Integrating Contrastive Focus with Givenness and Topic-Comment: A Hierarchical Focus Architecture of the Romanian Discourse-Prosody Interface

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Contrastivity-Allover Keynote: *How truthful is the intuition that behind larger (discursive, clausal) or smaller (dislocated, marked phrase) structures stand actually covert, implicit contrastive operators whose intonational-prosodic behavior should be overtly revealed, together with their corresponding background*?

***Abstract* – This paper presents the following results: (a) On the basis of an extensive overview of the currently Information Structure (IS) theories, the first goal of our paper is to update the IS terminology for the three important IS dimensions: ± Givenness, Background-Focus (also referred as Topic-Focus or Backgroud-Kontrast), and Topic-Comment (also Theme-Rheme). (b) We propose an intonational *discourse-level hierarchy* among the Contrastive Focus (First Occurrence Focus), Second Occurrence Focus, Informational (Discourse-New) Focus, and Deaccented (Discourse-Given) Focus, while the phonetic properties of the considered intonational inequalities remain to be statistically established and weighted through speech analysis for Romanian. (c) This discourse-level prosodic hierarchy is combined, in a separate and independent way, with the clause- and phrase-level intonational hierarchies driven by Sentence Accent Assignment Rules, Nuclear Stress Rule, and the more recently Sentence Break Assignment Rules. (d) Based on the intonational focus hierarchies at points (b) and (c) above, a *new architecture* for the Discourse-Prosody interface is outlined, aiming to replace the classical approaches of Topic-Focus and Theme-Rheme algorithms (which can provide only incomplete Information Structure) for prosody prediction of Romanian. (e) The notions of *explicit* and *implicit contrastive* focus are defined, and the meaningful relevance of the contrastive intonation for the Romanian finite-clauses is pointed out by significant percentages of the contrastivity phenomena on George Orwell's "1984" corpus. (f) Classes of examples illustrate and evaluate, for Romanian, the intonational-prosodic patterns of the contrastive and non-contrastive focus markers, categories, and domains.**

Keywords*: *prosody prediction, contrastive focus hierarchies; Communicative Dynamism degrees; implicit contrastive focus in Romanian; Discourse-Prosody interface.

I. Information Structure Dimensions, and Updated Terminology

A. *The Common Ground Communication Model*

The notion of *Common Ground* (CG) is essential for semantic theories on Information Structure (IS). The communicative model of CG is understood as the amount of shared knowledge between the speaker and hearer, at a certain moment [6], [9], [18], [25], [29]. A comprehensive analysis of the CG model for the IS theory is provided by Manfred Krifka [17], [9]. Worth to be mentioned the CG model initial approach of Wallace L. Chafe (1976), in a milestone article. In the CG account, two aspects are important: the CG *content* and the CG *management*. M. Krifka [17] gives coherent definitions for the IS notions of Focus, Given, Topic, Delimitation etc. in the formal framework of *Alternative Semantics* [23] and the CG communication model.

B. *Current Dimensions of the Information Structure Theory*

Three key dimensions are considered in the current IS theory [6]:

1) ± Givenness or *Givenness-Newness* IS dimension refers to the feature held by an entity present in the Common Ground (CG) database, at a certain time, within the discourse of the two interlocutors (speaker-hearer). If the entity is present in the CG, then it is denoted as a Discourse-Given entity, which bears the feature Givenness. The contrary statement in two-valued logic is false, *viz*. not all the elements in the complementary set of Discourse-Given entities are Discourse-New (bearing the Newness feature) ones: some of them are contrastively focused.

The categories displaying the feature of Givenness may be specified by anaphoric expressions, removal of the Discourse-Given entity from the context, deaccenting as well as preferential placement of the Discourse-Given entity in specific positions within the *Systemic Ordering* (SO-order) of

the clausal semantic roles [14], [11] [1]. This preferential position is language-dependent and observes that, *e.g.* for the free word order languages, the constituents bearing the Discourse-Given feature are usually preceding the Discourse-New ones in the SO-order.

There exist two types of *Newness* for the CG communication model: (*a*) an *informational Newness*, showing that the entity is a Discourse-New entity, not existing in the CG and being added now to the CG, once introduced in the discourse, and (*b*) a *contrastive Newness*, referring to the contrastive quality of the entity knowledge in the CG model. Two types of intonational Focus correspond in the IS theory to the two notions of Newness: *informational* (Discourse-New) *Focus* and *contrastive Focus*. For the contrastive Focus, the corresponding entity in CG may be either Discourse-New or Discourse-Given, either way intonationally emphasizing the existence of a semantic set of alternatives in the CG.

2) The second IS dimension consists of the pair *Background-Focus (*also referred as *Topic-Focus)*. In terms of Mats Rooth's *Alternative Semantics* [23], the *Background-Focus* pair marks the difference between the entities belonging to CG, which form the *Background*, as opposed to the *Focus*, representing the entity which is informationally and intonationally pointed out, emphasis also supported through morphology, syntax, semantics and/or pragmatics, besides intonation.

The modal-logic relationship between the first two IS dimensions is important: *Background* may have the feature *Givenness* but not *Newness*, while *Focus* has usually the feature *Newness* but, when *contrastive*, may also be *Givenness*. In a sentence, the constituents being not *Focus* must bear the *Givenness* feature. This modal behavior of the *Background-Focus* IS dimension, compared to the ± *Givenness* dimension meaning, is essential for the hierarchical focus evaluation we propose in this paper.

If in 1.a "Elena" is a constituent marked with Focus as opposed to Background entities, in 1.b "Elena" is a typical example of a constituent bearing the Givenness feature in CG, yet acting as contrastive Focus (since found in the alternation "he loved Elena, and not any other girl that might have been introduced in CG"), while 1.c contains a constituent "*Ioana*" which acts as informational Focus, since being a Discourse-New entity.

1.a. ***Elena***$_{\text{F}}$ i-a fost prezentată lui Mihai.

En: Elena was presented to Mihai.

1. b. Şi toată viaţa, el a iubit-o *numai* ***pe Elena***$_{\text{F-Contrast, Given}}$.

En: And all his life, he only loved Elena.

1. c. Şi toată viaţa, el a iubit-o ***pe Ioana***$_{\text{F-New}}$.

En: And all his life, he loved Ioana.

[1] The systemic ordering (SO) refers to a pre-established linear order of the clause constituents (i.e. semantic roles) in a standard clause. The systemic order is specific for each language.

3) The third important dimension of the IS theory relying on the CG communicative model is concerned with *Topic-Comment* (also referred as *Theme-Rheme*) clause-level structures. *Topic* ≡ *Theme* should be understood as the semantic subject introduced in the communication act (predication-level), while *Comment* ≡ *Rheme* refers to what is said or informationally emphasized about the Topic of the clause. *Topic* is also interpreted in the CG model as the pointer address where the Comment is stored [17].

Although Discourse-Given information is often linked to the *Topic* role and the prosodic prominent category of a clause *Focus* is naturally to be found within the *Comment*, this is not always the situation because the *Topic* and the information structures of a clause are generally distinct. In example 2, "*The lecturer*" is either *Topic* or *Comment* according to its intonational prominence, in each case [20].

2.a. [The lecturer]^{Topic} delivered [his speech ***today***$_{\text{F}}$]^{Comment}.

b. [The ***lecturer***$_{\text{F}}$]^{Comment} delivered [his speech today]^{Topic}.

For computing *Topic-Comment*, Firbas' approach [2] [11] describes four main interplaying factors: linear modification, context, semantics (for written text), and appended intonation (for spoken utterance). The elementary example from [21 :2]

3.a. *Vine* [*Maria*$_{\text{F-New}}$]^{Topic}.

En: Maria is coming.

3.b. [***Maria***$_{\text{F-Contrast}}$]^{Comment} *vine* {, *nu Ioana*}.

En: Maria is coming {, not Ioana}.

3.c. *Vine* [***Maria***$_{\text{F-Contrast}}$]^{Comment} {, *nu Ioana*}.

En: Here comes Maria {, not Ioana}.

illustrates the problem we are dealing with: [21] shows how to discriminate in speech the informational Focus in (3.a) from the contrastive Focus (vs. Background) in (3.b), the latter being typically expressed with (3.c).

Prosody prediction means to be able to discriminate, from the discursive context and semantics (since the word ordering is identical) in (3.a) and (3.b), which type of intonational focus each of the two identical textual structures bears. In terms of the classical paradigm of the IS dimensions, the same problem is expressed as follows: in the identical textual clause (3.a-b), how should one discriminate *Maria* as Topic (thus possible informational Focus) from *Maria* as Comment (thus possible contrastive Focus)? Steedman [16], [26] established for a sentence, starting from the analysis of its spoken utterances, a relationship between (sequences of) ToBI[3] intonational tags and the corresponding IS categories and semantic roles. This paper provides a *general architecture* relying on an updated settlement of the IS dimensions and categories, which the Steedman's function relies on, with a special emphasis on the

[2] In Firbas' approach, Topic-Comment are referred as Theme-Rheme, and he introduces also the Transition stage, such that the relation becomes *Theme-Transition-Rheme* or *Rheme-Transition-Theme*.

[3] ToBI (Tones and Break Indices) is a set of conventions for transcribing and annotating the prosody of speech (see http://en.wikipedia.org/wiki/ToBI).

intonational-prosodic behavior of the (both overt and covert) contrastive textual operators / markers.

C. Current Information Structure Terminology and Concept Correspondence

The IS terminology and concepts used in [4], [5] evolved from [2], [3], [14], [16], [26]. The pair *Topic-Focus* from the TFA (Topic-Focus Articulation) algorithm has been replaced in [4], [5] with the new pair *Background-Kontrast*, having the interpretations Topic ≡ Background ≡ Givenness (Discourse-Given entities for a certain discursive context), and Focus ≡ Kontrast ≡ Newness (Discourse-New entity introduced in the context). At the same time, evaluating the *Communicative Dynamism* (CD) [11], [15] for the prosodic calculus is performed in [4], [5] by estimating the *Theme-Rheme* structures, the conceptual pair corresponding to the updated terminology of *Topic-Comment* for a clause or sentence.

The classical IS notions used in [2-5], [14], [15] for the TFA algorithms are updated to the current terminology as follows: instead of *Topic-Focus*, the *Background-Focus* pair is used, with the meaning of pair entities, related to each other by a (informational and intonational) *contrastive* relationship, whether or not they possess the features Givenness or Newness. The term *Topic* is currently used with the meaning of "subject", "theme", entity which triggers the message development within the clause, and the first (also conditional) element of the *Topic-Comment* IS dimension. The *Focus* denotation is the most used term in IS theory, being related to the discursive-prosodic notions of *Narrow Focus* and *Broad (Wide) Focus* (as the textual projection of the Narrow Focus), with specific phonetic prominence.

The term *Topic* is very common for the Prague School's approach of TFA algorithms [14], [15], [2], [3], [4]. In that framework, *Topic* has the meaning of "contextually bound", possibly Discourse-Given in CG. The *Topic* from the classical TFA approach migrated currently to the term *Background*, which has the significant interpretation of *contrastive reference*, possibly Discourse-Given, intonationally deaccented entity, and whose *Focus* pair is intonationally accented in a contrastive manner. Particular examples of *Focus* meanings used in the current IS theories are FOF (First Occurrence Focus), SOF (Second Occurrence Focus) etc. for the *contrastive* intonational-prosodic prominence of a textual entity in semantic, pragmatic, or discursive contexts.

II. EXPLICIT CONTRASTIVE FOCUS: SEMANTICS, SYNTACTIC PATTERNS, PROSODIC PROMINENCE

A. Contrastive Focus Semantics: *Alternative Semantics, Structured Meaning, and Hearer-Expectation*

The main purpose of the present paper is to model and integrate the contrastive Focus along with other prominent intonational categories and patterns, in order to derive prosody for spoken Romanian language starting from text. In the previous section, we introduced the contrastive Focus as one of the IS components. In this subsection we expand the analysis of contrastive focus, briefly outlining the three most important approaches to the *semantics* of contrastive Focus.

The most frequently used and powerful semantics for the contrastive focus meaning is the approach of Mats Rooth's *Alternative Semantics* [23]. The meaning of *contrastive* Focus is defined as specifying the presence of relevant *alternatives* for the interpretation of certain linguistic phrases. Krifka [17], [23] takes into account two major categories for the intonational prominence of contrastive type: (a) Focus of *expression*, and (b) Focus of *denotation*. The *expression contrastive* Focus refers to lexical, syntactic or collocation alternatives. The default negation is also met frequently.

4.a. *A plecat la Pa**ris**, nu la **Pa**ris.*

4.b. *He went to **Pa**ris, not to Pa**ris**.*

The *denotation contrastive* Focus expresses the selection of a variant from a set of semantic and pragmatic alternatives, a variant that is intonationally highlighted. The semantic utilization of the contrastive Focus refers to the CG contents of the speaker-hearer communication model, while the pragmatic uses of this Focus type are related to the CG management. Such pragmatic types of contrastive Focus, along with their corresponding discursive patterns, are analyzed in [13]. Here are some examples:

5.a. ***Maria** a mâncat **prăjitura**, iar **Ion** a mâncat **ciocolata**.*

En: Maria ate the cookie, and Ion ate the chocolate.

5.b. *Ba nu, **Maria** a mâncat prăjitura!*

En: No, Maria ate the cookie.

5.c. *Nu **Ion** a mâncat prăjitura, ci **Gabi**.*

En: It was not Ion who eat the cookie, it was Gabi.

An essential role in the contrastive focus typology is played by the focusation markers (operators) introducing the *explicit contrastive Focus*. The well-known "*only*" (*numai*, *doar*, *măcar*), "*even*" (*chiar*, *exact*), "*also*" (*și*, *la fel*, *deasemenea*), the *negation* (correlated or not) etc. introduce specific prosodic patterns in discourse and intonation. To each contrastive focusation marker (similarly to generalized quantifiers, what they actually are) is associated its definition domain (*narrow Focus*) and application domain (*broad Focus*). A complex analysis of the contrastive markers, patterns, Foci, and their domains is contained in [7] (see also [27]).

Another semantics for contrastive Focus, parallel and independent of Rooth's Alternative Semantics, was developed by Manfred Krifka [17] under the name of *Structured Meaning*. The major idea of Krifka's semantics is that the intonational prominence of contrastive Focus entails a binary partition of the involved meanings into the contrastive category *Focus* and its referred entity *Background* subsets.

The *Structured Meaning* has the quality that it can represent more accurately the various kinds of intonational and grammatical contrastive Focus, because of the Background-related presuppositions. In the Structured Meaning semantics, a special role is played by the focusation markers called "*focus-sensitive*" operators, which allow operations connecting the contrastive Focus meanings with the set of *all* the other intonational alternatives, and to the contrastive Focus prominence of Rooth's *Alternative Semantics* [23].

A more specific relationship between *Alternative Semantics* and *Structured Meaning* is the following: the *Alternative Semantics* determines the relationships between the contrastive Focus and its alternatives, namely between Narrow and Broad Focus, while the *Structured Meaning* semantics, by its neutral utterances and focusation markers, better accomplish the relationship between Broad Focus and its focusation markers.

The *third semantics* for contrastive Focus was developed by Zimmermann [28], who considers contrastive Focus to be more adequately modeled with *discourse pragmatics* based on the Hearer-Expectation towards the Speaker. The basic idea of Zimmermann's Hearer-Expectation semantics is that contrastivity, hence the contrastive Focus, manifests itself as a discourse pragmatics phenomenon, reflected and marked in the grammar for intonational languages. Contrastivity means that a particular content or a speech act is unexpected for the listener from the speaker's viewpoint. Examples of contrastive utterances are:

7.a. *Pe* ***Ion***$_{F}$ *l-am invitat* (*nu pe altul*).

En: It is John that I invited (not someone else).

7.b. *Nu l-am invitat* ***pe Petru***$_{F}$, *ci* ***pe Pavel***$_{F}$.

En: I did not invite Petru, but Pavel.

7.c. ***Plăcinte***$_{F}$ *am mâncat*!

En: I have eaten pies!

These examples introduce contrastive Focus, either *explicit* by contrastivity-displaying lexical markers, such as "not" or "but", or *implicit contrastive Focus*, by covert markers, making the connection between the notions of contrastive Focus and the Topic-Comment IS dimension.

We support the idea that written discourse is accompanied actually by covert, implicit prosodic features of the communication act, which we name here *implicit contrastive Focus* of the clause constituents. The implicit contrastive Focus is defined (section IV) as SO-disordered dislocation of the semantic roles in the finite (and non-finite) clause. The semantics of the implicit contrastive Focus should be modeled similarly to its explicit counterpart, within the semantic framework discussed in this subsection ([17], [22], [23], [28]).

There exists a close relationship between Topic-Comment algorithms, computation of CD degrees, and implicit contrastive Focus evaluation. In the present approach based on hierarchical properties of contrastive and non-contrastive intonational Foci, solving the Topic-Comment structures can be seen as a component of the evaluation process for the implicit contrastive Focus, which represents the basic solution to intonational focus assignment and prosody prediction for the Romanian clause.

We identified the problem of *implicit contrastive Focus evaluation* as the main difficulty point to be solved inside the clause, whose complementary solution, added to the *explicit contrastive Focus computation* at discourse-level, can offer a sound procedure to the intonational focus assignment or, equivalently, to a new shape and improved design of the Steedman's function for the discourse-prosody prediction of Romanian [4], [16], [26].

B. Contrastive Markers, Foci, Domains, and Patterns

Lexical, overt markers of contrastive intonation introduce the category of *explicit contrastive Focus*, denoted also as *primary contrastive Focus* or, hereafter, *First Occurrence Focus* (FOF). FOF is specified by its *broad Focus* (projection) domain, and its contrastive marker pattern. For a second (or even third) contrastive marker, the existence of the second (or third) focusing entity is possible, called *Second* (or *Third*) *Occurrence Focus* (abbreviated SOF, respectively TOF) [8], with distinct focusing domains, embedded or not into each other. A problem to be solved is the assignment of the intonational Focus entities, when two or more markers (or marker phrases) generate several contrastive Foci, with broad contrastive foci domains embedded into each other (or possibly disjointed). For instance:

8.a. *Chiar* [***soțul ei***]$_{FOF}$ *doar* [*o singură* ***dată***$_{SOF}$ *a văzut tabloul*]$_{F}$.

En.:* [4] *Even* [her ***husband***$_{FOF}$] *only* [***once***$_{SOF}$ saw the picture].

En.: *Even her husband saw the picture only once.*

The contrastive markers "*chiar*" (*even*) and "*doar*" (*only*) introduce their own contrastive Focus categories and domains (broad Focus), [*soțul* ***ei***]$_{FOF}$ (*her husband*) being the domain and FOF, while [*o singură dată a văzut tabloul*]$_{BroadF}$ is the subordinated domain with its SOF [*o singură* ***dată***]$_{SOF}$. A comprehensive analysis (with herein theoretical and computational consequences) is formulated in E. Selkirk [25].

The *Cleft* constructions are also frequent,among the notable linguistic means introducing types of contrastive Focus.

9.a. *Ion este cel care a rezolvat problema.*

En: Ion is the one who solved the problem.

9.b. *Chiar* ***Ion***$_{F}$ *a rezolvat problema.*

En: It is Ion who solved the problem.

9.c. *Numai* ***Ion***$_{F}$ *a rezolvat problema.*

En:. Only Ion solved the problem.

9.d. *Însuși* ***Ion*** *a rezolvat problema*.

En.: Ion himself solved the problem.

C. The Prosodic Prominence of Explicit Contrastive Focus

The problem of the intonational-phonetic relationship between explicit contrastive Focus, associated with a

[4] In this paper, when translating Romanian examples into English, we mark by an * (asterisk) the word-by-word translations, where the translation units are split by spaces. These translations are known to be grammatically incorrect, but are only intended to provide the reader with a hint about the Romanian word order. If the sentences may be difficult to understand in English from the word-by-word translation, the correct, grammatical translation is also provided. In the other cases, when no * is shown before the translation, the Romanian sentences are directly translated into literal English.

focusation marker, and informational Focus, which corresponds to a Discourse-New entity, was solved by H. Truckenbrodt (1995) and Mats Rooth (1996). They attested the *Contrastive Focus Prominence Rule* (CFPR) as follows [25]: *Within the scope of a focus interpretation marker, the corresponding contrastive focus constituent is* ***the most prominent*** *metrically*.

The CFPR principle confirms, with remarkable robustness on phonetic data, that the *explicit* (*i.e.* lexically-overt marker defined) *contrastive Focus* is more prominent against *any* other kind of intonational focus, in *any* context, be it either informational (Discourse-New) Focus or contrastive SOF (Second Occurrence Focus). For instance:

10.a. *Chiar*$_i$ [***Maria***$_i$]$_{FOF}$ *i-a anunţat numai*$_j$ [***lui Ion***$_j$]$_{SOF}$ accidentul.

En: *Just Maria announced *only* to Ion the accident.

10.b. *Chiar*$_i$ [***Maria***$_i$]$_{FOF}$ *i-a anunţat lui Ion numai*$_j$ [***accidentul***$_j$]$_{SOF}$

En.:*Just Maria announced to Ion *only* the accident.

For the classical question of the relationship between contrastive and informational foci, the following solution is known to hold in speech analysis: the *informational Focus* is represented by a *pitch* accent, with a peak of intonational prominence, while the *contrastive Focus* corresponds to a constituent whose *broad Focus* is syntactically more complex, represented by an intonational contour with one or more pitch accents. These facts are parameterized for a large *class* of natural languages for which the informational Focus is determined by pitch accent, *e.g.* Italian, Spanish, Portuguese, Romanian, English, German, etc. [12]. This distinction between informational and contrastive Focus does not hold however for French, where the intonational Focus is displayed (not only) by pitch accents but rather by boundary tones and tonal phrasing. This makes CFPR to be language-dependent, nevertheless.

Experimental analyses established that, although SOF does not typically bear an intonational pitch accent, there is a clear phonetic prominence, by duration and intensity of the signal. The prominence accent may be different depending on whether the contrastive Focus marker is located at the beginning or the end of the clause. Example:

11. [***Maria***$_i$]$_F$ *numai*$_j$ *i-a anunţat lui Ion accidentul*, ***chiar ea***$_i$.

En: *Maria only announced to Ion the accident, herself.

For the problem of the relationship between various types of intonational foci, [25] proposed the solution of a hierarchy on three levels: the *contrastive Focus* is labeled with F-feature (F-marked), the clause-level referred constituents (Discourse-Given) are labeled with G-feature (G-marked), while the Discourse-New entities remain *unmarked*. The linguistic support for marking the Discourse-Given constituents with G-feature comes from the prosody introduced by the SOF entity, whose syntactic-discursive representation is twofold marked with F- and G-feature. The *G-marking Condition* in [25] considers SOF as a discourse-contrastive constituent, and it can be G-marked only when the semantic value of this constituent is endowed with the Discourse-Given feature.

The syntactic representation of the contrastive Focus with the F-feature, eventually doubled by the G-feature, together with removal from the same syntactic representation of the informational Focus, open the theoretical and computational means for the application of two relatively independent *systems of tagging* and evaluating the contrastive Focus (with the first one), and of the informational Focus (with the second one). The *first* system is based on marking (in syntax) of F and (in discourse) of G features, while the *second* one uses well-known principles of prosodic accentuation for "neutral" utterances: Sentence Accent Assignment Rule (SAAR) and Nuclear Stress Rule (NSR). To these rules of intonation, we added Sentence Break Assignment Rules (SBAR) [4], [5] for breaks between constituents at clause level.

When proving the validity of the G-marking Condition, E. Selkirk [25] used also the comparison between the prosody of SOF and Discourse-Given constituents, which are not contrastive (thus F-feature marked). Example (12.b) contains contrastive Foci, with non-embedded domains. A controversial issue in this case is that FOF does not seem to be genuinely contrastive, thus making the second Focus an authentic SOF.

12.a. *Ni s-a spus să avem numai* ***gânduri bune***$_F$.

En: We were told to have *only* good thoughts.

12.b. *Dar chiar ne-am plictisit să avem numai* ***gânduri bune***$_{F, G}$.

En: But we really got tired of having *only* good thoughts.

12.c. *Dar ne-am plictisit să avem* ***gânduri bune***$_G$.

En: But we got tired of having good thoughts.

The CFPR and G-Marking Condition [25] have major consequences: the algorithms computing the *informational Focus* (*e.g.* TFA or SDRT – N. Asher's Segmented Discourse Representation Theory [4], [5]), the evaluation rules for neutral intonation NSR [25], SAAR [13] and SBAR [3], [4], [5], and the procedures for contrastive Focus calculus (FOF, SOF, TOF, narrow and broad Foci, Focus patterns) can be applied *hierarchically*, *independently*, and *separately*.

III. Prosodic Hierarchies Defined on Intonational Focus Categories

Combining the consequences of CFPR (*Contrastive Focus Prominence Rule*) and *G-*(*Givenness*)*-marking Condition* [25], we propose to use, for the prosody prediction of Romanian, an intonational discourse level hierarchy among the Contrastive Focus (First Occurrence Focus – FOF, typically explicit contrastive), Second Occurrence Focus (SOF – explicit contrastive), Informational (Discourse-New) Focus (non-Given, possibly implicit contrastive), and Deaccented (Discourse-Given) Focus (Given, possibly implicit contrastive):

13.a. FOF $\geq_{Phon}$ SOF $\geq_{Phon}$ Disc-GivenF;

b. FOF $\geq_{Phon}$ Disc-NewF $\geq_{Phon}$ Disc-GivenF;

c. SOF ?$\geq_{Phon}$ Disc-NewF.

In (13), for two intonational categories Foc1 and Foc2, Foc1 $\geq_{Phon}$ Foc2 means that Foc1 has intonationally stronger phonetic features than Foc2 (see also [10], [12], [21]). Since the statistical inequalities (13) are strongly language-dependent, they should be equated with specific *weights* established by fundamental speech-oriented studies on the Romanian language (*e.g.* [21], [10]).

The discourse-level prosodic hierarchy provided by (7) is to be combined, in a separate and independent way, with the clause- and phrase-level intonational hierarchy of SAAR (Sentence Accent Assignment Rules) and NSR (Nuclear Stress Rule) [13], [2], [3]:

14. VG $\leq_{Focus}$ Arguments $\leq_{Focus}$ Adjuncts,

and

15. Head $\leq_{Focus}$ Modifier,

where for the syntactic categories C1 and C2, C1 $\leq_{Focus}$ C2 means that C1 is less intonationally stressed than C2.

The classical TFA (Topic-Focus Articulation) paradigm [14], SDRT (Segmented Discourse Representation Theory) [4], [5], and the Theme-Rheme Computing [19], [11], [4], are envisaged to be merged within SAAR, NSR, newly defined SBAR (Sentence Break Assignment Rules) [4], [5], prosodic inequalities (13)-(14)-(15) and similar ones, with the aim of an improved intonational Focus assignment on the Syntax-Phonology and Discourse-Prosody interfaces.

As shown by the outcome of the TFA algorithms and (especially) SDRT [4], [5], determining the Discourse-New entities in a multi-clause text is more difficult than evaluating the Discourse-Given ones, the latter situation being obtained with anaphora resolution and referred category identification at clause-level. This fact explains the relatively large number of resulted Discourse-New categories, while their confirmation process raises more difficulties than Discourse-Given entity computing with anaphora resolution.

This is the mechanism by which the hierarchical-level tagging, in discourse and syntax, of the contrastive Focus (F-marking) and Discourse-Given (G-marking) constituents, on one hand, and (apparently) disregarding the informational Focus (Discourse-New) categories, on the other hand, provide a major *methodological and computational* advantage: the Discourse-Given entities are located with anaphora resolution, the (primary or SOF) contrastive Focus is obtained from discourse and syntactic analyses (SOF has to be F and G twice marked), while the informational (Discourse-New) Focus should be the outcome of applying specific procedures on the intonational hierarchy of the prosodic entities at the inside-clause level: NSR, SAAR [13], [4], SBAR [5], *implicit contrastive Focus* computing, CD degree computing [15], and Topic-Comment evaluation (with partial results) [19], [11]. Our bet in this paper is on *implicit contrastive Focus* calculus.

In this new, hierarchical focus-based architecture for prosody prediction algorithms, the status of the Topic-Comment (Theme-Rheme) procedures and of computing the CD degrees (introduced by dislocation of the SO-ordering of the semantic roles) should be (re)established. The typical example (with constituent permutation variants), exposed as problem to be solved in the larger framework of Topic-Comment algorithms [19], [11], is that of [4 :Ex.4.b], and here:

16. *Mariei*$_i$, *maşina*$_j$, ***Ion***$_F$ *i*$_i$*-a dat-o*$_j$.

En: **To Maria the car Ion gave.*

En: *Ion gave the car to Maria.*

(16) is also a characteristic example of *implicit contrastive Focus*, whose resolution we identified as being essential in the economy of a prosody prediction general algorithm for Romanian.

Along with specific algorithms of intonational-prosodic nature, getting from focused entity assignment to intonational phrasing annotation supposes a number of natural language pre-processing tasks: finite clause parsing with inter-clausal markers of lexical type [1], anaphora resolution on the clausal structures, the existence of consistent results on SO-ordering [15] (of the semantic roles of predications) for Romanian, Topic-Comment efficient algorithms [19], [11], [15], solving CD degrees and (explicit and implicit) contrastive Focus algorithms (at discourse and finite-clause level).

We also notice that G-marked (Discourse-Given) entities, resulted commonly from anaphora resolution, could be evaluated with the (less expensive computationally but also less accurate) "contextually-bounded" constraints from the TFA classical algorithm [14], [4], [5].

IV. Topic-Comment, Communicative Dynamism Degrees, and Implicit Contrastive Focus

A. *Contrastive Focus Relevance for Spoken Romanian*

The relevance of the *contrastive intonation* for the Romanian discourse and finite-clause structures is pointed out by significant percentages of the phenomena on George Orwell's "1984" novel. We performed an interesting gold evaluation on 550 sentences from "1984" and obtained the following results with respect to the types of focus found: 62.5% "neutral" utterances (Discourse-New Focus, mainly) resulted from SO-ordered semantic roles in the finite clause; 20% explicit contrastive Focus, *i.e.* contrastive Focus derived from lexical contrastive markers, domains and patterns; and 17.5% implicit contrastive Focus, *i.e.* SO-disordered semantic roles represented by contrastively dislocated constituents inside the finite clause. Thus the *contrastive Focus* activates on around 37.5% within these corpus clauses, while the classical TFA and Theme-Rheme algorithms do not incorporate modeling of the phenomena.

Our intuition is that an even (much) greater fraction of the contrastivity phenomena holds but, just for a smaller percentage, contrastive intonation and patterns are essential for the prosody modeling and focus entity prediction. A small

excerpt from the intonational contrastivity investigation on the Romanian subcorpus is given in (17) below:

17. { [(*Îţi dădea) impresia*]^{30N16} [*că (ar fi fost) pe deplin satisfăcută*]^{31N17} [*dacă seara aceea de iunie (* ***nu*** *s- ar mai fi sfârşit)* ***niciodată***]^{32E8} [, *iar rufele de pus la uscat (ar fi fost) fără număr* ;] ^{33N18}[*atunci (ar fi rămas)* ***şi ea*** *acolo încă o mie de ani , agăţând scutece pe sârmă şi cântând nerozii .*]^{34E9} } { [*Lui Winston (îi trecu) prin cap un gând curios*]^{35I8} [*şi anume că (nu auzise)* ***niciodată*** *un membru al Partidului*]^{36E10} [*care (să cânte) singur , din proprie iniţiativă .*]^{37N19} } { [(*Ar fi părut)* ***şi*** *oarecum neortodox , o excentritate periculoasă , la fel ,* ***de pildă*** *, cu vorbitul de unul singur .*]^{38E11} } { [*Probabil că* (*trebuia*) , ***totuşi***]^{39E12} [, (*să ajungi*) *pe undeva prin vecinătatea morţii de foame*]^{40N20} [*ca (să ai)*]^{41N21} [***de ce*** *(să cânţi)* .]^{42E13} }

B. *Implicit Contrastive Focus and the Relationship to Topic-Comment Structures in Romanian*

"*Explicit contrastive Focus*" and "*implicit contrastive Focus*" phrases shall be used with the following meanings: the first one refers to those categories of contrastive Focus introduced by specific lexical markers, while the second phrase includes the situations where contrastive focusation is hidden by dislocation of the semantic roles in the finite clause. Implicit contrastive Focus is particularly investigated (for pre- and post-nuclear cases) in [22], being of major interest for at least three reasons: (a) The close relationship with topicalization and Topic-Comment (Theme-Rheme) algorithms; (b) the behavior shapes for Romanian, including covert markers, contexts, syntactic dislocations and (dis)orders, discursive-intonational patterns; and (c) development of a sound semantics of the implicit contrastive Focus, which covers the variety of these discourse-prosody constructs, compatible with the classical *Alternative Semantics* approaches for contrastive Focus (see section II.A, [23], [22]).

For instance, the semantic modeling of the contrastive Focus proposed by Onea & Heusinger [22] is called *Backgrounded Material Principle* (BMP). *Backgrounded Material* instances are considered to comprise the presupposition and the *selection restrictions* especially for verbs, adjectives, clitic pronouns and other syntactic categories. The meaning of the phrase "*backgrounded material*" has nothing in common with the concept of *Background* from the *Background-Focus* IS dimension, understood as the intonationally contrasted pair, often but not always equivalent to another pair of entities (Discourse-Given, Discourse-New) from IS. The BMP approach for modeling the contrastive Focus represents an interesting approach to modify and refine the classical *Alternative Semantics* [23] of contrastive Focus. BMP restricts the contrastive focal alternatives at the level of semantic composition, analyzing both explicit but especially implicit contrastive Foci.

The BMP nature and its close relationship with the IB (Inference Boundary) Topic-Comment algorithm [19], and to the Principle of *Acceptable Message Development* supporting the IB algorithm, should be examined carefully. The analysis of grammatical restrictions on the contrastive Focus alternatives performed with BMP, in [22: Table 5] for the example:

18. *Petru* ***bicicleta***$_F$ *a lovit-o.*

En: **Petru the bicycle hit.*

En: *Petru hit the bicycle.*

but for many other examples involving contrastive Focus, shows consistent similarities to the recursive form of the Leong's IB Topic-Comment algorithm and to Firbas' Theme-Transition-Rheme structures [11]. Examples (2) and (3) are also illustrative for the discussion.

The conclusions of this relationship analysis are the following: **(*i*)** Topic-Comment (Theme-Rheme) computing is important by itself for IS textual processing. **(*ii*)** Remarkable approaches for Theme-Rheme (Topic-Comment) evaluations are those of the Prague School (J. Firbas [11], P. Sgall and E. Hajicova [14], [15]) as well as A. Leong's IB (Inference Boundary) algorithm [19]. **(*iii*)** The effective utility of Topic-Comment IS dimension for prosody prediction can only be partial, as J. Firbas specify the four main factors contributing to Topic-Comment computing: CD (Communicative Dynamism) *vs.* SO (Systemic Ordering) of the semantic roles, their semantics, the discursive context, and intonation. Naturally, only the first three textual factors can be utilized on the discourse-prosody prediction mapping. **(*iv*)** Finally, performing a similar analysis for the TFA algorithm role in the IS framework, one may notice that TFA, with its contextually-bound and non-bound entities, is a decent competitor with SDRT for clause-level Discourse-Given vs. Discourse-New category tagging.

C. *Examples of Implicit Contrastive Focus and Its Discourse-Prosodic Patterns*

Several examples of implicit contrastive Focus (suggesting for some cases the corresponding explicit variant) are presented:

19.a. *Maria* ***poşeta***$_{i\,F}$ *a uitat-o*$_i$ *acasă.*

En: *Maria the purse forgot home.

19.b. *Poşeta*$_i$, ***Maria***$_F$ *a uitat-o*$_i$ *acasă* {, *nu Elena*}.

En: * The purse by Maria was forgotten {not by Elena}.

19.c. *Vasile*$_i$, ***pe Maria***$_{i\,F}$ *a sunat-o*$_i$ {, nu pe Elena}.

En: *Vasile Maria called {, not Elena}

19.d. [#5]***Pe Maria***$_{i\,F}$ *Vasile*$_i$ *a sunat-o*$_i$ {, nu pe Elena}.

En: It is Maria that Vasile called, not Elena.

The clitic is doubling the direct complement independently whether or not that complement is contrastively focused. Variants of [22 :Ex. (49)] provides examples of contrastivity on double complements:

20.a. *Supa de legume,* [*bluza*$_i$ ***bucătăresei***$_F$] *a murdărit-o*$_i$ {, nu fusta}.

En: *The vegetable soup, the cook's blouse has stained {, not her skirt}.

20.b. [*Bluza*$_i$ ***bucătăresei***$_{iFOF}$], [*cu supa* ***de legume***$_{iSOF}$] s_i - *a murdărit.*

[5] The # before a Romanian sentence means the sentence, even if grammatically correct, is only marginally used in this form.

En: The cook's blouse was stained with the vegetable soup.

Remark: iFOF and iSOF abbreviate the expressions of "implicit First Occurrence Focus" and "implicit Second Occurrence Focus". See also Ex. 24.e and Fig. 5 below.

The intonational analysis of the contrastive Focus examples points out a *first* prosodic *pattern*, apparently most natural and frequent for the involved context, which locates the implicit contrastive Focus on the *immediately pre-nuclear* constituent. A *second* prosodic *pattern*, both important and frequent, shows the *first pre-nuclear constituent* in the clause to be contrastively focused. In such a pattern, all the other semantic roles are non-focused, but the (usually, explicit) existence of a post-nuclear contrastive Focus is also probable.

The contrastive Focus pattern examples in [22] reveal also selection restrictions to be fulfilled by the enclosed semantic roles, being investigated phenomena such as clitic doubling in (direct, multiple or not) complements, preposition "*pe*" (*on*) case marking in certain complements, syntactical-semantic restrictions on the contrastive Focus occurrence, either explicit or implicit. The proposed approach in [22] has the merit of opening a meaningful discussion on a key problem: obtaining a consistent set of discursive-prosodic patterns implies that implicit contrastive Focus needed to be tested and validated by well-defined, correctly spoken, and complete sets of (Romanian) experimental utterances.

Similarly to the investigation in [22] on explicit and implicit contrastive Focus for Romanian, English, and German, the work in [24] concentrates on Italian. As [24] notices, the focus in Italian occurs always clause right-most, since Focus position is tied in Italian to the position of stress, which is clause-rightmost. Is this also true for Romanian?

Quite probably, but reliable studies are needed. In the same area of essential observations for the Italian clause, [24] points out that "the greater the number of right-dislocated constituents, the closer focus appears to the clause left-edge and away from the clause right-edge". In other words, the focus remains structurally final with respect to the clause it belongs to when the Background (non-focused, possibly Discourse-Given) entities are dislocated clause-rightmost (post-nuclear, by default). Here there are some examples transposed into Romanian, supporting these facts:

21.a. *Maria şi-a cumpărat cerceii* ***ieri***$_F$.

En: Maria bought her earrings yesterday.

21.b. *Şi-a cumpărat* ***ieri***$_F$, *cerceii*, *Maria*.

En: *Bought yesterday the earrings Maria.

Some Focus patterns and CD degree tentative rules, inspired from Italian [24] but illustrated for Romanian, are challenging. For instance, does contrastive Focus migrate to the clause left-boundary for post-nuclear right-dislocated constituents? As already mentioned, the implicit contrastive Focus of a dislocated Topic (Theme) from the SO-ordering should be a pre-nuclear constituent:

22.a. *Florile*$_i$, ***Mariei***$_{j\,F}$ i_j *le*$_i$*-am dat.*

En: *The flowers to Maria I gave.

22.b. *Florile*$_i$, *Mariei*$_j$, ***noi***$_F$ i_j *le*$_i$*-am dat.*

En: *The flowers to Maria we gave.

22.c. ***Mariei***$_{i\,F}$ i_i*-am dat florile.*

En: *To Maria I gave the flowers.

22.d. #*Mariei*$_{i\,F}$ i_i*-am dat florile*, ***noi***.

En: * To Maria gave the flowers, we.

Once again, we remark the rule, working in both Italian and Romanian, according to which the contrastive focusation for left-nuclear dislocated constituents acts on the pre-nuclear one, predominantly. This rule is just one example from the unitary set of rules, not yet cleared up, representing the principle(s) according to which the CD degrees of the semantic roles are to be computed within the finite clause. Here there are other examples of various patterns of implicit contrastive Focus, as Romanian variants derived from Italian [24]:

23.a. *Le*$_i$*-o*$_j$ *prezintă pe soţia*$_j$ *mea, părinţilor*$_i$ *lui*$_k$, ***Ion***$_k$.

En: He presents my wife to Ion's parents.

23.b. *Le*$_i$*-o*$_j$ *prezintă părinţilor*$_i$ *lui*$_k$,, *pe* ***soţia***$_j$ ***mea***.

En: He presents my wife to his parents.

23.c. #*Le*$_i$*-o*$_j$ *prezintă* #***Ion***$_k$, *părinţilor*$_i$ *lui*$_k$,, *pe soţia*$_j$ *mea*.

En: * Presents Ion to his parents my wife.

D. Implicit Contrastive Focus on the Syntax-Phonology Interface

In order to evaluate the correctitude of our implicit contrastive focus patterns, we analyzed several recordings representing variations of the constituent order for the sentence in 21.a. According to the *systemic ordering* (SO) we considered for Romanian, the SO-order obeying variant of the sentence is given in 24.a. (Romanian SO is considered to be the same or similar to the ones in Czech and English [14], [15], despite the lack of scientific results on this matter).

24.a. ***Ieri***$_F$ *Maria şi-a cumpărat cerceii.*

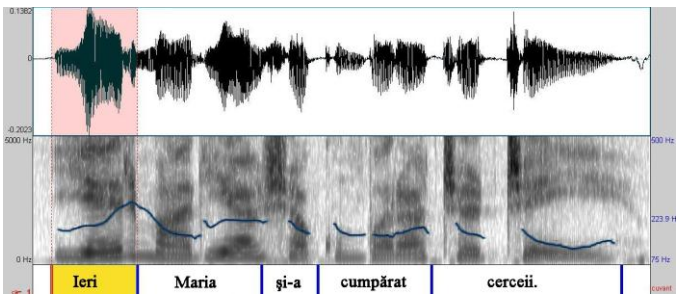

Figure 1. Analysis of the focus in *"**Yesterday** Maria bought the earrings."

Figure 1 shows the signal for the considered sentence, and the value of the pitch computed with Praat. From the pitch contour, it is evident that the adverb "yesterday" has the

highest pitch, which is in respect of the descending pattern for Romanian assertive sentences, but also the highest intensity.

If one of the constituents in the clause is situated in SO-disorder, then, according to the rules presented in the previous sections, it will receive implicit contrastive focus. Such an example is presented in 24.b., with the corresponding signal in Figure 2.

24.b. *Maria* ***ieri***$_F$ *şi-a cumpărat cerceii.*

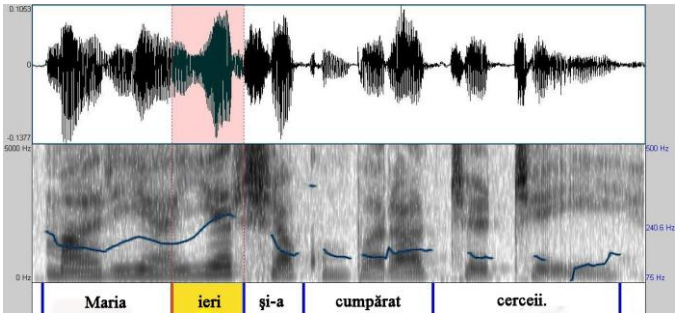

Figure 2. Analysis of the implicit contrastive focus in "Maria **yesterday** bought the earrings."

When placed in a pre-nuclear position (before the predicate of the sentence), in an SO-disorder, the finite clause constituents can receive one implicit contrastive Focus (Fig. 3 and Fig. 4).

24.c. *Ieri cerceii* ***Maria***$_F$ *şi i-a cumpărat.*

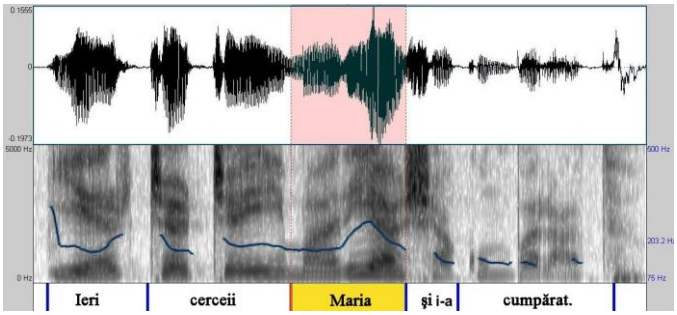

Figure 3. Analysis of the implicit contrastive focus in *"Yesterday the earrings **Maria** bought."

24.d. *Cerceii Maria* ***ieri***$_F$ *şi i-a cumpărat.*

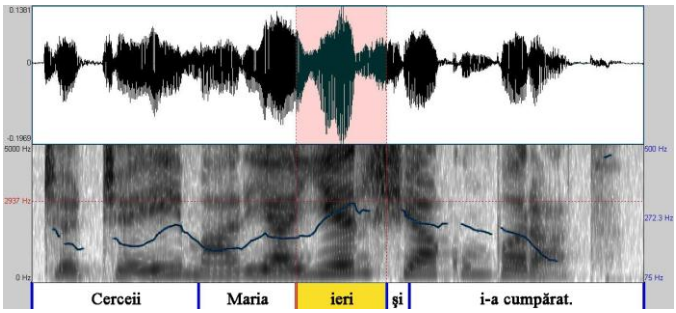

Figure 4. Analysis of the implicit contrastive focus in *"The earrings Maria **yesterday** bought for herself."

With the important (and also probable) variant (Fig. 5):

24.e. ***Cerceii***$_{iFOF}$ *Maria* ***ieri***$_{iSOF}$ *şi i-a cumpărat.*

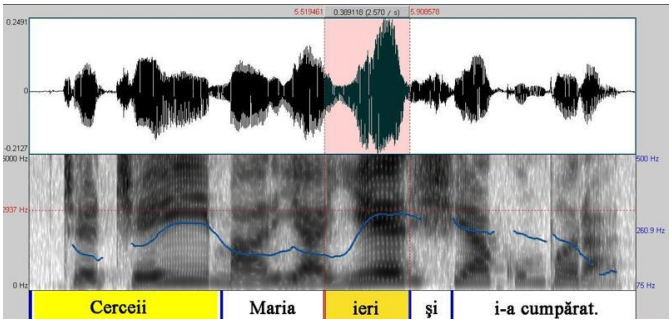

Figure 5. Analysis of the implicit contrastive focus in *"**The earrings**$_{iFOF}$ Maria **yesterday**$_{iSOF}$ bought herself them."

In analogy with the classical, explicit contrastive foci FOF and SOF, we introduce and remark the inside-clausal contrastive FOF and SOF of *implicit type*, denoted respectively, iFOF and iSOF, represented in example 24.e. by the categories ***cerceii***$_{iFOF}$ and ***ieri***$_{iSOF}$. This kind of implicit contrastive foci behave as if they were operated by traces of the corresponding (missing) focusing markers "*doar*" (*only*) and "*chiar*" (*even*), pointed out in the example:

24.e. {<u>*Doar*</u>} ***Cerceii***$_{iFOF}$ *Maria* {<u>*chiar*</u>} ***ieri***$_{iSOF}$

şi i-a cumpărat.

En: *{<u>*Only*</u>} **the earrings**$_{iFOF}$ Maria {<u>*even*</u>} **yesterday**$_{iSOF}$ *bought for herself.*

This second type of prosodic pattern seems to preserve the intonational inequality holding for the explicit contrastive categories, *i.e.* iFOF $\geq_{Phon}$ iSOF, inherited by the shadows of corresponding explicit contrastive markers. Both statistical but especially careful prosody semantics studies are necessary.

As examples 24.f. and 24.g. show, post-nuclear (after the predicate, in the linear order) dislocations of the constituents force them to bear implicit contrastive focus as well. The speech signals for the respective sentences are presented in Fig. 6 and Fig. 7.

24.f. *Şi-a cumpărat Maria ieri* ***cerceii***$_F$.

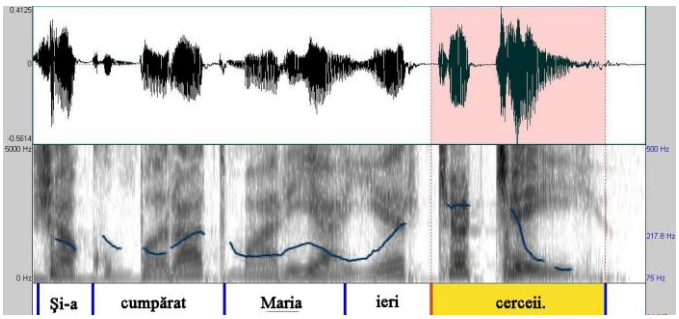

Figure 6. Analysis of the implicit contrastive focus in *"Bought Maria yesterday the **earrings**."

24.g. *Şi-a cumpărat* ***Maria***$_F$ *ieri cerceii.*

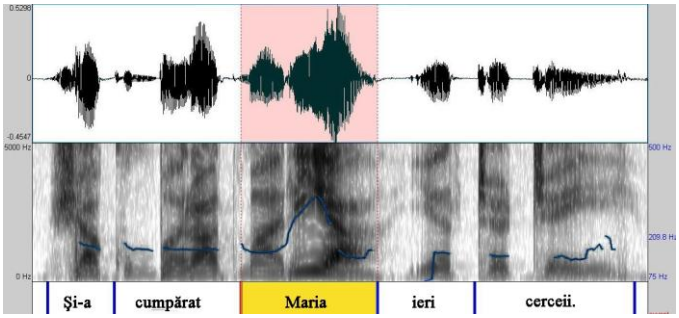

Figure 7. Analysis of the implicit contrastive focus in
*"Bought **Maria** yesterday the earrings."

An important notice is that examples 24.f. and 24.g are similar wrt. their word order, but the context involved in the previous discourse between the interlocutors has created different possible prosodic alternations for the constituents in the sentence, thus offering different constituents the chance to have implicit contrastive focus.

E. A General Architecture for Discourse-Prosody Interface Based on Contrastive Focus Modeling

The importance of the Givenness-feature (G-marked) entities, discourse resulting, and their linear ordering influence inside the clause for assigning the *contrastive* (F-marked) or *informational* (Discourse-New) Focus has remarkable consequences: **(a)** The definition of the *implicit contrastive focus* is consistent, reflecting the frequent situation when the contrastive Focus lexical markers are covert (lexically missing) but the Background-Focus IS dimension is embodied into the finite clause by SO-disordered, dislocated constituents. **(b)** Computing the clause-level Foci is both a discourse and clause matter: the Discourse-New and Discourse-Given entities are the result of anaphora resolution, an inter-clause type procedure. When contrastive markers do not occur lexically, it remains to evaluate the clause-level foci of the implicit contrastive kind, based only on the CD degrees of the semantic roles. **(c)** Combined with the minimal intonation stress of the Discourse-Given entities from the finite clause, CD degree computing is equivalent with obtaining a scale of contrastive foci prominence inside clause, the outcome being the clausal implicit contrastive focus. **(d)** The results in [22] and [24] are important steps on this road, *viz.* obtaining a consistent set of principles, rules, patterns, and intonational hierarchies useful to compute the implicit contrastive focus within the finite clause. **(e)** In the present framework, TFA and Topic-Comment algorithms are just partial steps toward clause-level foci computing, in a discursive setting: the "contextually-bound" entities are a superset of the Discourse-Given ones, while the "contextually non-bound" constituents are possible Discourse-New foci. The contrastive but still Discourse-Given ones (both F- and G-marked in terms of Selkirk [25]) are "lost" for the TFA focus assignment procedure. Despite this weakness, TFA offers the advantages of a good linguistic modeling and efficient computing procedure [4], [5] compared to the possibly expensive anaphora resolution to obtain the Discourse-Given constituents. **(f)** The Topic-Comment (Theme-Rheme) algorithms [19], [11], [4], [5] provide only information on the intonationally non-prominent entities and structures playing the role of Topic ≡ Theme ≡ Subject discussed into a clause-predication. The Topic-Comment algorithms [19], [11], [5] provide also just partial information on the prosodic focus assignment, the complete procedure relying on CD degree computing for all the clausal constituents or, equivalent, evaluating the implicit contrastive focus of the clause. **(g)** Computing the Topic-Comment with Theme-Transition-Rheme Firbas' approach [11] involves *linear modification*, *context*, *semantics* (written text), and *intonation* (spoken text). The *context* is of utmost importance for computing the Topic-Comment [11], and relates to whether an element is retrievable from the relevant verbal or situational setting. **(h)** The newly proposed architecture for Focus computing is discourse-level in nature since both hierarchies of explicit and implicit contrastive foci are handing down from the multi-clause discourse segments into sub-clausal constituents.

Closely related to the implicit contrastive focus, we can introduce *measures* of the *communicative dynamism* (CD) associated to a predicate *p* that is heading the distribution of the constituents within a finite or non-finite clause. The *systemic ordering* (SO) and the communicative dynamism (CD) for a specific predicate (or predication) *p* are denoted, respectively, with SO_p and CD_p. We notice that while SO_p is a statistic concept, CD_p is timely associated to a certain (finite) clause semantic roles. A CD_p measure should reflect the difference between the permutation having as the first line the SO_p and its second line the current CD_p (the real ordering of the clause constituents). If we denote this permutation by $Per(SO_p, CD_p)$, a CD_p measure could be the *number of the inversions* for $Per(SO_p, CD_p)$. Another CD_p measure one could define is *the sum of all the distances* to the predicational nucleus of all the inversions obtained by the permutations of the semantic roles from SO_p to CD_p. One can use either *oriented* (with plus or minus) distances, or only-positive distances. The use of these measures (or others which can be defined on the CD degrees of the semantic role ordering of a predication should be proved in rapport to the syntactic-prosodic patterns specific for a language, a communication type (assertive, interrogative, etc.), or a specific accentuation (neutral or contrastive).

A General Procedure for Hierarchical Intonational Focus and Break Assignment on the Discourse-Prosody Interface:

1. Finite and non-finite clause segmentation of the paragraph textual unit;
2. Parsing at semantic roles inside the clause;
3. Anaphora resolution (or lexical chain computing) – possibly replaced by TFA algorithm;
4. G-marking (Givenness-feature) entities at clause level;
5. Parsing discourse contrastive structures: contrastive marker and pattern recognition; Explicit contrastive broad focus recognition;
6. Explicit contrastive narrow focus recognition; F-marking (contrastive Focus-marking) entities at clause level;
7. Explicit contrastive SOF (Second Occurrence Focus) and TOF (Third Occurrence Focus, when existing) computing (both F- and G-marked);
8. Computing the *implicit contrastive Focus* (or, equivalently, the CD degrees) of the SO-ordered or SO-disordered semantic

roles, for each finite and non-finite clause; in particular, informational (Discourse-New) Focus;

8.1. G-marked entities are ignored;

8.2. For SO-ordered clausal constituents, SAAR-based patterns and intonational Discourse-New Focus entities should be F-marked;

8.3. For SO-disordered clausal constituents, *patterns* of *implicit contrastive Focus* (F-marked) should propose intonational prominence variants;

9. Assigning Focus and Break weighted values for the intonationally prominent categories and phrases in the clause on the basis of contrastive and non-contrastive foci and break hierarchies (CFPR, SAAR, NSR, SBAR – see Table I).

Figure 8. A General Procedure for prosody prediction based on contrastive Focus modeling

TABLE I. INTONATIONAL FOCUS EVALUATION: PREVIOUS AND CURRENT APPROACHES

	Intonational Focus Assignment Procedures		**Hierarchical Contrastive Focus (HCF) Computing**
Discourse-level Contrastive Focus	-	-	*Contrastive Focus* markers, domains (Broad Focus), and categories (Narrow Focus): FOF, SOF, TOF computing
Discourse-Given category	TFA algorithm ⇒ contextually bound entities [14], [15], [2], [3]	Segmented DRT (Discourse Representation Theory): N. Asher & H. Kamp (1993), [4], [5]	Anaphora Resolution, Lexical Chain categories; or TFA algorithms
Discourse-New category	TFA algorithm ⇒ contextually non-bound entities [14], [15], [2], [3]	Segmented DRT (Discourse Representation Theory): N. Asher & H. Kamp (1993), [4], [5]	-
Clause-level G-marked, F-marked categories	CD degrees; [14], [15]	Topic-Comment (Theme-Rheme) Computing; IB-algorithm [19]	*Implicit contrastive Focus* evaluation in the finite clause; Firbas' Topic-Comment Computing [11]
Intonational -Prosodic Hierarchies	Disc-NewF $\geq_{Phon}$ Disc-GivenF Comment-NarrowF $\geq_{Phon}$ Topic-NarrowF Topic-NarrowF $\geq_{Phon}$ Disc-GivenF VG $\leq_{\alpha(Focus)}$ Arguments $\leq_{\beta(Focus)}$ Adjuncts (SAAR) [13], [4], [5] Head $\leq_{\varphi(Focus)}$ Modifier (NSR) [13], [5] VG $\leq_{\phi(Break)}$ Arguments $\leq_{\gamma(Break)}$ Adjuncts (SBAR) [4], [5]		FOF $\geq_{Phon}$ SOF $\geq_{Phon}$ TOF; iFOF $\geq_{Phon}$ iSOF; (?) SOF $\geq_{Phon}$ TOF $\geq_{Phon}$ Disc-GivenF; [25] FOF $\geq_{Phon}$ Disc-NewF; [25] SOF ?$\geq_{Phon}$ Disc-NewF; TOF ?$\geq_{Phon}$ Disc-NewF; Disc-NewF $\geq_{Phon}$ Disc-GivenF; F-Marked $\geq_{Phon}$ G-Marked; Comment-NarrowF $\geq_{Phon}$ Topic-NarrowF; Topic-NarrowF $\geq_{Phon}$ Disc-GivenF; Head $\leq_{\varphi(Focus)}$ Modifier (NSR) [13], [5] VG $\leq_{\phi(Break)}$ Arguments Arguments $\leq_{\gamma(Break)}$ Adjuncts (SBAR) [4], [5]

Questions: Is it possible to prove inequality relations the phonetic functions such as $\varphi \leq \beta$ or $\varphi \leq \alpha \leq \beta$? Alternatively or furthermore, there exist priorities to the application ordering between SAAR and NRS rules? Consistent answers to these questions (and some important other ones) should contribute to an improved general algorithm for the intonational Focus assignment, outlined in the above Fig. 8.

V. CONCLUSION

As shown in section IV.A, the contrastivity phenomena in written language are important; the intuition guesses them to be much stronger in spoken language. The investigation on contrastive Focus behavior revealed that the explicit contrastive Focus is a specific problem of discourse analysis for contrastive markers, focused categories, their domains, and patterns. For the clause-level counterpart of the intonational contrastivity, we introduced in this paper the concept of *implicit contrastive Focus* (ICF), defined as *dislocated*, SO-*disordered semantic roles* inside the finite clause. Evaluating the focused entity in a clause with specific ICF represents, in our view, the key problem for solving the prosody prediction *at finite clause-level*. This is the necessary and complementary step to the explicit contrastive Focus computation, at discourse level. Concentrating on the ICF problem solving, we performed a careful analysis of the intonational ICF patterns of a simple clause. The results are exemplified in section IV.D. Further intensive studies on this direction are needed dreadfully.

Jan Firbas (the author of the Communicative Dynamism concept) states [11] that *three* factors are mainly responsible for a correct evaluation of the Theme-Transition-Rheme textual clause structures: CD-ordering, semantics, and context. (The fourth one, intonation, is exactly the ICF problem.) These factors, together with other substantial results on the same problem in [22], [24], [25], [21], [28] etc., led us to propose the following hybrid and combined solution to the ICF problem: **(a)** The *statistical approach* on the SO-ordered and *disordered semantic roles* within the finite clause. In exactly the same manner as SO_p was defined [14], [15] for the predication *p* in a language (SO being the corresponding *p*-free, statistical ordering), the SO_p-disordering of the dislocated semantic roles should be investigated for the predication (predicate) *p*. For a certain CD-ordering (*viz.* SO-disordering) of *p*, the most frequent *contrastive* Foci in that clause are considered as the solution to the ICF associated problem. **(b)** The *semantics* of an ICF entity solution refers to the syntactical-semantic selectional properties of the nuclear verb and nouns of the considered clause. The semantics of an ICF pattern is the outcome of the composed logical predicates of the nuclear predication and its arguments, the linear ordering inside the clause being independent on the result. Semantics-oriented approaches such as [22], [19], [24] are most desirable. **(c)** The (discourse level) *context* is perhaps the most important factor to achieve the correct prosody. In examples (2.a.b) and (3.a.b), identical CD-orderings and semantics receive quite different prosodies, thus distinct ICF*s*, because of their different discursive contexts. Discourse context computing of an ICF patterns is thus essential for establishing the correct ICF solution, *i.e.* clause-level prosody prediction. Firbas' ideas on the Theme-Transition-Rheme computing could be really fruitful [11].

These principled-based solutions to the ICF problem *must* be supported by intensive and accurate experimental studies on the spoken Romanian. Despite their honesty and correctness, investigations devoted *only* to empirical, recorded measurements on contrastive Focus utterances, such as [21], are discouraging because they are not associated with symbolic, "impressionistic" methods for ICF solving. They are simply not enough for a general solution of the considered ICF problem. The methodological couple of powerful text analyses, on one hand, supported by in-depth speech exploration of Romanian, on the other hand, should be the tool for obtaining satisfactory solutions to the ICF problem. Finally, for both kinds of techniques, essentially on the speech-related ones, the recognizing and using of the (weighted) hierarchies of intonationally-contrasted categories within the spoken (Romanian) language represent the key roadmap we proposed here for the Discourse-Prosody interface computing.

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