GERMAN FOCUS PARTICLES AND INTONATION

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ABSTRACT
Spoken German uses far fewer pitch accents than standard American English. It is commonly assumed that German makes use of focus particles to achieve a comparable gradation of meaning (e.g. depending on context, ‘only’ can be translated by “allein”, “erst”, “noch” or “nur”). There are two interacting aspects that are examined in this work. The first aspect is the disambiguation of particles i.e. the decision on the basis of intonation patterns and syntactic information whether the particle is a focus particle or not. The second aspect is the analysis of the intonation patterns that are assigned by focus particles and of the semantic influence on these intonation patterns. The interaction between these different aspects will be discussed.

1. INTRODUCTION
An important challenge in speech synthesis concerns the naturality of synthesized speech. Intonation plays a big role if speech is judged natural or monotonous. There are several ways of assigning pitch accents to synthesized speech: e.g. one is a rule-based assignment another way is an algorithmic assignment of pitch accents. Möhler and Conkie (1998) [10] for example choose a pitch accent out of a set of pitch accents and place them on words. This leads to quite good intonation patterns. However, semantic aspects does not influence this decision. Intonation is regarded to influence the meaning of a sentence (Mayer 1997). It would be very useful if it would be possible to control semantic information by triggers that point to a specific intonation pattern. Focus particles seem to provide the information to control semantic information by triggers that point to a specific intonation pattern. Focus particles seem to provide the information that the following lexical head is the focus of the sentence or part of sentence. As intonation is a complex topic and different aspects are influencing each other, one way to examine this complex phenomenon is to look at real data. Although there is a wide variability in intonation the aim of this study is to extract the main intonation contours from the spoken data.

2. THE DATA
As this study is a data-based approach I examined a spoken database consisting of four hours acted speech, two hours of a feature series and one and a half hours of news stories. Out of this database I chose those sentences that comprised at least one particle. Unfortunately, there are homonymous expressions that looks exactly the same as their counterparts, the focus particles. Thus, pitch accents were found that can be used for disambiguation of homonymous particles.

3. GERMAN PROSODIC ANNOTATIONS
The intonation contour was labelled by the German Tone and Break Indices (GToBI(S)) which was developed at the university of Stuttgart. GToBI(S) is a labelling system for the transcription of German intonation. It is based on the Tone Sequence Model (TSM) that was first introduced for English by Pierrehumbert (1980) [12]. In the beginning of the nineties the TSM was implemented by a research group around Pierrehumbert and Beckman [13] resulting in the ToBI - Tones and Break Indices - labelling system. The TSM for German was developed by Féry [2] in 1993.

3.1 GToBI(S) [9]
3.1.1 Boundary Tones In GToBI(S) only the position but not the tonal specification of terminal intermediate phrase (ip) or intonational phrase (IP) boundaries is marked. The tonal specification can be derived from the trailing tone of the phrase-final pitch accent. It is sufficient to label:
- a “+” for ip boundaries, which is interpreted as H- and
- a “%” for IPs interpreted as H%.

After a falling pitch accent (a L-trailing tone) with the contour staying low then “=” is interpreted as “L-” and “%” as “L%”. If the contour rises nevertheless then, according to Féry’s analysis, a real “H%” boundary is labelled. There are the following terminal boundary categories left in GToBI(S):
- **ip boundaries -
- **IP boundaries without terminal tone: %
- **IP boundaries with rising terminal tone (only after falling nuclear accent): H%

3.1.2 Pitch Accents The pitch accents of GToBI(S) are identical to the categories that are introduced in Féry (1993) [2]. There are five accents1: H*L, L’*H, HH’*L, L’*HL and H’*M.
- **H’*L ‘Peak Accent’. It is a high target (local fundamental frequency maximum) in an accented syllable, followed by a steep pitch descent into the lower third of the pitch range (L-target). If the accented syllable is the last syllable of the phrase, then the H-target is also within in the accented syllable, in all other cases the low target is reached after the accented syllable (The exact position depends on speech velocity as well as syllable and segmental structure).
- **HH’*L ‘Early Peak’. There is a H-target in the preaccented syllable followed by a steep or gradual pitch descent. This accent has to be realized over at least two syllables (the preaccented and the accented one). HH’*L can only be used when the preaccented syllable is a metrically weak syllable, meaning it can not be stressed.
- **L’*HL ‘Rise-Fall’. An early L target in the accented syllable followed by a pitch peak (H target) and a steep pitch descent (L-target). If the accented syllable is not phrase-final (this does not occur very often, since there is usually an ip boundary immediately following an L’HL), the three tonal targets can spread over three syllables. However, L’HL frequently spreads over only two syllables or just one long syllable. Thereby the position of the H target depends strongly on the segmental structure of the syllables.
- **L’*HL is an interesting pitch accent. The perceptive impression is that the speaker uses this pitch accent in order to express a contrastive focus or s/he tries to lead the listener’s attention to this part of information. The L’*HL usually is realized on one syllable and is one third higher than the pitch accents around it. Normally in a paragraph the peaks of the H-suffixes/prefixes can be combined and they form a falling line. The L’HL tops this invisible line. Furthermore it seems that the L’HL can overwrite

1GToBI(S) does not imply the symbol “+”. A star is followed by the standard notation “*”. The positions of all other tones depend on that of the starredtone: they are either leading tones (prefixes) or trailing tones (suffixes). Therefore H’*L is equivalent to H’*+L etc.
a H*L. The sentences could be made with a H*L as well but the speaker uses a L*HL because of personal intentions (e.g. emotive purposes):

- H*M: 'Stylization'. H*M can only appear in nuclear position. The pitch contour ends in the middle of the pitch range. Rarely appearing pitch accent. The labels H*, L*, L and H are used to represent linking processes. As they do not appear in the presented examples they were just mentioned here. In Mayer 97 [9]
  - L*/H: Partial Linking.
  - H*: Complete Linking.
  - L*: Complete Linking.

As in ToBI the symbol "!" denotes downstep. It only can appear before non-phrase-initial H tones.

GToBI(S) is a phonological transcription system. The main purpose of this system is not the adequate description of the fundamental frequency contour. Various smoothing algorithms can take over this task. GToBI(S) tries to annotate only those events that are categorical and interpretable. While GToBI(S) is a phonological transcription system. The main purpose of this system is not the adequate description of the fundamental frequency contour. Various smoothing algorithms can take over this task.

3.2 The Meaning of Pitch Accents

The present study attempt to interpret these labels. The semantic head of the phrase is "zerbrechlich" (fragile) which receives the new information H*L-tone.

The second Sternzeit-example (2) [14] is about the beauty of spiral nebulas. The speaker called them cosmic spinning tops. The forms seem to be ‘almost fragile’ (German original is: “beinahe zerbrechlich”).

The subsequent Sternzeit-example demonstrates the case where a L*HL pitch accent appears instead of a H*L pitch accent (L*HL is described in section 3.1.2 in more details). The different types of molecules in outer space are described. The speaker did not expect that amino acids belong to the set of molecules that exist in outer space. “Aminosäuren” (amino acids) gets a L*HL-tone in order to mark that even this element belongs to the set of molecules that exist in outer space.

4. PARTICLES

The particles can not be treated as a single group. Most focus particles have a different number of homonyms. However, if they are identified as focus particles the same phenomena can be found. Firstly, I would like to present the focus particles and their influence on intonation. In this paper I examined the following six different focus particles: "selbst" (even), "noch" (finally), "nahezu" (almost, nearly), "beinahe" (almost, nearly), "fast" (almost, nearly), "nur" (only). It is to be expected that all other focus particles act like these exemplary examined ones.

4.1 Focus Particles and their phenomena

In this function all six particles are subject to the same phenomena.

4.1.1 Focus on the Semantic (lexical) Head

If the information is new a falling pitch accent (H*L) is generally found on the lexical head. The particle "Sternenzeit" (light years) received a new information H*L-tone. The H*L H-tone means the information is salient and new and the L-suffix means that it is not specified if the information is complete.

The first example describes the discovery of a supernova. A Canad-ian astronomer studied some photographs of the Greater Magelian Cloud. He discovered a very bright star that had not been observed before. The star could be seen with naked eyes even from a distance of 170000 light years (German original is: “selbst aus einer Entfernung von 170000 Lichtjahren”). The semantic head "Lichtjahre" (light years) receives a new information H*L-tone. The L*H L-tone means the information is incomplete, open-ended fundamental frequency contour. Various smoothing algorithms can take over this task. GToBI(S) tries to annotate only those events that are categorical and interpretable. While GToBI(S) is a phonological transcription system. The main purpose of this system is not the adequate description of the fundamental frequency contour. Various smoothing algorithms can take over this task.

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- HL tops the top line in order to contrast it with the following H*L.

(1) GE: [Selbst aus einer Entfernung von 170 000 Lichtjahren]
L*H L*H L*H L*H L*H %

Even from a distance of 170 000 light years, one make out the supernova with the naked eye.

EN: Even from a distance of 170000 light-years, one make out the supernova with the naked eye.

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(3) GE: [Selbst Aminosäuren] zählen dazu
L*HL %

Even amino acids include this

EN: Even amino acids are included.

4.1.2 Focus on the Modification

If the semantic head of the phrase was mentioned before and only the modification is new information then the falling pitch accent H*L (or the related pitch accents HH*L, !H*L) appears on the modification (the pitch accent "wanders" to the new information). This phenomenon is mentioned by Jacobs [6] and later by Kuhn [8] as deaccenting which expresses the influence of context on intonation. In the following Sternzeit-example [14] ”meisten anderen Sternen” (mostly all other stars) were mentioned before thus the semantic head after “nur” (only) did not get the falling pitch accent but the preceding modification which provides the new information.

2May be thats why the L* HL tops the top line in order to contrast it from a H*L

3Either the speaker did not expect that amino acids are in outer space or s/he thinks that the listener do not expect it.
4 Provided that it does not start with a capital letter, or is preceded by 'von'.
The particle "nur" (not yet) - Negation of "schon" (already)
Description: The addressee understands the event has not happened yet. If there is a H’ L pitch accent on “noch” itself, then it signals an expectation that the event will happen soon (contrast accent).

The phenomena are not different from focus particles as described before (this is the case also for “immer noch” (still) as well as “immer noch nicht” still not.

Conjunction “Weder [...] Noch” (Neither Nor)
Description: The addressee understands the states/event as an negated enumeration of at least two events. Both states/events are not going to happen.

All examples agree in the L’ H-tone on the semantic head after “weder” (neither) and in 5 of 8 cases there was a falling tone on the semantic head that was following “noch” (nor).

4.2.3 Nahezu, Beinahe, Fast “Nahezu, beinahe, fast” can be grouped together. The phenomena in the function as focus particles has already been described in chapter 4.1.1. Moreover can be used synonymously in the the construction “fast/beinahe/nahezu so [...] wie” (almost as [...] as).

“Nahezu, Beinahe, Fast” (Almost, Nearly) as Focus Particle
Description: The addressee understands “nahezu NP” as an NP1, whereas NP1 is a subset of NP (but NP1 is not the same as NP) and NP minus NP1 is small 5

Comparison “Fast so [...] wie” (almost as [...] as)
As there are only two examples in the corpus, it is not possible to give a conclusive analysis of the comparison use of “fast”. Nevertheless there seems that there is a particular intonation pattern. There was a high pitch accent on “fast” as well as a rising tone on the adjective. This points out that the compared element gives the main information, for example so alt wie x (as old as x).

‘Fast’ as Adverbial
“Fast” as an adverbial occurs at the end of a sentence. It is similar to an idiomatic expression.

(6) GE: Wir haben es fast. Wir haben fast.
EN: We’re almost there. We’ve almost finished

4.2.4 Nur The particle “nur” can be used as a focus particle, as a modal particle, as a restrictive conjunction or as a multipartite conjunction.

“Nur” (Only) as Focus Particle
Description: The addressee understands the focus of “nur” as a singular choice out of a sets of alternative choices.

“Nur” (Just)
Description Modal particles are used to modify a statement and are mainly used in colloquial language. The speaker (or writer) expresses his/her amazement, doubt, resignation or annoyance.

Unfortunately, the small number of examples does not allow to detail analysis of “nur” in the function as modal particle. However, some hints that there was found rising tones on on “nur” itself and on the semantic head after the particle.

“Nur” (But) as Restrictive Conjunction
Description: The addressee understands the whole event (the sentence) as a restriction of another event that was mentioned before in the context. If “nur” (just) occurs at the beginning of a phrase followed by a finite verb, then “nur” is used as a conjunction. If “nur” is followed by an infinite verb and a comma, then it is about a topicalized focus particle.

• “Nicht Nur” (Not Only) as Multipartite Conjunction
In the construction “nicht nur [...] sondern” (not only [...] but) there is a particular intonation pattern. “Sondern” (but) makes a high tone (a H’ or a H±1) to contrast to the facts mentioned before. There was found only one example in the data.

5. DISCUSSION
This study is a starting point in the examination of focus particles and their influence on intonation. I was interested in finding triggers for typical German intonation contours. Focus particles were assumed to deliver this kind of information. Thus, I examined the surrounding of focus particles on spoken data. I observed two main phenomena regarding focus particles: generally a falling pitch accent on the lexical head of the subsequent phrase or if the information was mentioned before a falling pitch accent on the modification. There is no falling pitch accent on the focus particle itself.

Furthermore, some particles can be separated from focus particles because of pitch accent. For instance, if “selbst” bears a falling pitch accent it used as a reflexive pronoun.

There is much more to say about focus particles, but to make statements about the data that was available, it seems that all focus particles suffer from the same phenomena.

Particle accumulation should be subject to further studies. Some remarks on this topic can be found in M¨oller (1998) [11]. Focus particles can be modified by other focus particles and it is far too much to say something about them in this study.

REFERENCES
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[15] Stuttgarter Zeitung