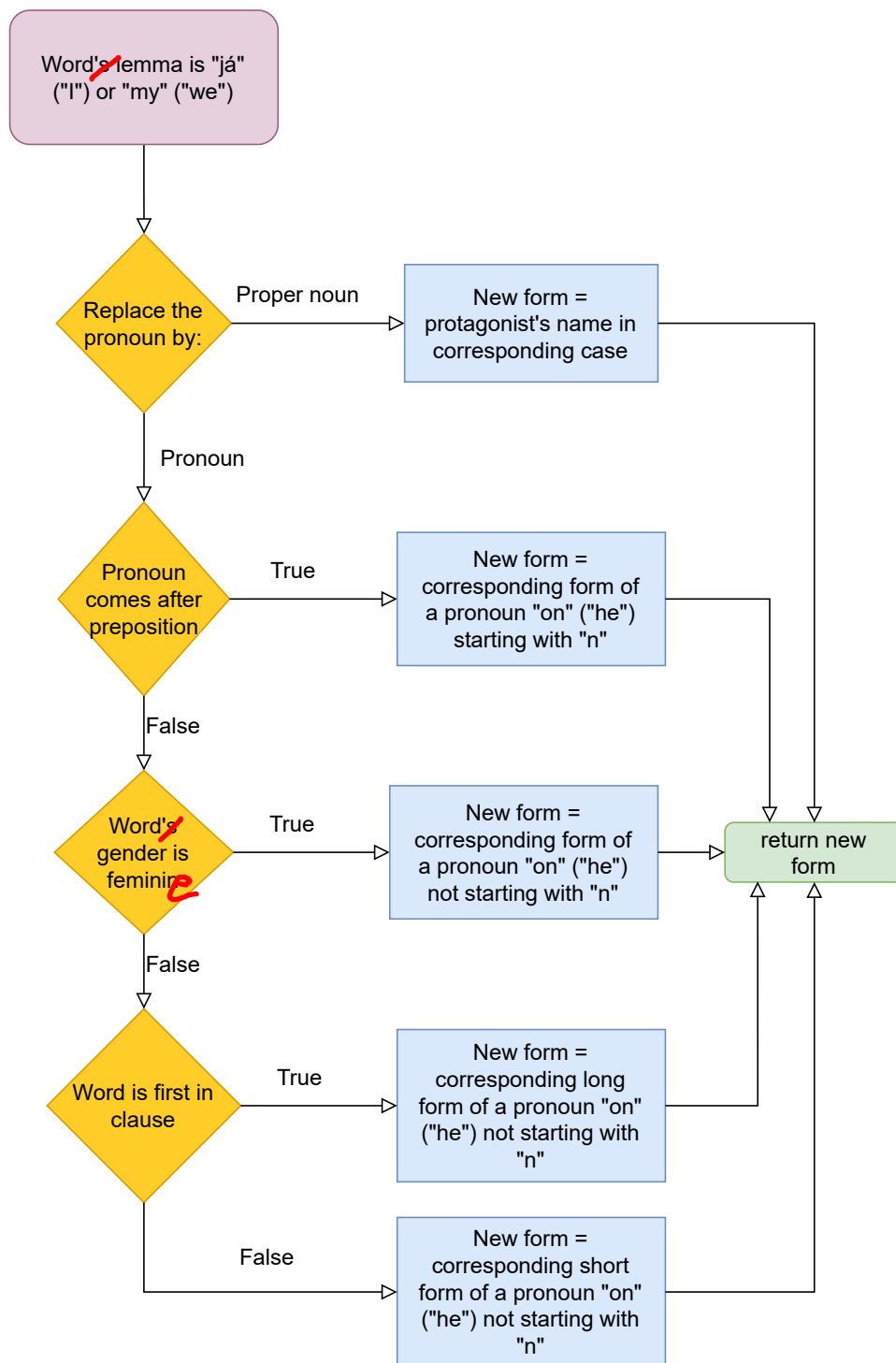


Figure 5.1: Personal pronouns replacement rule

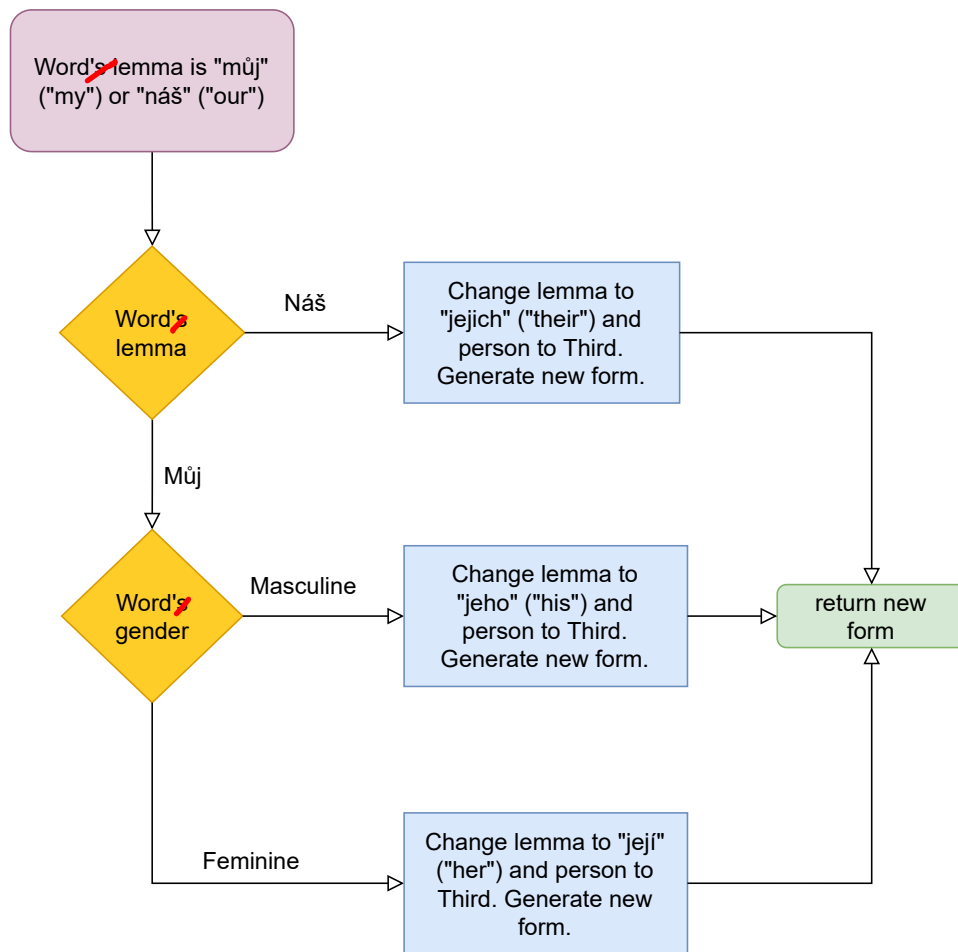


Figure 5.2: Possessive pronouns replacement rule

5.1.3 Conditionals, indicatives, conjunctions

The third rule covers several cases because the conversion procedure is the same in all cases. The process is simple: we need to change the person in the word's tag and then generate a new word form from this new tag and the original lemma, as shown in 5.3.

~~To put it simply,~~ this rule includes the following types of conversion:

- bych/bychom → by – *conditional auxiliary verbs*
- budu/budeme → bude/budou – *future indicatives*
- píšu/píšeme → píše/píšeme – *example of present indicative*
- abych/abychom/kdybych/kdybychom → aby/kdyby – *conjunctions*



5.1.4 Auxiliary verbs

Finally, we need to replace or delete other auxiliary verbs. If the auxiliary verb depends on an active participle, the auxiliary should be deleted. However, if the participle is passive, the auxiliary should be kept and converted.

For example, a sentence *Ukradl jsem klávesnici* (I stole a keyboard) converts to *Ukradl klávesnici* (He stole a keyboard), but *Jsem ukradena* (I am stolen) should convert to *Je ukradena* (She is stolen).

Also, the auxiliary verb needs to be in the indicative mode to be converted. The conditional verbs are covered in the previous rule. Then, other modes of auxiliary verbs should not be converted at all, as the auxiliary in plusquamperfect. For instance, a sentence *Byl jsem ukradl klávesnici* might convert to *Juraj byl ukradl klávesnici*. As we can see, the sentence in the first-person narrative contains two auxiliary verbs; however, only the one in indicative mode would be deleted.

I present the rule in 5.4.

5.2 Third-person to First-person Rules

Since this direction is much more complicated for conversion than the other one, I propose seven rules which cover:

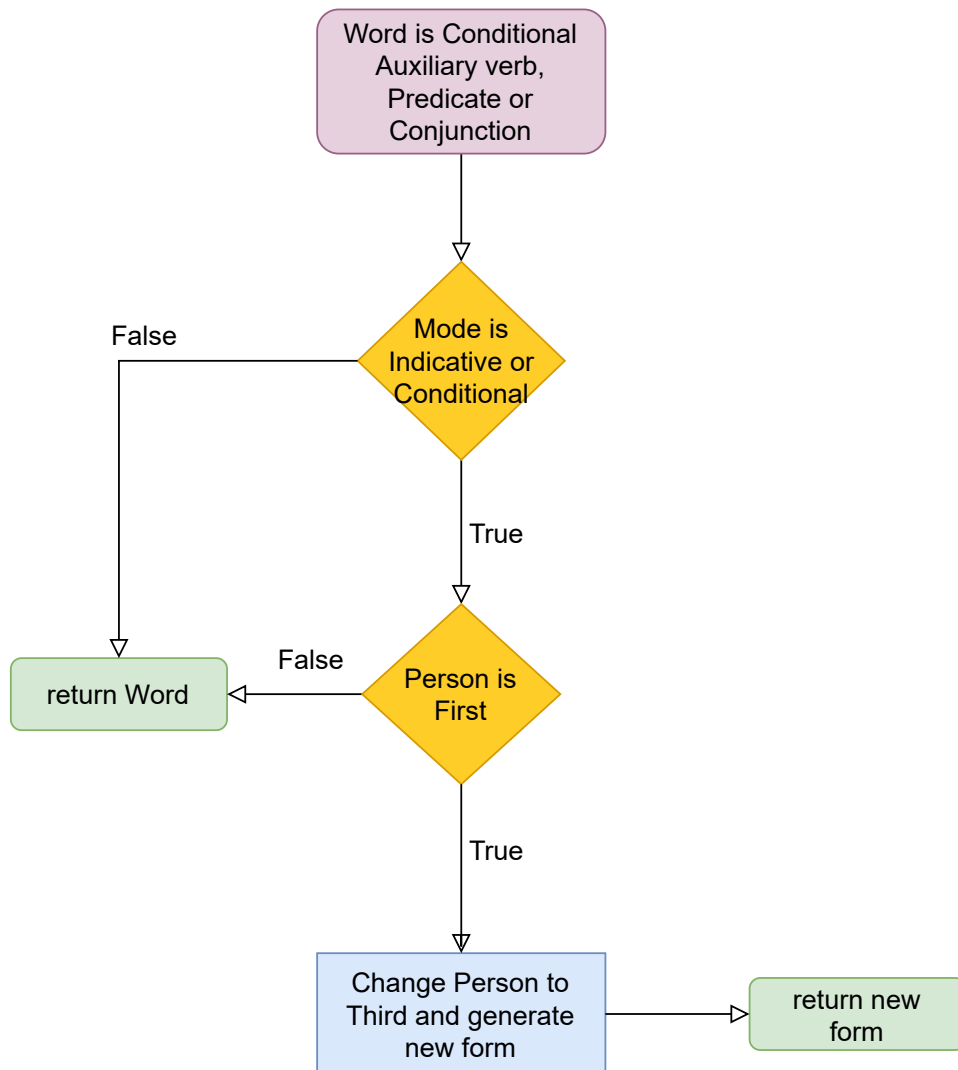


Figure 5.3: Rule replacing the conditionals, conjunctions and verb forms in present indicative tense and future indicative tense

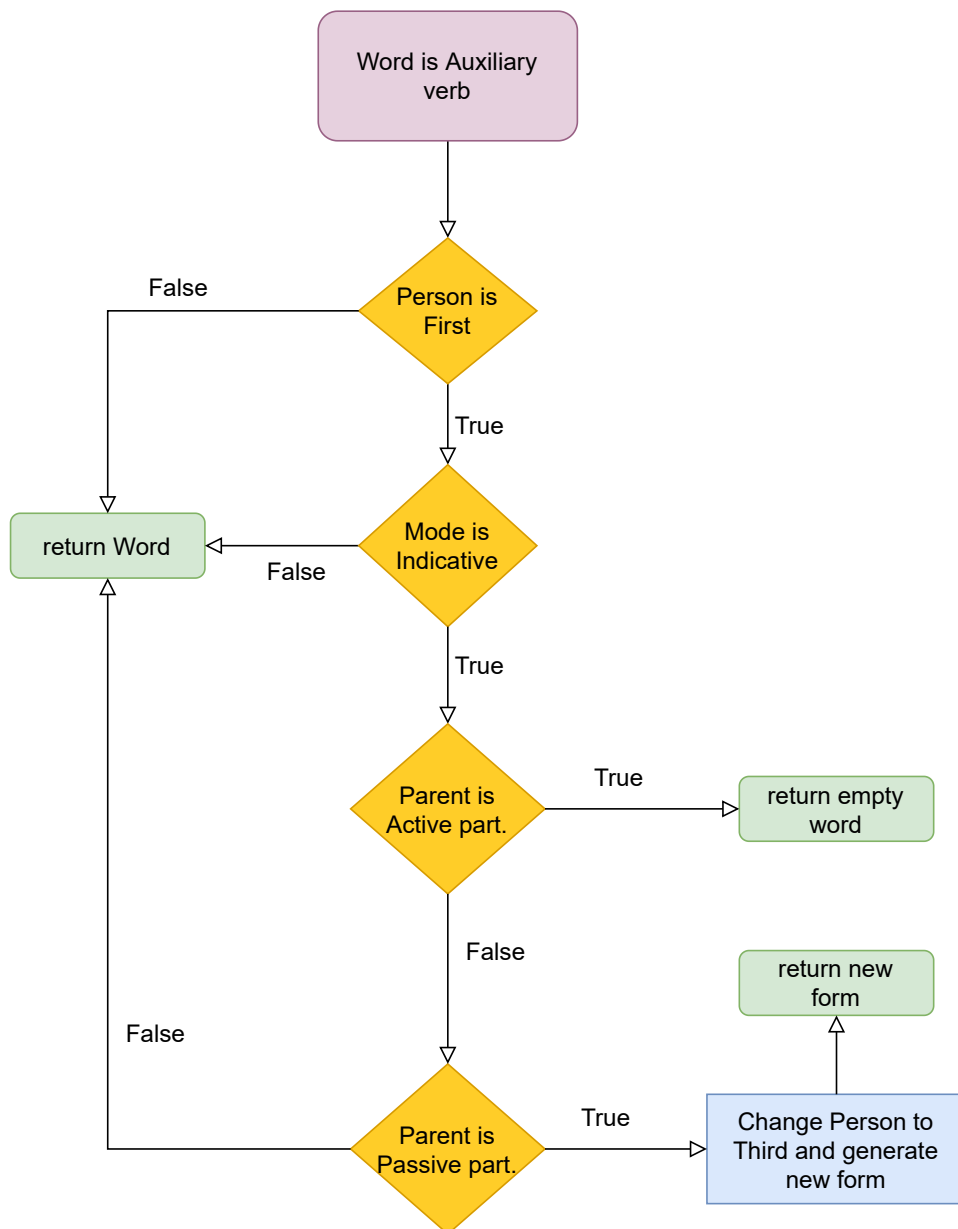


Figure 5.4: Rule replacing the indicative forms of auxiliary verbs

- Proper nouns replacement
- Predicates replacement
- Conditional auxiliars replacement
- Auxiliary verbs addition
- Personal pronouns replacement
- Possessive pronouns replacement
- Conjunction replacement

5.2.1 Proper nouns

The first rule deals with the occurrences of the protagonist's name. Firstly, we need to decide if we should replace the name with a personal pronoun or skip it. The name can only be skipped if the member is a subject and the name is not part of multiple subject coordination.

The rule is illustrated in figure 5.5.

5.2.2 Predicates

Indicative verbs should be replaced. In contrast to First-person → Third-person conversion, the information about a person is not enough. We need to know the subject to our predicate and replace the word with a new form only if the subject refers to the protagonist, as I show in figure 5.6

5.2.3 Conditional auxiliars

These auxiliars are treated similarly to the predicates. I illustrate the decision process in figure 5.7

5.2.4 Auxiliars addition

I talk about auxiliar deletion in the ~~First-person → Third-person conversion~~ section. Naturally, in the opposite direction, the auxiliars need

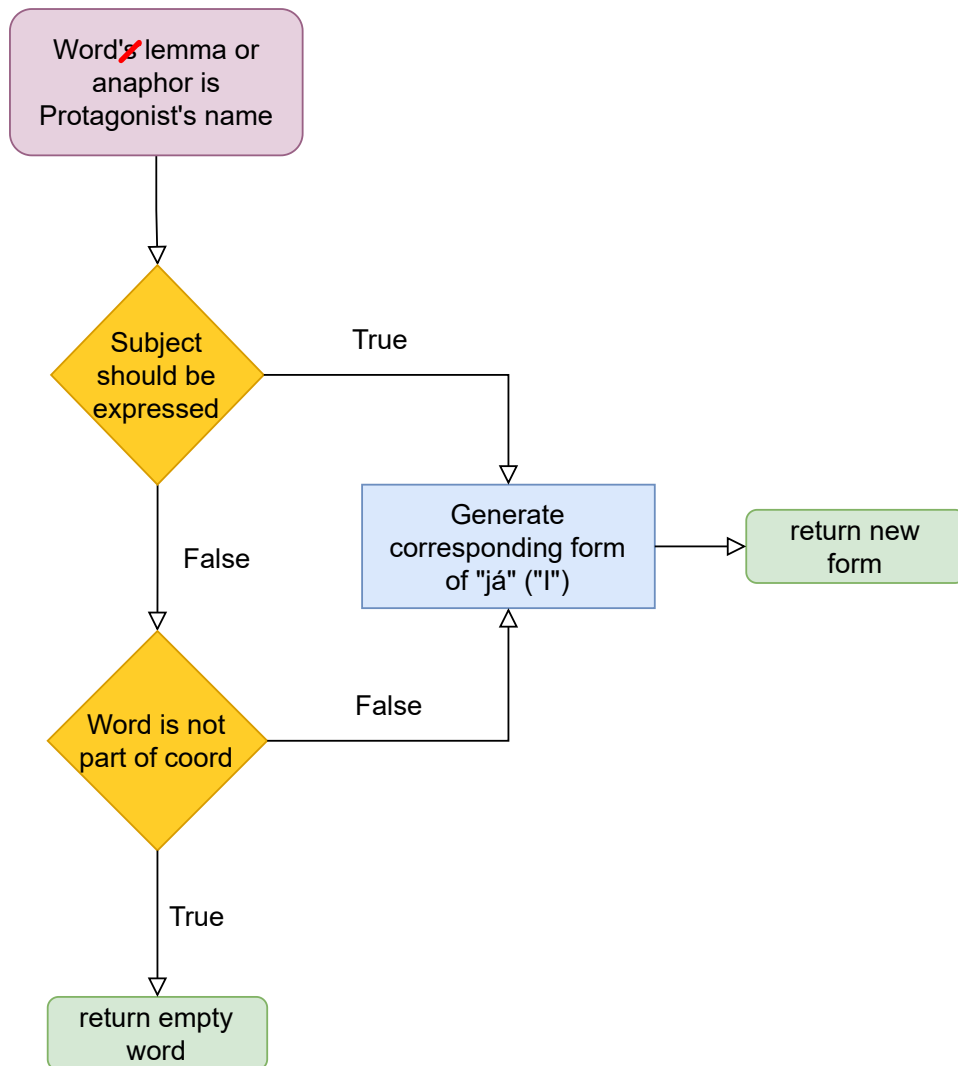


Figure 5.5: Rule replacing or skipping the occurrences of protagonist's name

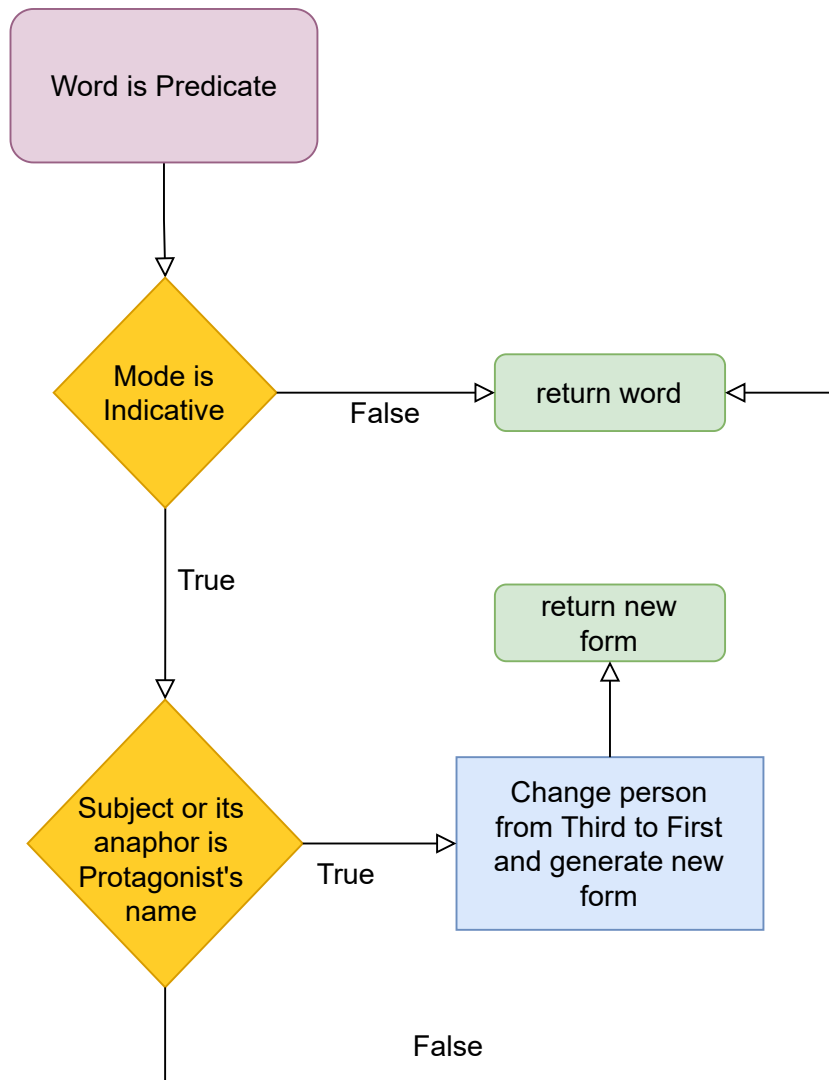


Figure 5.6: Rule covering the predicate replacement

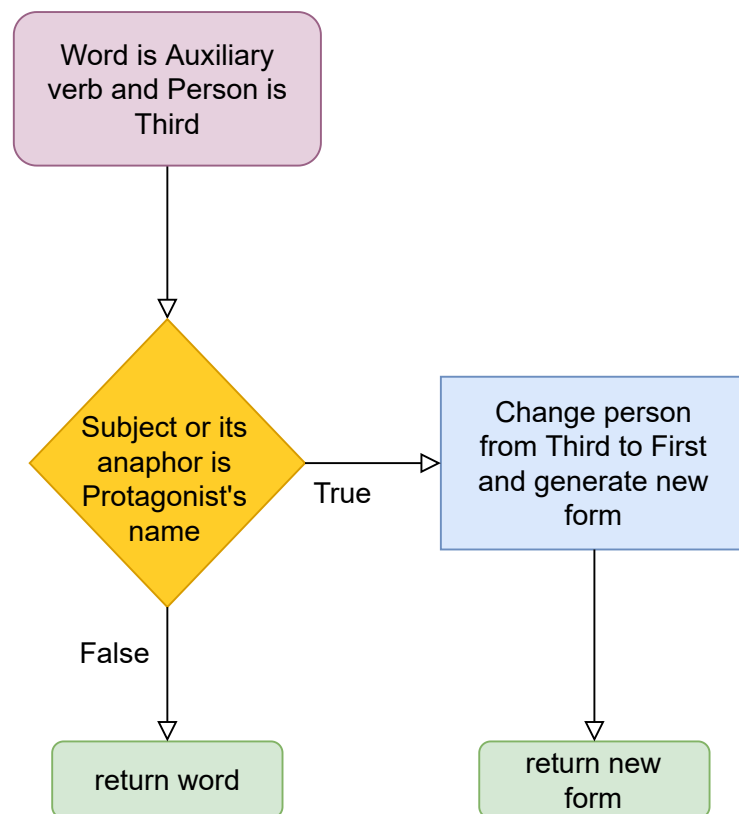


Figure 5.7: Rule replacing the conditional auxiliars

to be added. Thus, the rule considers the participles. For each predicate expressed as a participle, we find the subject. If the subject refers to the protagonist, an auxiliary verb would be added.

Figure 5.8 illustrates this rule.

5.2.5 Personal pronouns

This rule covers the conversion of personal pronouns. The goal is to replace the pronouns which refer to the protagonist with a personal pronoun in the first person, as shown in the figure 5.9.

5.2.6 Possessive pronouns

As you can see in figure 5.10, the process of replacing possessive pronouns is almost the same as the previous one. Nevertheless, finding whom the pronoun refers to is more complicated.

5.2.7 Conjunctions

The rule is not applied directly to the conjunction but only retrospectively when applying the rule for adding auxiliary verbs, as can be seen in Figure 5.11.

5.3 Direct speech

The last rule is independent of the person, and it covers the processing of direct speech. The simplifying assumption is that the direct speech is in quotes. Therefore, all the text found in quotes should be ignored during the conversion process.



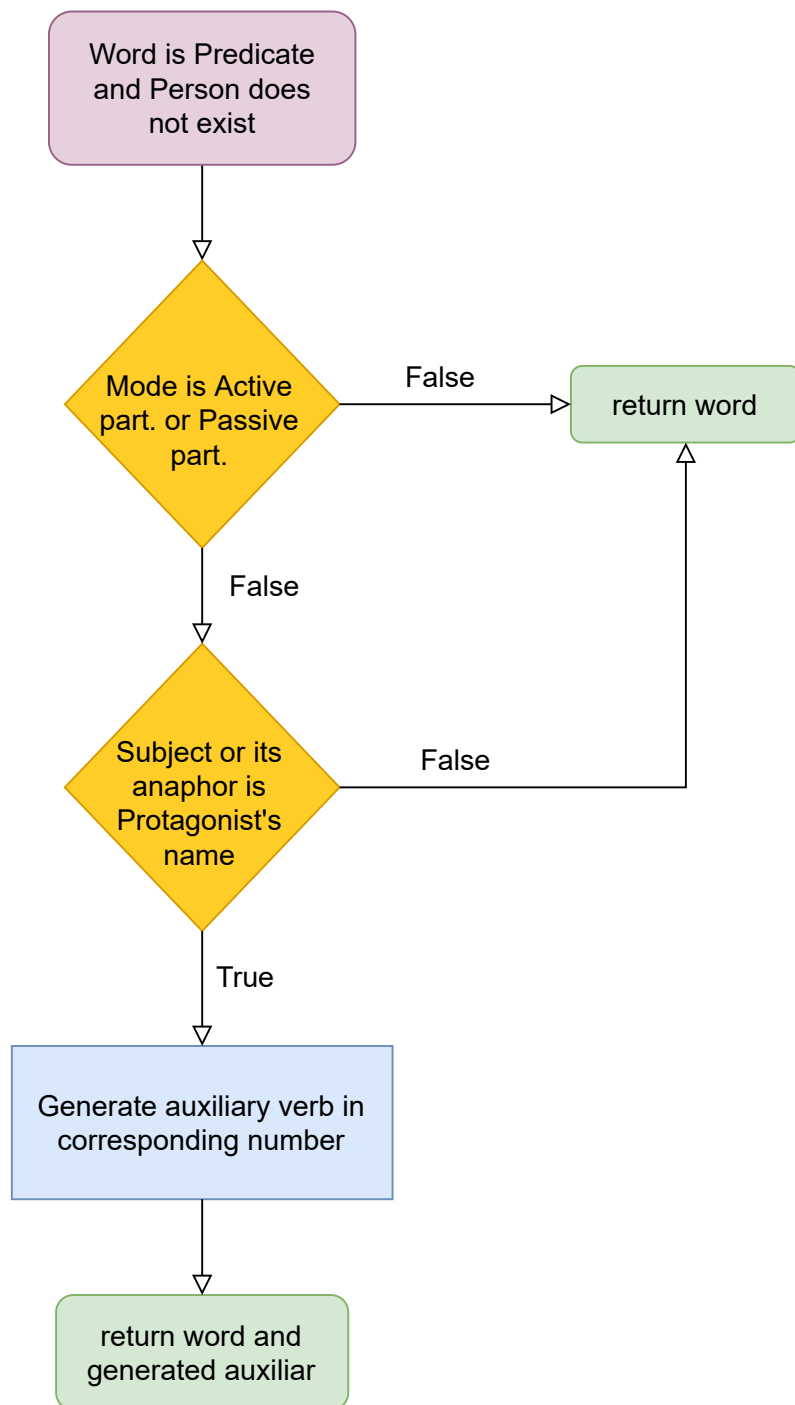


Figure 5.8: Rule adding the auxiliars to the sentence

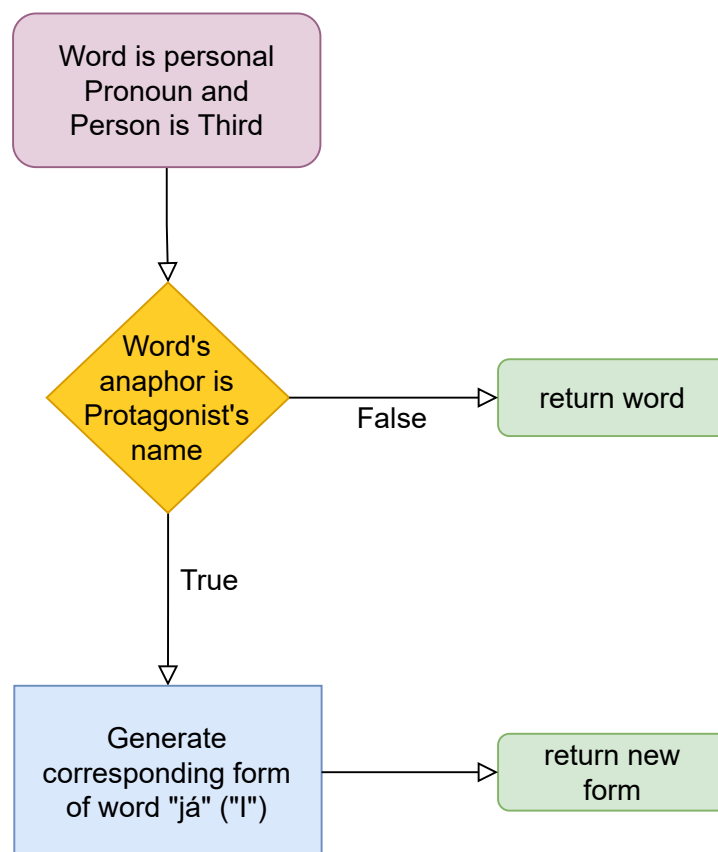


Figure 5.9: Rule replacing the personal pronouns

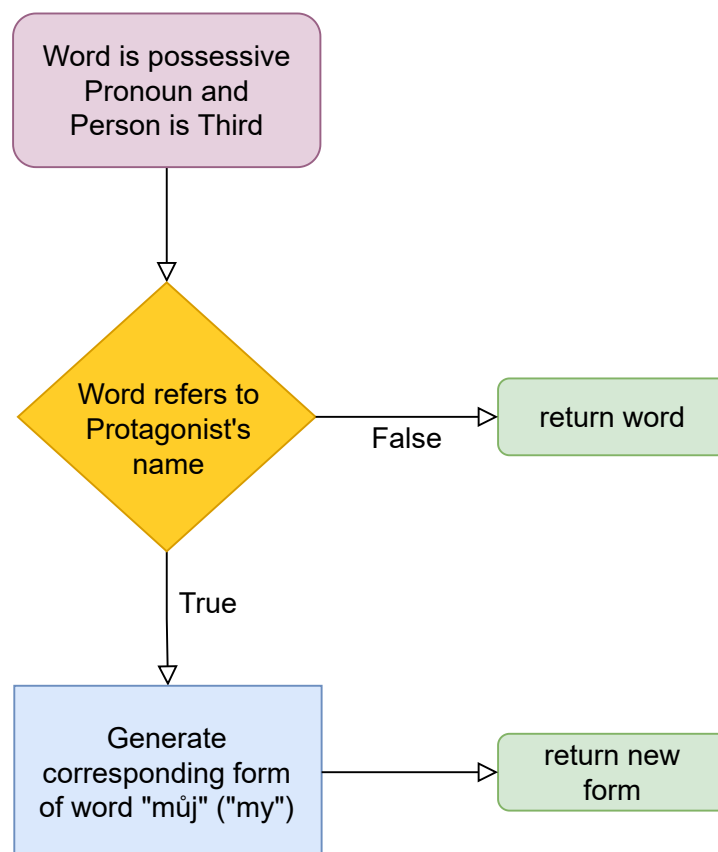


Figure 5.10: Rule replacing the possessive pronouns

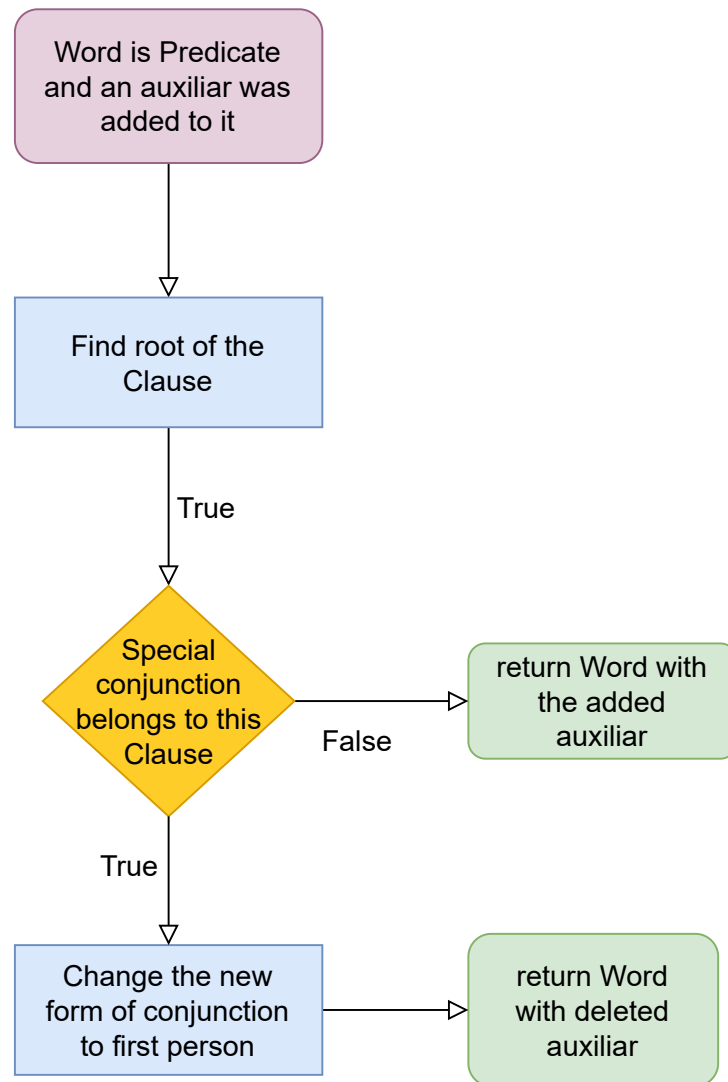


Figure 5.11: Rule replacing the special conjunctions


6 RephrasErIch

In this chapter, I describe the implementation of the tool *RephrasErIch* which converts a given text between first-person and third-person narratives, and I present other tools that I used in the implementation.

6.1 Tools used

6.1.1 SET



As mentioned before, syntactic analysis is needed for narrative conversion. From the existing Czech syntactic analyzers, I decided to use analyzer *SET*. The main reason why I chose this analyzer is my previous experience with using this tool and its ability to produce dependency trees.

 SET is implemented in the Python programming language. Although *RephrasErIch* is also written in this programming language, it would be challenging to integrate the tools since *SET* is implemented in the old Python version, Python 2. For this reason, the tools communicate with each other through the command line. The communication is handled by a class *Syn*.

6.1.2 Majka

Majka [4] provides a morphological analysis. The tool is able to:

- assign lemmas and tags to words
- generate all correct word forms and tags for a given lemma
- generate a word form according to a given lemma and tag

RephrasErIch uses *Majka* directly, mainly for the third use case. *Majka* is written in C language. Therefore my tool contains a class *morph* which calls *Majka*  binary code from a  command line and processes the output.

6.1.3 Desamb

Desamb is a morphological disambiguator using Majka as a morphological tagger. Majka finds the set of lemmas and tags to the given word, then Desamb chooses the most appropriate lemma and tag. Unlike Majka, results also depend on the word's context, which is essential for correct tagging.

In my implementation, I use Desamb to generate an input for syntactic analysis.

6.1.4 Aara

The last task that I use external tools for is *anaphora resolution*. Anaphora resolution is a problem of resolving what a pronoun refers to earlier or later in the discourse. For instance, the resolution of a sentence: *Jacob saw his dad in the school* would tell us that *his* refers to *Jacob*.

There are few tools for Czech anaphora resolution, and the existing ones do not perform very well. Still, anaphora resolution is required for third-to-first conversion. Thus I decided to use a tool *Aara*. Usage of Aara is provided by a class *Anaph*, which is run from a command line for the same reasons as SET.

6.2 Class structure

The tool is implemented as a Python library. The library consists of six important classes. It is easier to identify at which linguistic level the problem occurred by decomposing the processes into different levels. It allows parts of the text to be easily put back together, and I found the object representation to be a straightforward way of storing information from the various analyses. In this section, I briefly describe these main classes and their interactions.

6.2.1 RephrasErIch

RephrasErIch is the highest class of the implementation which represents the tool itself. It keeps three attributes:

- `from_form` – the narrative form we would like to convert from

- protg – a story protagonist
- text – a given text, an instance of a class Text

The essential method is a method `rephrase` which creates an object representation of the given text and starts the narrative conversion.

6.2.2 Text

Class Text is an object representation of text data to be converted. When constructed, the text is divided into paragraphs. The paragraphs are being kept as a list of Paragraph objects.

6.2.3 Paragraph

Just as text is divided into paragraphs, a paragraph is divided into sentences. Besides the division, the class Paragraph is responsible for direct speech preprocessing and anaphora resolution.

After the direct speech has been processed and the anaphors resolved, the `create_sentences` method is called. This method segments the paragraph and creates a list of Sentence objects.

6.2.4 Sentence

Class Sentence takes a text version of a given sentence and a dictionary of anaphors related to the sentence. At the sentence level, the syntactic analysis is performed. A sentence is represented as a dependency tree generated by SET and Desamb. Every node of this tree (usually a word) is an instance of a class Word.

6.2.5 Word

The basic unit of this recursive class structure is class Word. After performing the higher-level analyses, the word now has all the information needed to be converted: protagonist, anaphors, direct speech, position in the sentence tree, word's lemma, etc.

At the word level, finally, the narrative conversion is being done. The word generates a new form as it applies the earlier proposed rules.

6.2.6 Protagonist

The last important class I have decided to mention is the Protagonist. This class stands out somewhat from the whole class structure, but at the same time, it is passed by across all the other classes. It keeps the information about the story protagonist, which is essential to the conversion process.

6.3 Conversion Rules Implementation

This section describes the implementation of the rules introduced in Chapter 5.

For clarity, the implementation of the rules is divided in two files (`erich_rules.py` and `icher_rules.py`¹) according to the conversion direction. Each rule is implemented as a Python function. These functions are called inside methods of the `Word` class. (`word._ich_to_er()`, `word._er_to_ich()`) As can be seen in Chapter 5, each rule starts with an assumption (e.g. as *Word is Auxiliary verb*). These assumptions are represented by conditions inside the `Word` methods. If a condition is evaluated as true, the relevant rule is called, and the return value is set as the new form of the word. Thus, there are two steps needed to add a new rule to the implementation:

1. Define the rule as a function in `icher_rules.py/erich_rules.py`.
2. Add the initial assumption as a condition to the corresponding `Word` method and call the rule function in that block.

Notes to the implementation of the rules

I note that not all of the proposed rules could be implemented. The tool does not include a rule replacing possessive pronouns when converting from third-person to the first-person narrative. This is because of the limitations set by Aara, which is currently unable to assign references to possessive pronouns.

1. The terms *ich* and *er* come from German, where *ich* means *I* and *er* means *he*. These terms are also used in Czech to refer to first-person and third-person narratives.

6.4 How to Use the Tool

Currently, RephrasErIch's use is limited by several factors:

- RephrasErIch works only on Unix due to the command line execution of some programs.
- The use of the tool assumes running on the NLP Centre of the Faculty of Informatics machines, which have access to the center's other projects.² Otherwise, it would be necessary to install the external tools mentioned in Section 6.1.

~~As stated in the introduction of this thesis, the goal was not to create an application for ordinary users, so I do not consider these limitations too serious at the moment.~~

I illustrate the usage of the tool in the following code, which should be placed in the `main.py` file.

```
import sys

sys.path.append('./enums/') # enumeration
                             classes, such as Forms
sys.path.append('./classes/') # the six classes
                              mentioned in section 6.2
sys.path.append('./tools/') # classes handling
                             communication with external tools

from RephrasErIch import RephrasErIch
from Forms import Form

text = "Petr chce, aby Anna plakala."

rerich = RephrasErIch(Form.ER)
rerich.create_protagonist("Anna")
rephrased_text = rerich.rephrase(text)
```

As can be seen, five main steps are needed to convert a text:

2. More information can be found at nlp.fi.muni.cz

1. Add all the necessary paths to subdirectories. In the example, I use a module `sys` to do so.
2. Import the classes being used.
3. Initialize an object (`rerich`) as an instance of the class `RephraserIch` with declared original narrative form of the text.
4. Create an instance of the class `Protagonist`.
5. Call the method `rephrase(text: str)` on `rerich` with the text to rephrase as an argument.


If we print the content of the variable after the program has finished, we might get the following output:

```
> Petr chce, abych plakala.
```

7 Evaluation

7.1 Evaluation Corpus

For evaluation, I have constructed my own text corpus. The corpus is composed of texts written by contemporary Czech authors who provided the texts themselves. The corpus is intentionally small as humans did the evaluation, and evaluating a large set of sentences would be expensive.

In selecting the texts, I tried to capture various characteristics of the texts. Thus, the corpus consists of several different literary genres; the narrators are both male and female; I have included texts written in the present and past tense, and I have chosen texts containing different types of speech, (such as direct speech,  ni-direct speech). Finally, the corpus, of course, includes both first-person and third-person narratives.

In total, the evaluation data consists of 36 different texts composed of 388 sentences. The numbers divided by narratives are captured in chart 7.1.

Number of input texts and sentences

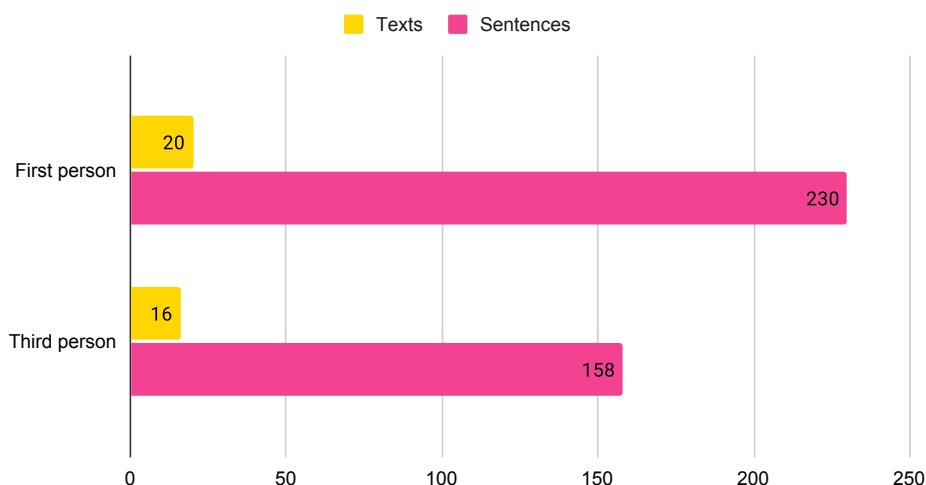


Figure 7.1: Statistics about the corpus

7.2 Annotation Process

As mentioned in the previous section, human annotators evaluated the sentences manually. The annotators have got: the person the text is converted from, the name of the protagonist, the original text, and the rephrased text. After reading the texts, an annotator could mark one or more statements for each sentence as true.

The possible statements to mark:

- The sentence is converted correctly, without grammatical errors, sounds natural, and is unambiguous.
- The sentence has lost its unambiguity.
- The word order is unnatural, or there are other unnatural sounding elements in the sentence.
- The sentence contains grammatical errors.
- Some parts of the sentence are converted correctly, and some are not.
- The sentence is not converted correctly or not converted at all.
- The sentence has not been converted, and that is correct.

The evaluation's non-binarity also offers a basic error analysis, which gives us a basis for discussion about the quality of generated texts.

7.3 Results

Based on the marking, I retrieved the results statistics.

As can be seen in figure 7.2, most of the sentences were converted correctly, which also includes not converting the sentence at all (about 66%). Only 17% of the 388 sentences were converted incorrectly, partially, or entirely. The remaining 17% are sentences that were converted correctly. However, the conversion damaged the text's quality (naturalness of expression, unambiguity, or grammar).

~~Now let us take a look at the results for each narrative mode.~~



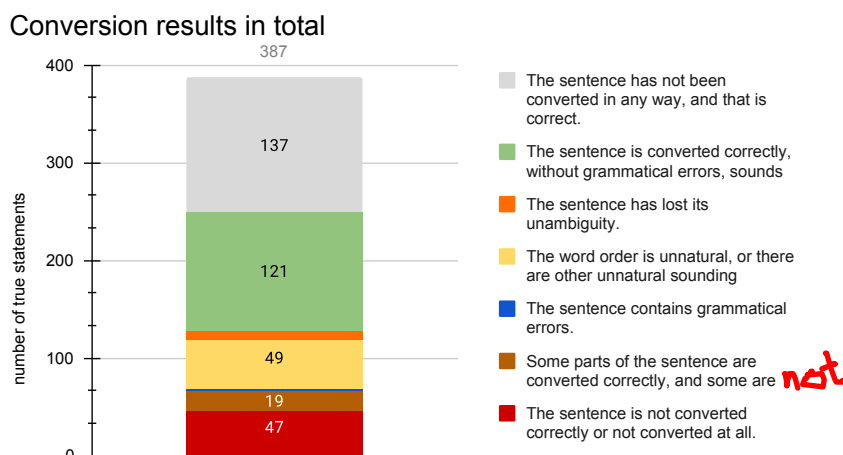


Figure 7.2: Results statistics in total

7.3.1 First-person to Third-person results

Figure 7.3 shows very good results for the first-person narrative to third-person narrative conversion. Less than 5% of the sentences were converted partially or completely incorrectly. Moreover, about 82% of the remaining sentences were converted (or not converted) without any quality loss. The most common problem was unnatural word order.

In Table 7.1, I show examples of rephrased sentences with the assigned results.

7.3.2 Third-person to First-person results

On the other hand, figure 7.4 illustrates quite a different picture. The third-to-first conversion direction delivers poor performance results. Notice that the number of completely incorrect sentences is ~~very~~ high (more than 25%) even when considering the fact that 68 sentences were not affected by the conversion at all. The reasons for these poor results are further described in Section 7.4.

Examples of the sentences are shown in Table 7.2.

First-person to Third-person conversion

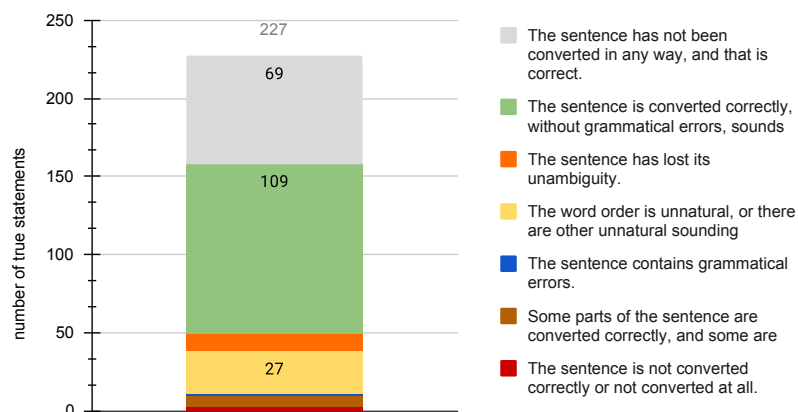


Figure 7.3: Results statistics for first-person to third-person conversion

Third-person to First-person conversion

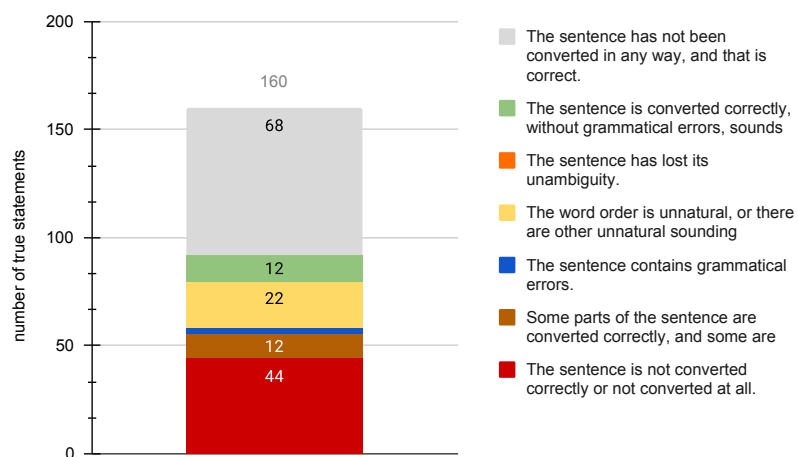




Figure 7.4: Results statistics for third-person to first-person conversion

Table 7.1: Examples of rephrased sentences from first-person to third-person narrative

result	original sentence	rephrased sentence
Correct	Mám sto chutí sebou trhnout a vysvobodit se z doteku jeho horkých prstů, ale vím, že mi to pouta nedovolí, a i kdybych je neměla, zřejmě by na to moje tělo nenašlo sílu.	Majka má sto chutí sebou trhnout a vysvobodit se z doteku jeho horkých prstů, ale ví, že jí to pouta nedovolí, a i kdyby je neměla, zřejmě by na to její tělo nenašlo sílu.
Ambiguous	<i>Odvrátila jsem pohled z ráje a uviděla Evu. Následovala mě.</i>	<i>Odvrátila pohled z ráje a uviděla Evu. Následovala ji.</i>
Unnatural	Byla jednou z mála lidí, se kterou jsem se sblížil.	Byla jednou z mála lidí, se kterou Gabriel se hodně sblížil. 
Grammar error	Sdílela se mnou jídlo.	Sdílela se jí jídlo. 
Incorrect	Její obličej nerozeznám, ale slyším, že pláče.	Její obličej nerozezná, ale slyším, že pláče.



7.4 Errors and How to Fix Them

In this section, I provide an error analysis. I examine the causes of the errors and discuss their solvability. The errors are divided into two groups: 1) incorrect conversion and 2) text quality lost.

7.4.1 Conversion Errors

As mentioned in the previous section, most conversion errors come from the third-to-first conversion. Since this direction is much more complicated than the other way, the poorer results are not surprising. In contrast to first-to-third, when converting a text from the third-person narrative, we need to recognize the protagonist who should

Table 7.2: Examples of rephrased sentences from third-person to first-person narrative

result	original sentence	rephrased sentence
Correct	Král a královna osaměli.	Král a já jsme osaměli.
Unnatural	Hana se na ni dívala a čekala.	Se na ni  jsem dívala a čekala.
Grammar error	Eva byla ráda, že se matka nechala přesvědčit, aby utekly.	Já byla ráda, že se matka nechala přesvědčit, aby jsme utekly.
 Incorrect	Hana má pocit, jako by prošvihla nějakou několikaměsíční akci, kde se všichni mezitím seznámili.	Mám pocit, jako by prošvihla nějakou několikaměsíční akci, kde se všichni mezitím seznámili.

become the narrator and change all the words whose form depends on this protagonist. This task should be handled by anaphora resolution. Nevertheless, the performance of Aara is poor. Thus, it affects RephrasErIch. The considerable difference between first-to-third and third-to-first results confirms this issue since anaphora resolution is not used in the first-to-third conversion.

A solution to this error is beyond the limits of the tool. Aara would have to be improved or replaced by better performing tool.

7.4.2 Text Quality Errors

Word order

Unnatural word order is the most common quality error. It was usually caused by adding or removing words during the conversion. It mostly includes:

- **Adding or removing a subject.** Example: *Adam věří jim to*. The original sentence here was *Věřím jim to*. and the tool added the protagonist's name at the beginning of the sentence. However, the

other words should be reordered to sound natural: *Adam jim to věří.*

- **Adding or removing an auxiliary verb.** Example: *Konečně se jsem mohla rozesmát.* The auxiliary verb *jsem* was added to the original sentence *Konečně se mohla rozesmát.*. In Czech, it is natural for reflexive pronoun *se* to come after the auxiliary: *Konečně jsem se mohla rozesmát.*

Word order in Czech is not entirely free, but it is variable. It is applied mainly by the role of the sentence members but also by the rhythmic principle and other circumstances. Often, the word order is determined semantically. Their informativeness and expressive dynamics influence the order of the sentence members, and it also depends on the type of sentence. [9] This semantic principle would be challenging to implement in the tool. On the other hand, most words remain in the same order after rephrasing, so I believe that semantics has a relatively minor influence on unnaturalness.

Another principle mentioned is the rhythmic principle. The rhythm of a sentence is mainly influenced by the position of unstressed clitics, such as short forms of personal pronouns (*mě, mi, ho, mu...*), reflexive pronouns (*se, si*) or auxiliary verbs (*jsem, bych, by...*). [9]

The relative order of clitics is quite precisely defined. Thus, adding a few rules might help the tool generate more natural sentences.

Prepositions

Some prepositions in Czech have both vocalized and non-vocalized forms. The vocalized (longer) versions are used mainly for easier pronunciation. Usually, when the word after the preposition begins with the same consonant or a sequence of several consonants. However, it may also depend on other factors, such as rhythm. [9]

For instance, ~~let us have a sentence~~ *Táta šel k ní.* ~~Converting the sentence to the first-person narrative, we get~~ *Táta šel k mně.* However, that is unnatural, and it is harder to pronounce – we would rather write *Táta šel ke mně.* This also applies in vice versa.

Currently, the tool does not change the prepositions when the following word converts. However, this issue would be solvable, at

least for cases where the word begins with the same consonant or multiple consonants.

Proper nouns, unnaturalness, and ambiguity

When rephrasing, the tool decides in some processes whether to add the proper name of the protagonist instead of the unexpressed subject or pronoun, especially when converting from first to third person. One reason for this addition is to avoid ambiguity. However, this decision is made randomly, leading to the unnaturalness of the text and ambiguity problems.

The **unnaturalness** occurs when a proper name is inserted in the wrong place in a sentence.

An example may be the following sentence: *Rozhodl jsem se, že půjdu na nákup*. RephrasErIch generated an output: *Rozhodl se, že Adam půjde na nákup*. The sounding would become natural if the proper noun (*Adam*) would stand in the first phrase of the sentence or nowhere. Also, overuse of the name can be unnatural.

In contrast to unnaturalness, **ambiguity** occurs when a proper name is not inserted. In the first-person narrative, the grammatical person identifies whom the word refers. However, by conversion, we lose this identification. Hence the need to add a proper name to clarify the meaning.

It is a matter of considering where to draw the line between naturalness and ambiguity. Using a proper name in every phrase would lead to perfect unambiguity, but such a sentence would sound highly unnatural. That is the reason why the tool adds the name only with some probability. Nevertheless, it might be helpful to implement a more intelligent decision algorithm, which would consider the position of the phrase in the sentence and further context.

8 Conclusion

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A Appendix