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Dependency Phonology: Construction of the theory and Its Relationship to Other non-Linear Approaches

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A B S T R A C T

Dependency phonology is a distinctive approach to phonological description where hierarchisation is the main notion within it. In essence it claims that one value can have implications upon the whole parts of the phonological structure. Dependency phonology (DP) is not intended to show relational issues in terms of 'strong vs weak' relations rather it is intended to show hierarchy relations in terms of head: dependent or governor: dependent. The analogy of dependency relations which had been introduced by syntax represented the initial and first steps in DP work (cf. Anderson & Jones ١٩٧٢/١٩٧٤, Anderson & Ewen ١٩٨٧, Anderson ١٩٩٢).
Although the whole material of DP work is not large before ١٩٨٧, several aspects of the theory of the DP are adopted later by leaders of Generative phonology especially in regard to the transformation of GP from linear to non-linear Generative phonology in ١٩٧٠s and ١٩٨٠s. Government phonology has similarities with DP, but it differs from DP in making generalization and universal principles and parameters. The feature geometry and dependency phonology also have affinities because both aim at describing a feature in a system that is based on governance. This paper aims at showing that DP is a modern theory of phonological analysis. DP offers several innovations to phonological field whether on segmental or suprasegmental patterns. It traces its applications to specific issues like vocalic feature hierarchisation and gestures within the modern trends represented by many authors like Ewen (١٩٨٠), van der Hulst (١٩٨٩, ١٩٩٥), Anderson (٢٠٠٢), Durand (١٩٩٠, ١٩٩٥), Staun (١٩٩٦). This study will add perspectives to the applications of DP and highlight its relation to the 'main stream' GP.
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التبعية الصوتية : تطورها وعلاقتها بالنظريات الاخرى

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الخلاصة

تعتبر الاعتمادية الصوتية منهجاً متميزاً في دراسة وصف النظام الصوتي حيث يكون التسلسل الهرمي للعلاقات مبدأ اساسي فيها. في معناها الرئيسي وجود قيمة واحدة لديها صلة وثيقة مع جميع الاجزاء الخاصة بتركيب علم النظام الصوتي. الاعتمادية الصوتية لايُقصد بها القضايا التي تتعلق بعلاقات الضعف والقوة وانما يُقصد بها اظهار العلاقات الهرمية بمعنى الاساس والفروع المعتمده عليه.

العلاقات الاعتمادية قد قُدمت بالاصل بألاطار النحوي والذي يمثل الخطوات الاولية للعمل في النظرية الاعتمادية الصوتية (اندرسن،١٩٧٤/١٩٧٢، اندرسن واوين ١٩٨٧، اندرسن ١٩٩٢). بالرغم من ان المادة المخصصة للعمل ضمن النظرية الاعتمادية ليست بكثيرة قبل ١٩٨٧، فأن الكثير من قضايا النظرية قد تم تبنيها لاحقاً من قبل قادة النظرية التوليدية الصوتية وخصوصاً فيما يخص التحول من النظرية التوليدية الصوتية ذات المسار الخطي الى النظري الصوتية غير الخطية في فترة السبعينات والثمانينات. هنالك تشابهات مابين نظرية النظام الصوتي المحكم ونظرية الاعتمادية الصوتية لكنها تختلف عن النظرية الاعتمادية بعمل عموميات وقواعد ومبادئ عالمية. نظرية الصفات الهندسية الصوتية تحمل الكثير من الصفات المشتركة مع الاعتمادية الصوتية وذلك بسبب ان كلاهما تهدفان لوصف صفة في نظام قائماً على اساس الحكم. هذا البحث يهدف الى اظهار ان النظرية الاعتمادية الصوتية من النظريات الحديثة لتحليل النظام الصوتي. يعرض الكثير من التحديثات التي قدمتها النظرية سواء على مستوى الوحدة الصوتية ام فوق الصوتية. تتبع تطورات النظرية وتطبيقاتها لقضايا محددة منها صفة الهرمية الصوتية لحروف العلة ومخارج الحروف والاصوات الصحيحة وذلك ضمن الاتجاهات الحديثة التي يمثلها العديد من الكتّاب منهم ايون (١٩٨٠) فان دي هرست (١٩٩٥،١٩٨٧)، اندرسن (٢٠٠٢)، ديوراند (١٩٩٠، ١٩٩٥) وستون (١٩٩٦). هذا البحث من المؤمل ان يضيف وجهات نظر لتطبيق نظرية الاعتمادية الصوتية ويؤكد علاقتها مع الاتجاة الاساسي في الدراسات الصوتية وهو علم النظام الصوتي التوليدي.

Introduction

Dependency phonology represents an approach in phonological description both in paradigmatic and syntagmatic dimensions. In paradigmatic scale DP intends to present suggestions for a set of ultimate 'features' (the main 'building blocks of phonological segments') and for "their relationship within segments". In syntagmatic dimension a set of structures extending from the syllable to the level of utterance is proposed by DP. Therefore it is possible to state that DP covers the phonological structure in its complete form (both at segmental and suprasegmental levels), (van der Hulst, ٢٠٠٦). Dependency phonology is not intended to show relational issues in terms of 'strong; weak' relations rather it is intended to show hierarchy relations in terms of head: dependent or governor: dependent. According to Staun (٢٠٠٢:٣) three main assumptions are embedded under this approach: firstly, some units of higher direction structured the lower ones; secondly, higher units can be features or autonomous labels that are based on phonological or phonetic components; and thirdly, there exist binary or unary features that represent the final constituents of the tree. Lass (١٩٨٤:٢٧١) states that dependency phonology has not received a wide popularity especially in comparison with other approaches to phonology, and it has been adopted by a limited number of scholars. He describes DP in a very satisfactory way, as: "It represents an interesting departure from previous frameworks, and manages to make connections that are inapparent in other systems, by unifying apparently disparate phenomena under a single set of notations."

The earlier form of dependency phonology is originally stated in European phonological model which is the first that shows hierarchy relations under feature matrices. The main notions of the theory especially concerning the core structure of a segment are presented formerly by Lass and Anderson, ١٩٧٥; Lass, ١٩٧٦; Ewen, ١٩٨٠. As is shown in the following figure:

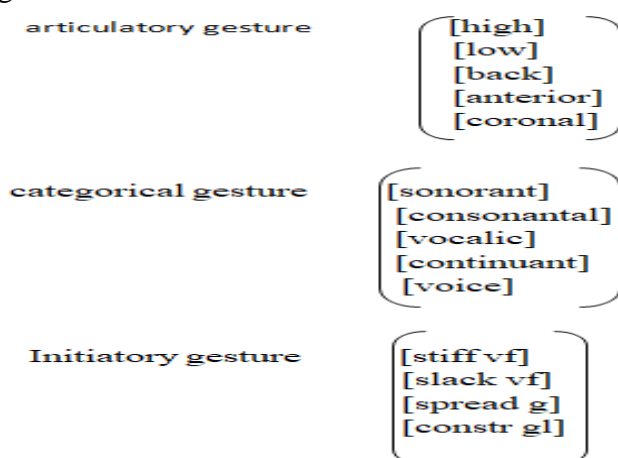| articulatory gesture	[high] [low] [back] [anterior] [coronal]
categorical gesture	[sonorant] [consonantal] [vocalic] [continuant] [voice]
Initiatory gesture	[stiff vf] [slack vf] [spread g] [constr gl]

Figure (١) from Staun (٢٠٠٢) Segments Core Structure

Van der Hulst (٢٠٠٦:٢) observes that DP posits a different phonological representation in the paradigmatic dimension. It shows suggestions for a set of ultimate 'features' or 'primes' "i.e. the basic building blocks of phonological segment, and for their relationships within segments." Whereas in syntagmatic dimension, DP posits proposals for a hierarchy of structures stretching from the syllabic to the utterance level. So DP covers the complete range of phonological structure and that is applied to both segmental and prosodic level. However, DP firstly initiated by papers put forward by Anderson and Jones (١٩٧٤), their goal is to make the main framework to dependency model based on phonological terms that **constitute (grammar)** an equivalent part to Anderson's dependency models in morphology and syntax. Therefore DP can be situated under dependency grammar, this participation adds innovative view in the application of dependency grammar which previously has been specified primarily to morpho-syntax. Anderson (١٩٨٥, ١٩٩٢) has introduced the idea of Structural Analogy Assumption or Hypothesis in which morpho-syntactic and phonological structure should be analyzed mutually in terms of a particular construction of dependency relations.

Dependency Description of Segmental and Suprasegmental Relations

Ewen (١٩٩٦:٣) observes that dependency phonology is distinctive in the segmental representation from all other nonlinear models; because it holds that headedness is involved in the internal structure of the segment (dependency relation can be shown within this domain). However, the nature of the interaction among features is determined by the relative prominence. It is still single-valued (unary) features which are closely related to the vowel systems. Within segments' level, vowels are dealt with as examples to show dependency. Since vowels have more than one 'single-valued feature', dependency phonology is induced to involve in their representation. So a standard set of features [front], [round], and [sonorant] (or [open]), can be denoted in DP as |i|,|u|, and |a|, respectively, therefore a specific set of representations two or three of these features can co-occur viz.,|i, u|, |i, a|, |u, a|, and |i, u, a| . What is significant is that, if the vowel complexity is increased there will be a need for more features to its representation. Vowel space can be dealt with from dependency view. According to Ewen and van der Hulst some vowel systems may be ordered in terms of [tense] vs. [lax], and others require an ART oppositions. A third system is also added, it is the scalar processes which involve vowel lowering and raising affecting. It is agreed that for a system containing two mid vowels /e/ and /ɛ/ in the sense both have the features |i| and |a|. The only difference is that they have different prominence: |a| governs /ɛ/ and |i|, and | ɛ|, | i | are

dependent on |a|. At the same time, from another perspective, assuming that the relation between all four vowel sounds /i e ɛ a/ is the same because they belong to unrounded vowels. Relative prominence is the factor that distinguishes one vowel from another in terms of dependency, so / ɛ/ is more sonorant than /i/ but its frontness is less prominent than /i/. Therefore vowel height can be considered as a scale to show relative prominence of two components in relation to unrounded vowels, sonority, and frontness, as in (٢)
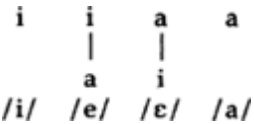
```
i    i    a    a
     |    |
     a    i
/i/  /e/  /ɛ/  /a/
```

Figure (٢) Vowel Height and Prominence, from Ewen (١٩٩٦)

In another context, DP has proved a valid claim in relation to monophthongization. The representation of mid vowel system (those of /e/ and /ɛ/), is stated in relation to dependency where the process of fusion will show dependency relation holding among them. Anderson and Ewen (١٩٨٧:١٢٩) have clarified that monophthongization of Middle English diphthongs/aɪ/ and /aʊ/ to /ɛ/ and /ɔ:/ in late Middle English posts the anticipated development, as shown in (٣)

Early Middle English /daɪ/ > late Middle English /dɛ:/ "day"
Early Middle English /klaʊ/ > late Middle English /klɔ:/ "claw"
Figure (٣) Middle English Monophthongization.

Here the change is in a falling diphthong where the second element (containing /ɪ/ and /ʊ/) are less prominent than the first element containing only /a/, so /a/ governs both /ɪ/ and /ʊ/. After fusion the dependency relation is maintained. That low mid vowel is given instead of high mid vowel.

The above details are related to dependency within the segment, dependency relations are also held above the segment: suprasegmental level. A symmetric relation is shown by governor and dependent. Therefore a syllable is headed by a syllabic segment. Thus it is commonly believed that a stressed syllabic segment is more prominent than unstressed syllabic segment. Even among consonant clusters dependency is maintained in the sense that a sonorant consonant is more prominent than a nonsonorant consonant. Therefore in the construction of the English word 'marinade' the head is associated with the line related to /e:/, it is head of the rhyme /e:d/ and the syllable /ne:d/ as in figure (٤):
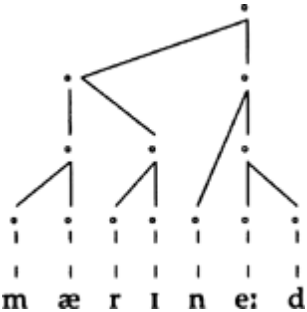
```
m  æ  r  ɪ  n  e:  d
```

Figure (٤) Dependency Representation of the Word 'marinade', Ewen (١٩٩٦)

However parallel considerations can be applied to the subsyllabic constructions the onset and the coda, in which the governor is the one which is more sonorant consonant than the other.

Structural Analogy and Constructions

Anderson (٢٠٠٢:٣) states that the congruence of molds in the representation of any phonological phenomena is the major principle in dependency phonology. The central notions are the head and the dependent; in which the first is dominant and has one terminal (a minimal unit), and the dependent(s) is the construction(s) that has one head. The head is characterized by particular phonological features; the perceptual salience is the fundamental one. For example, the head of the syllable of the word 'pat' is the vowel /ɑ:/ ; it is salient because of being at the peak of energy in the pronunciation of the syllable as well as its inherent sonority. But in the orthographic representation of the cluster as 'spr' of the English word 'sprat' the cluster does not constitute a syllable, and does not have a syllable head. In spite of that the cluster 'spr' has a construction which is a syllable onset; some specific rules and rigid restrictions concerning the occurrence of a cluster (as str- and spr- but not *stl-) it is not qualified to be a syllable. Constituency in dependency representations is not primitive. In the sense, that all constructions can be constituted by a head and other dependents to show dependency. Therefore the syllable spelled in 'pat' can be represented by a graph to constitute a head, and dependents are represented as branches:
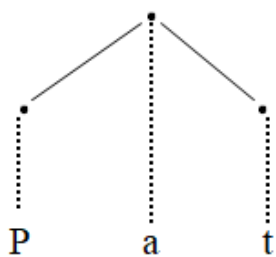
(٥)

Figure (٥) Dependency and constituency, from Anderson (٢٠٠٢)

A head node is characterized by a symmetric line or arc, and it is distinguished by its position which is always superior in the node of the tree. It is also terminal. In dependency representation there is no recourse to labels for construction. For example, no pre-terminal categories can occur, like 'a syllable' or 'a foot', however a syllabic is the head of a syllable construction. In this respect it is similar to Halle and Vergnaud (١٩٨٧) 'bracketed grid' representations. It is different from much analysis in prosodic structure which is based on 'a hierarchy of constituent-types' and 'constituency based' such as the work of Selkirk (١٩٨٤). Another different trend is 'relational labeling' related to metrical phonology originated by Liberman and Prince (١٩٧٧), that involves a constituency in tree representations which fundamentally shows strong vs. weak labels. However in dependency phonology prominence of the syllabic, for instance, can be represented relationally by the dependency arcs.

Dependency Phonology and Syntax: relations and effects

The analogy of dependency relations which had been introduced by syntax represented the initial and first steps in DP work (cf. Anderson & Jones ١٩٧٢/١٩٧٤, Anderson & Ewen ١٩٨٧: §٣،١, Anderson ١٩٩٢a: ch.٢). That early work of analogies between levels has played a major role in the development of DP(cf. e.g. Anderson ١٩٨٥, ١٩٨٦a), and of dependency morphology(see e.g. Anderson ١٩٨٠a, ١٩٩٢a: §٢،٣, Colman ١٩٨٥, ١٩٩٤, ١٩٩٦). Linguistic levels are represented differently because each level has different domains or shows distinct organization principles. Within phonology it is possible to recognize a distinction between an utterance level and a lexical level. Thus the

main distinction between representation levels is the difference of plane and the uniqueness of the 'substantive alphabet'. Initially alphabets specify the major 'elements' (words and segments) which constitute the structures. Then each level has its own determination and rules, for instance, the alphabet of syntax is semantically or conceptually based, that is according to views derived from 'notional grammar'. It is phonetically or perceptually based in phonology. So, phonological and syntactic representations are of different planes. Therefore 'structural analogy hypothesis' constrains differences among levels. That hypothesis is used especially in the work of DP by discussions of Anderson in Anderson (١٩٩٢), Anderson & Durand (١٩٨٦), Anderson & Ewen (١٩٨٧:) and Durand (١٩٩٠, ١٩٩٥), Staun (١٩٩٦).

Structural Analogy Assumption: Similarities and Differences

The structural properties can be represented in the same terms both in syntax and phonology. Of course some differences exist specially in regard to planes, that is due to the nature of the alphabet involved in each level. Apart from being semantically vs. phonetically based, syntax and phonology are different in their alphabets in several perspectives. For example, syntactic categories are very exceptionally differentiable from syntactic perspective; whereas in phonology the categories (which are proper to phonology) are much more restricted. However the relation is asymmetrical between the two planes; in the sense that the phonology can be 'interpretive' of the syntax. Therefore analogy works both within planes and across levels: transplanarly. So phonology has similarity with syntax in regard to the relevance of invoking relations in a dependency sense as well as a stimulus for discriminating between dependency relations as 'adjunction' and dependency as 'subjunction'.

It is also supposed that the dependency relations are always associated with a distinction in 'linear precedence. As in the following example, the head is distinguished from its both dependents in precedence and in being positioned distinctly. This involves subjunction, it is equivalent to the dependents: the subject (jo) and the object (Jill) which represent both dependents of the head 'kissed', so it is useful to distinguish between a sentence and a verb phrase, as in the syntactic tree:
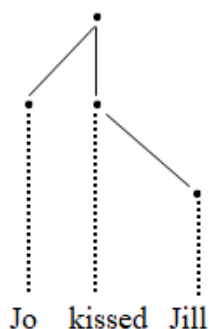

Figure (٦) Sentence and verb phrase relation, from Anderson (٢٠٠٢)

A node which is associated with 'jo' is the subject, it is joined to the head 'kissed'. Here the head 'kissed' represents both the head of the whole sentence and the head of the verb phrase 'kissed Jill'. The two constructions: the sentence and the verb phrase stay distinct, each one occurs in a different side: the left dependent 'Jo', and the right dependent 'Jill'. "*kissed* is subcategorised for both the subject, dependent on the head of the sentence, and the object, dependent on the head of the 'verb phrase'."

Likewise, the representation in regard to subjunction of the phonological example 'pat' can be stated with the rhyme as a constituent, as:
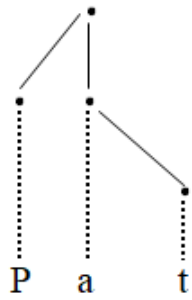
P   a   t

Figure (٧) Rhyme and Constituent, from Anderson (٢٠٠٢)
The nucleus of the syllable 'a' is both the head of the rhyme and the head of the syllable. Syllable final consonant is an essential part of this rhyme. Here the nucleus represented by 'a' is ' a transitive' one. It is different from vowels in words like: 'pea' and 'peat' which are free: that a dependent consonant need not be associated with them. Therefore, both syntax and phonology have in common many structural properties other than dependency relations: both planes share adjunction vs. subjunction and the relation of transitivity.
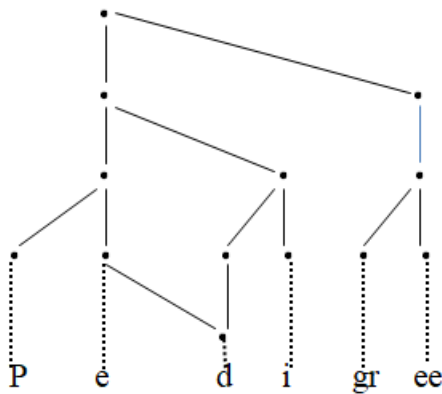More inclusive constructions can be embedded within headhood, as in the following example:

P   e   d   i   gr   ee

Figure (٨) Inclusive constructions of Headhood, from Anderson (٢٠٠٢)
The initial vowel is 'the phonological head of the word', it is the word-accent; and both the first and the final vowels. Both syntactic and phonological construction show transplanar analogies including dependency relation. There are also intraplanar analogies occurring in phonology between word structure, or lexical structure, and utterance structure. Both domains have similar structural hierarchy, as shown in 'Fly from Aberdeen':

Tonic   UTTERANCE

Ictus

Syllabic

Tonic   WORD

Lctus

Syllabic

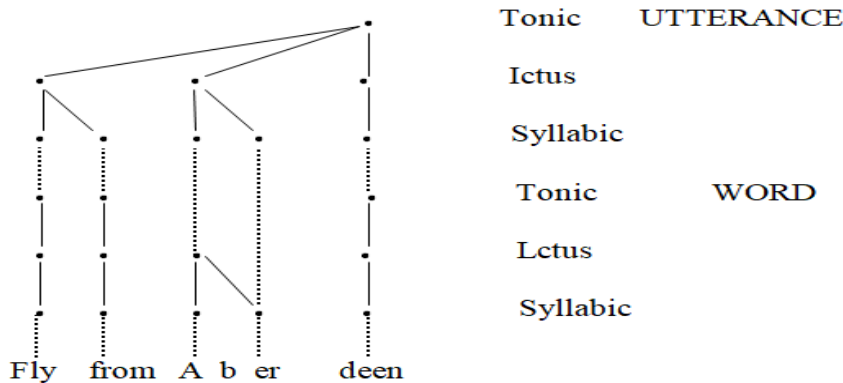Fly   from   A   b   er   deen

Figure (٩) Constructional Hierarchy

Within its own domain, each level has (the word or the utterance) "the same successive constructions: syllable, with syllabic head, or peak; foot, with foot-head, or ictus; and word or tonic group, with tonic head (word accent or group tonic)."

Of course, not all stressed words can be an ictus or an utterance tonic. Word structure in English suprasegmental can be predictable from "the segmental content of the lexical entry for the word." The study of the internal structure of words has also been invoked in dependency phonology and that is equivalent to the structural analogy assumption. However DP assumption related to the phonological structure representation is "unarism of the atoms of phonological representation."

The Primary Form of Dependency Description

Staun (٢٠٠٢:٧) observes that Vowel space is used as an example to illustrate the notion of dependency phonology. It is originally argued by Lass's and Lass and Anderson's (١٩٧٥) proposals of feature organisation which holds that "phonological primitives are unary particles or components". That means a feature may be present or absent (a presence of one value) that is contrasted with binary features which means the characterization of a sound by a plus or minus values. By tree components, the initial dependency system appears as follows:
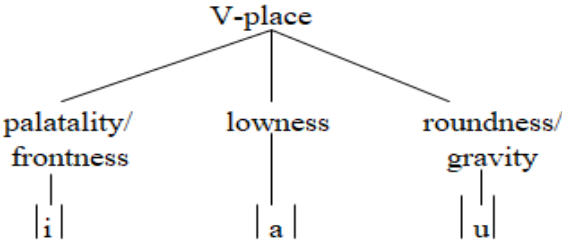

Figure (١٠) A Feature Tree System, Staun (٢٠٠٢)

The above three modules /i/, /a/ and /u/ constitute the final ends of the tree (see Maddieson, ١٩٨٤). Any vowel can be described according to the specifications that are drawn by each one of these vowels. If there is a combination of structure there will be components (or a component) that are dominated by others. So the vowel system as /i, e, a, ɑ, o, ɔ, u/ will have the following clarification, for example, |i;a| denotes that the component |i| is the governor of |a|, so |a| is a dependent of |i|. This governance relationship can be shown as an arrow form: '→'where arrow way can postulate dominance direction relationship:

١١-/i/ /i;a/ /a;i/ /a/ /a;u/   /u;a/   /u/
 /i/ /e/   /a/   /ɑ/ / ɔ/   /o/ /u/

Thus vowels which are placed on the |i|– |a|-'scale' are described as front vowels and those which are placed on the |u|–|a|-'scale' are back vowels. So the more open vowel the more a-ness it contains and will be dominant in it. However, it is evident that the key notion here in (١١) relationship is a dependency one where hierarchy relations are held among components. So to describe a segment's internal structure, one component can enter "into with one or more other components".

Further Developments of the Dependency Description

The initial form of dependency phonology in relation to vowel description is criticized by phonologists, and van der Hulst (١٩٨٩) is the major one who has presented innovations to it, that is for two reasons. Primarily, the distinction among |i|, |u|, and |a| is contrasted with binary features of phonological structure in the sense that the three-mode distinctions violate the binary system claim. Hence, the three modes must be re-arranged into two-way separations. Therefore van der Hulst has put the three modes into a new hierarchical organization, as in (١٢):
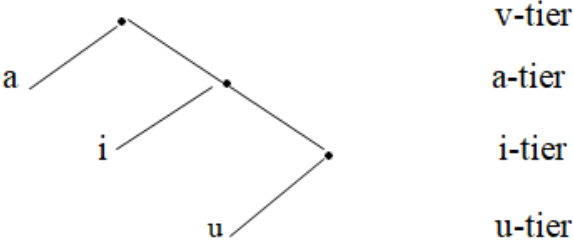
```
                    •                    v-tier

      a                      •           a-tier

             i                           i-tier

                  u                •     u-tier
```

Figure (١٢) Hierarchical Organization, (Hulst, ١٩٨٩)

that splits |a| on one side , from |i| and |u| from the other. A major justification for this separation is that the dispersion of |i| also involves the dispersion |u|. Another one is that the class of high vowel can also be shown. Furthermore, van der Hulst has discussed the case of specification in the sense that 'why |u| alone specifies [u]'' and the same for |i| so the reason behind that is not clear for him. While it is true according to the description of these elements that a front vowel is specified by |i| but it is not inevitably a high vowel. The same is also said about |u| which alone can specify a back vowel but not inevitably a high vowel. In order to solve this lack innovative interpretations have been suggested by van der Hulst (١٩٨٩:٢٦١) of the three components relying on whether they act as dependents or governors.

```
        ___ governor:     velar constriction
|u| <
        ___ dependent:    rounding

        ___ governor:     palatal constriction
|i| <
        ___ dependent:    advanced tongue root

        ___ governor:     pharyngeal constriction
|a| <
        ___ dependent:    openness
```
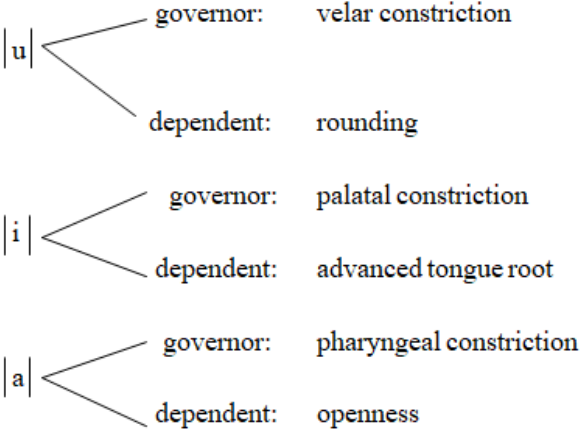
Figure (١٣) Dependents and Governors' Relations

It is proposed by van der Hulst that a redundancy rule can be linked to the above new interpretation in the sense that in the representation of a vowel one component can have two values that can be both governor and dependent. So |i;i| |u;u| and |a;a| are 'all possible represntations'. In the following example, the first two are stated to differentiate between /i/_ / ɨ/ and /u/_/ ui/:

١٤- /i/ /ɨ /   /u/   / ui/
      /i;i/ /i/   / u;u/   /u/

This innovation has proved to be useful in solving the problem of centrality |e| (Anderson and Ewen, ١٩٨٧). However a further interpretation has been suggested by van der Hulst in

which the three components are dealt with hierarchically. He presents intrinsic features of components that include open and close, and |u| as round. According to their structural position as tiers as in (١٢) |a|, |i|, |u|, the components have extrinsic features. Of course by |i| and |u| the components are assigned as high and have to pass by the higher tiers. So at this step the extrinsic features are stimulated. However it is due to the status of the component as dependent or a governor the features of that component which passes through the tier (any of the three tiers) can be specified. Colour features are only activated if the component is a dependent. If the component is a governor both location and colour features are activated. Van der Hulst presents further modification that can express hierarchy as shown in the following figure:

```
         intrinsic features          extrinsic features
                                            /    \
                                       colour    location

    |a|  [pharyngeal con.]         [closed]      [tongue body con.]
         [open]
    |i|  [palatal con.]            [RTR]         [velar con]
         [ATR]
    |u|  [round]                   (none)        (none)
```

Figure (١٥) Further Hierarchy Relations

The description is that the features activated by the component are the results of the component's status that can be a dependent or a governor. Although the description becomes rich and elaborative, it presents much complexity to the system. For instance, it is not appropriate to describe /e/ and/a/ as having both [closed] and [open] at the same time, and the same can be said about /y/ and /o/ as having the features [RTR] and the feature [ATR] at the same time. Both [closed] and [open] and [RTR] and [ATR] are not identical. Obviously bringing these mismatched features together to specify a component is the problematic area of his interpretation. The overall result is that the description becomes problematic but the improvement exists in some parts. That is why van der Hulst has later developed CV phonology: a new phonological model (cf. van der Hulst, ١٩٩٤, ١٩٩٥). That model has much affinity with dependency phonology.

Applications of the Theory and Insights

The notion of dependency is originally incorporated with dependency phonology model. In recent years some applications of the model are used in other approaches. Ewen (١٩٩٦:٨) denotes that two main approaches have adopted the application of DP and its insights, these approaches are: Structural Dependency and Parametric Dependency. The recent versions of Feature Geometry has used 'dependency' under the title 'Feature Geometry and dependency' by McCarthy (١٩٨٨). Here dependency plays a central role in the theory. Dependency relations are held between different tiers features. Paradis and Prunet (١٩٩٠:٥) state that "a node or feature X immediately dominated by a node Y is said to be a dependent of node Y." Therefore dependency is maintained within this theory. However McCarthy (١٩٨٨: ٩٨) observes that "by the logic of the dependency relation, the presence of a subordinate or dependent feature entails the presence of the superordinate or dominating feature". In reference to McCarthy's example of coronal and labial dependency relations it is clear that these notions (*Dependency ones*) have proved valid, as in the following:
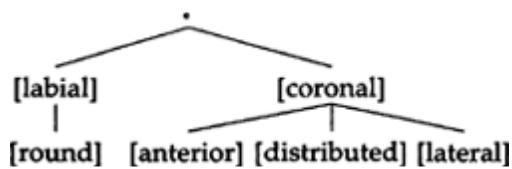
Figure (١٦) Labial and Coronal Dependencies, from McCarthy(١٩٨٨:١٠٣)

In the above figure, [round] is said to be dependent of labial, and [anterior] is dependent of coronal, coronal is the governor of anterior, and so on. Thus, in McCarthy's analysis both [labial] and [coronal] are unary. However in Feature Geometry what is significant to deal with is "dependency of occurrence" or structural dependency rather than 'inherent dependency', and despite of the fact that much emphasis is laid upon structural dependency the notion of 'inherent dependency' is embedded in the theory. A universal feature geometry is formulated to show that dependency relations are intended to "formalize the constraints holding on the human articulators." (Ewen:١٩٩٦:٩).

Parametric dependency, on the other hand, shows also the dependency notion among tiers. Mester (١٩٨٨:١٢٧), for example, cited in Ewen (١٩٩٦), claims that "dependent tier ordering means that a hierarchical organization is imposed on the set of features,". In the same context he says: "individual features, while occupying separate tiers, are not entirely autonomous and are dependent on other tiers which have a more central location" (Ibid). Although Features are binary in Mester's model, the nature of a dependent feature is constrained by the feature that controls it.

Furthermore, some insights of Dependency relations can be found in Arabic. Owens(١٩٨٣:٢٥) states that "Three of the key principles in Arabic grammatical theory are structure, class and dependency; items occur in classes at positions of structure and are bound together syntactically in terms of dependency relations." Arabic theory can be set within the pattern of modern western grammar. However Carter (١٩٧٣) is prominent in these attempts. Thus in Arabic theory, the position of each item is related to the notion of governance or dependency. positions are related to each other in terms of dependency or governance .

Within Arabic theory positions are associated with each other according to dependency or governance. The notion of dependency in Arabic is similar to the western principals and according to Robinson (١٩٧٠:٢٦٠) there are four conditions that must be followed to combine a well-formed structure.

١. "One and only one element is independent.
٢. All others depend directly on some element.
٣. No element on more than one other.
٤. If A depends directly on B and some element C intervenes between them, then C depends directly on B or on A or on some other intervening element."

In Arabic theory dependency relations are combined by the existents of many elements as (ᶜɑɑmil) which is the governor and the (maᵉ muul) which is the governed. For the noun these are the nominative (-u, called rɑfᵉ⁾' accusative (-ɑ, naṣb), and genitive (-i, jar or xɑfd); for the verb these are the indicative (-u rɑfᵉ), the subjunctive (-ɑ, ansb), and jussive (Ø, jazm).
-u form, rɑfᵉ : rɑjul-u- n   'a man' (nom) yadhab-u- 'he goes'
          Man nom indef   (indicative):
-ɑ form, naṣb: rɑjul-a-n 'a man' (acc) yadhab-ɑ 'he go' (subjunctive):
-i form, jar: rɑjul-i-n 'a man'(gen) (no –i form in verb):
-Ø, jazm: (none for noun) yadhab 'he go' (jussive).

It is important to emphasize that 'governance relations' are related to the changes in the inflectional forms (iᵉ rɑɑb), and similarly any change in governor leads to changes in

inflectional forms. The dependency relation between inflectional forms   and governor forms the basis of the syntactic structure in Arabic. This co-variation of governor and inflectional form to a large degree constitutes the basis of Arabic.

An example of dependency structure is shown in the following example:

Lan yadrub-a ar-rajul-u gulaama zayd-in

Not hit sbj the-man-nom boy acc zayd gen

'The man won't hit Zayd's son' (arrows are drawn from governor to governed)

The negative future *lan* governs the verb *yadruba* governs the agent, ɑr-rɑjulu in the nominative.The possessor 'zaydin' in the genitive is governed by the object 'gulaama'.

It is observed from this example that Robison's conditions are applied to Arabic. As seen (lan) is the only independent element, all the others are dependent on other elements, for example 'gulaama' depends on 'yadrubu' while the item ar-rajulu depends on 'yadruba'. However in Modern dependency practice and in Arabic there are constrains on the proximity of head and the dependent and with restrictions on their separation.

It is worth mentioning that details of application and insights are beyond the scope of this paper, however the researcher tries to post the view in a simple and brief method. It is hoped that this paper will help researchers who are interested in Dependency phonology to write more elaboration of the theory and its application as well as its status among nonlinear approaches.

Dependency Phonology and Other Nonlinear Theories

Sometimes the feature geometry and dependency phonology are used to describe a feature in a system that is based on governance. However feature geometry covers several aspects and dependency phonology covers aspects of more homogenous nature. All components within dependency phonology share a common feature which is the hierarchy relation. Whether segmental or suprasegmental units, all have a sense of dependency that covers the structural units of the hierarchies of features 'of the ultimate components'(Staun,٢٠٠٢: ٣).

Dependency graphs can represent suprasegmental or prosodic structure, Andersoon and Ewen (١٩٨٧) have presented details related to syllabic (also include ambisyllabic and subsyllabic) and prosodic structures. Although their work have much similarity with Metrical Phonology and Prosodic Phonology, it is slightly different in parametric applications and being 'less explicit on the cross-linguistic'. However DP in regard to (intra)segmental level is related also to constituency. Anderson & Jones (١٩٧٤) and Lass (١٩٧٦) have presented arguments concerning the view of characterizing the phonological segment in DP which must consist of two submatrices, according to DP they are called gestures. It reflects the state in which phonological processes like deletion and assimilation that effect specific gestures and other gestures are left unaffected. This condition is called stability effects which viewed specifically in 'Autosegmental Phonology'. Some cases of reduction of full consonants to the glottal [h] and glottal stop [?], which occur in many Scots varieties, are discussed by Lass (١٩٧٦), which display the "independence of the laryngeal features vis-a-vis the oral (or supralaryngeal) features". The discussions of phonological primes which reflect the grouping of subsegmental features are similar to concepts argued in Feature Geometry in regard to feature classes.

However in early work of DP the main division is split into two parts: a laryngeal gesture (including glottal states and voice) and a broad oral gesture (covering major class, manner and

place primes). Then according to Anderson & Ewen (١٩٨٠), Ewen (١٩٨٠), (Lass ١٩٨٤), it is later replaced by a tripartite gestural organization.

However the detailed and fundamental account of DP can be observed, more than a decade before, in Anderson and Ewen (١٩٨٧) work in which original proposals are raised as well as extensions to the theory. But before and after ١٩٨٧ the whole material of DP work is not large, even the number of researchers is limited especially in comparison with the number of researchers working in 'major trend of generative phonology' represented by Morris Halle and his followers. Unfortunately DP has been ignored by many because it has failed to 'penetrate' the mainstream of generative phonology. In spite of that several aspects of the theory of the DP were adopted by leaders of Generative phonology especially Chomsky and Halle ١٩٦٨ in regard to the transformation of GP from linear to non-linear generative phonology in ١٩٧٠s and ١٩٨٠s. Government phonology, recent phonological model in ١٩٨٠s, also has similarities with DP, but it differs from DP in two aspects. DP has developed more open ended patterns in its application, wheras Government Phonology has laid much emphasis on elaborating a restricted and 'a narrowly-defined' theory of primes as well as segmental and suprasegmental patterns. Another difference is that Government Phonology tries to make generalization and universal principles and parameters whereas DP follows the view of Chomsky's and Halle's model in which "language specific phonological rules map underlying representations into surface structure." (Van der Hulst ,٢٠٠٦:٣).

Conclusions

The above details related to Dependency Phonology, concepts, orientations, and relations are stated from different perspectives. The researcher is lucky to have an opportunity to meet professors in English Department, Tikrit University, just to exchange knowledge and that has contributed a lot in the process of enriching the content of this particular paper. Many thanks to all staff members who contribute in a way or another ,giving references or providing information by discussion, in the production of this paper.

It is worth mentioning that DP is not incompatible with any other non-linear approaches. Although it suffers from insularity for a short time, it has proved later that it is closely related to modern phonological theories like, Metrical phonology, Autosegmental phonology, Government and Feature Geometry. The main notions of DP are adopted and followed by most authors and scholars of GP. What is interesting is the complementary among all phonological models and that helps in presenting a clear interpretation about various phonological phenomenon.
Some insights of the theory are found in the mainstream GP in which 'nonlinear approaches' have adopted.
However dependency phonology, with respect to the previous discussion, has not given the status that it deserves especially if the situation is compared with other approaches under 'Generative Phonology'. The best that can be stated in favor of this approach is that it has dealt with several interesting aspects in phonology (and grammar), that structural analogy, gestures, vocalization, dependency and governance are successfully incorporated with under this approach.
What is required is further research and finding out further applications of the theory that may lead to a better understanding of its contribution. Although the situation in recent years is different from the initial period of initiating the theory, the efforts in developing Government

Phonology and Feature Geometry are more than those exerted in developing Dependency phonology. Furthermore, it is possible to find evidence of the theory in other languages, Arabic language, for instance, is given in a very brief way to denote an insight of the theory.

Finally this paper is a very brief account of DP and is intended to show the contribution of DP and its main construction. It is also an attempt to encourage researchers to study topics about DP and find relations with other theories.

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