



3rd International Conference on Arabic Computational Linguistics, ACLing 2017, 5-6 November
2017, Dubai, United Arab Emirates

The Applicative Combinatory Categorial Analysis of Arabic

Ismaïl Biskri^a, Fatima-Zahra Berrakem^b, Adel Jebali^{c*}

^aLAMIA, Département de Mathématiques et Informatique, Université du Québec à Trois-Rivières, Trois-Rivières G9A5H7, Canada

^bLTALA, Université de Tlemcen, Tlemcen 13000, Algeria

^cDépartement d'études françaises, Concordia University, Montreal H3G1M9, Canada

Abstract

The Applicative Combinatory Categorial Grammar (ACCG), like the whole of the other categorial models conceptualizes the languages as organized systems of linguistic units (words, morphemes, lexemes, etc) of which some function as operators whereas others function as operands. The ACCG is a sufficiently flexible model to give an account of several languages (SVO, VSO, SOV, etc.) and several forms of organisation of the linguistic units of these languages (coordination, subordination, with backward modifier, etc). However, the research tasks were limited almost exclusively to European languages, in particular French, English, German, Dutch. A language like Arabic, in spite of the richness of the tradition of its schools of thought, which go back for several centuries, remains unexplored by this current, except some research works. In our article, we show how the model of Applicative Combinatory Categorial Grammar can give an account of certain forms of Arabic.

© 2017 The Authors. Published by Elsevier B.V.

Peer-review under responsibility of the scientific committee of the 3rd International Conference on Arabic Computational Linguistics.

Keywords: Applicative Combinatory Categorial Grammar ; Combinatory Logic ; Arabic.

1. Categorial Grammars : an introduction

The model of categorial grammars is based on explicit logical rules for a logical inferential calculation substituted to a purely linguistic surface analysis. Relying more on the notion of surface structure, it leads to the notion of logical form to express the meaning. This model has the advantage of representing the arrangement of

* Corresponding author. Tel.: +1-819-376-5011#3837.

E-mail address: Ismail.Biskri@uqtr.ca

phrase units by means of the operation of applying an operator to its operand, which is a universal representation. There are several research projects in the domain of categorial grammars. We can mention the group of Flexible Categorial Grammar. This group is represented by models of Universal Grammar for a categorial syntax and a denotative semantics [15], the Combinatory Categorial Grammar which combines the categorial parsing with the construction of the functional semantic interpretation using the lambda calculus [21], the Grammar of Operators and Operands of Harris [12], the Unification Categorial Grammar [22], the intuitionistic types of Martin L of [18], the Applicative Combinatory Categorial Grammar with the use of combinatory logic and the addition of meta-rules to control type-raising and composition rules [4], and other generalizations of Lambek Calculus. Among the most recent developments, we find the multimodal version of Combinatory Categorial Grammars [20] which introduces modalities and restrictions on the operability of categorial rules in order to eliminate ambiguities; the model of Abstract Categorial Grammars [8] to describe the syntax and the semantics and allow learning syntax from semantic forms. Finally, the model of Type-Inheritance Combinatory Categorial Grammar [3] exploits the performance of categorial grammars while keeping basic syntagmatic grammatical HPSG.

Despite differences in the approaches and applications, what emerges, in particular, all the models presented by this group is: (i) the use of logical and mathematical methods to analyze languages, especially semantics; (ii) their assumption of multiple logical levels of representations of languages, including at least the linear structure of the observable and the operator/operand structure of the constructed expressions [19]; (iii) their flexibility and adaptability to multiple languages. Besides french, english, dutch and german, new languages are concerned by the current of categorial grammars. The most recent work focuses on exploratory analyzes for non-Indo-European languages like turkish [6], Japanese [14], nominal sentences in Arabic [1] and Korean [13]. Despite their success increasingly growing, we see that these works consider almost exclusively the syntax. They omit to take into account morphology. Many statements in Arabic, for example, are considered ungrammatical because of unfulfilled morphological agreements. The reader may have a look on [10] for a better understanding of morphological agreement in Arabic and on [5] for a better understanding of agreement asymmetries in Arabic from a categorial perspective.

In this paper, we will show the model of Applicative Combinatory Categorial Grammar, and then we will show the analysis of several forms of coordination in Arabic.

2. The Applicative Combinatory Categorial Grammar

The model of Applicative Combinatory Categorial Grammar (ACCG), as most of categorial models, assigns syntactical categories to each linguistic unit in order to express its function. The basic categories N^* and S are assigned respectively to noun phrases and sentences. The orientated categories, developed from basic types by means of the two operators of types construction “/” and “\”, are assigned to the linguistic units which function like operators. For example, the category $(S \setminus N^*) / N^*$ is assigned to transitive verbs which are seen as operators with two operands, the first being the object of type N^* positioned to its right whereas the second being the subject of type N^* positioned to its left. A linguistic unit u with the type X will be noted by $[X : u]$.

According to the postulate that the representation of the language is with three levels [9] [19]: (i) the level of morpho-syntactical expressions; (ii) the level of applicative expressions; (iii) The cognitive level, the ACCG makes it possible, by means of rules : (1) to verify the syntactic correctness of the sentences and (2) to incrementally construct the semantic functional interpretation.

Let us show the rules that we use in this paper:

Application rules :

$$\frac{[X/Y : u_1] + [Y : u_2]}{[X : (u_1 u_2)]} \longrightarrow \quad ; \quad \frac{[Y : u_1] + [X \setminus Y : u_2]}{[X : (u_2 u_1)]} \longleftarrow$$

Download English Version:

<https://daneshyari.com/en/article/6902104>

Download Persian Version:

<https://daneshyari.com/article/6902104>

[Daneshyari.com](https://daneshyari.com)