POSITIONAL CONTRAST AND NEUTRALIZATION OF VOICING IN CLASSICAL ARABIC

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التضاد والتحييد اللفضي الموقعى فى اللغة العربية

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الملخص:

تتوزع الاصوات العربية الصحيحة باعتبار سياقاتها اللفظية وهده السياقات الصوتية المختلفة تخلق اشارات سمعية مختلفة .هنالك سبعة اشارات سمعية لتباين الاصوات الانفجارية افترضها العالم ستيريد عام 1997 وهى: صوت الاطباق, وزمن الاطباق, وزمن رنين الصوت السابق, وقيم الطبقة الصوتية لصوت العلة السابق, والسعة وزمن انفجار الصوت, وزمن بدء التصويت وقيم التردد الاساسى والطبقة الاولى عند انطلاق الصوت وبعكسها ستكون الاصوات متعادلة. تشير السياقات الصوتية المختلفة الى المواضع المختلفة التى يحتلها الصوت ضمن المقطع الصوتى الواحد كان تكون بداية فى حدود الكلمات.المقطع الواحد ونهايته او نهاية المقطع الاول وبداية المقطع اللاحق. فتكون الاصوات فى اللغة العربية متباينة ضمن المقطع الواحد او المقطعين المتجاورين فى حين تكون متعادلة في حدود الكلمات.

الكلمات المفتاحية: التضاد، التحييد، اللفض، الموقع، اللغة العربية.

Abstrac

Arabic consonant segments are distributed in accordance with the phonetic and phonemic environments. Different phonetic environments creat different perceptual or voicing cues. There are seven voicing cues to voicing asymmetry in plosives: closure voicing, closure duration, duration of preceding sonorant,values of the first formant frequency (F1) in the preceding vowel, burst duration and amplitude, voicing onset time (VOT), and values of fundamental frequency (Fo) as well as (F1) values at the onset voicing (Steriade, 1997) otherwise voicing is neutralized. Different phonemic environments refer to the different positions that the segments occupy in the syllable constituent of prosodic structure such as intrasyllabic segments (onset-coda) or adjacent intersyllabic ones (coda-onset) and each phonological position is subject to the licencing principles (Kaye, 1990). In classical Arabic, voicing is asymmetrical in intrasyllabic or adjacent intersyllabic environments whereas neutralized in word boundry.

Keywords: antithesis, neutralization, leprosy, location, Arabic.

1- INTRODUCTION

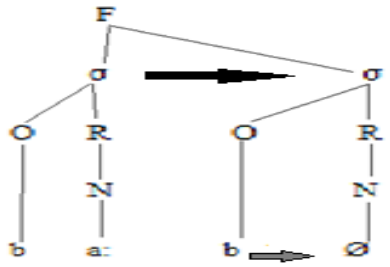
phonemes, the minimal phonological featural contrastive units that represent atomic speech sounds must be formed in matrices, (Eric S.Ristad, 1992) and arranged in distinct temporal order in the stream of speech. Phonetic variation of these phonemes is systematic and conditioned by the surrounding environment.These phonemes are universal consonants and vowels. Arabic consonants are divided into two groups, fourteen Shamsy letters (/t/, /ŧ/, /d/, /dˤ/, /Ɵ/, /ð/, /ðˤ/, /s/, /ʂ/, /z/, /S/, /l/, /r/, /n/) and fourteen Qamary letters (/b/, /k/, /q/, /ʔ/, /f/, /x/, /ɣ/, /ħ/, /ç/, /h/, /J/, /m/, /w/, /Y/) on the basis of their effect on the prefixal definite article [ʔal], 'the' (Kenstowics,1994). Any process related to these segments must be passing through one of the hierarchical prosodic structures of these segments which is syllable (Selkirk, 1982). Consonants are margins whereas vowels are peaks. "Segments have inherent featural suitability for these positions and one segment must be for each position" (Prince and Smolensky, 1993). They are phonologically and phonetically licensed for these positions and "the

privileged one triggers certain phonological processes such as assimilation … etc. (Jill.N.Beckman, 1998) .The relationship between adjacent and inadjacent segments within a constituent or in two adjacent constituents in certain environments is asymmetrical whereas neutraliztion of those contrasts is available in others.As far as classical Arabic is concerned, the language licenses voicing contrasts of obstruents before sonorants in coda position as in /ṣaqr/ 'falcon' whereas it bans such cluster in onset position. The language also licenses voicing neutralization of the mentioned cluster in coda-onset position or word boundry as in /mib.rad/ 'file'. The environments where voicing asymmetry and voicing neutrliztion take place are licenced by prosody or by cue (Steriade, 1997) and developed by Becman (1998) and Lombardi (1999, 2001).

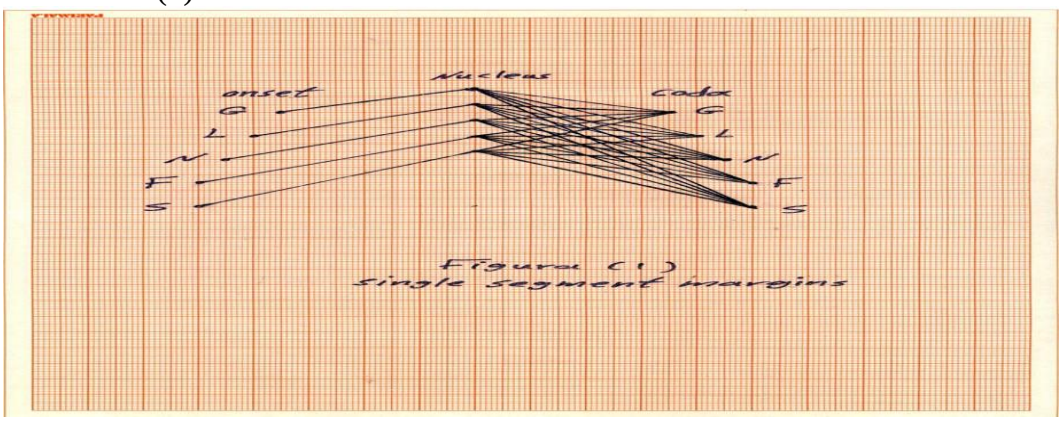
2- Licensing by prosody

Licensing by prosody is used to specify the environment of voicing asymmetry and neutralization by referring to the constituents of prosodic hierarchy such as syllable or foot. Voicing contrast is always found in onset position whereas coda position represents voicing neutralization (Wheeler, 2005). Though segments are in contrastive distribution to form syllable, voicing contrast is neutralized in specific environment.Taking for instance the medial cluster of alveolar nasal /n/,coda of previous syllable, plus obstruent voiced stop /b/,onset of the following syllable, in the Arabic word /min.bar/→/mim.bar/,pulpit, the voicing contrast of the alveolar nasal /n/ is neutralized in bilabiality so /n/ is partially assimilated to be bilabial nasal [m] in order the two are homorganic (Clark.J and Yallop.C, 1995). They also consider clipping vowels in unstressed syllable or before fortis plosives a kind of neutralization such as /mak.ta.ba:t/→ /mak.ta.baᵛt 'libraries'.Voicing of obstruents in Arabic as far as licensing relation below syllable level is concerned is neutralized before any adjacent obstruent in intersyllabic constituents (Steriade, 1997) as they are assimilated in voicing to the following obstruent such as /mat.Jar/→ /maJ.Jar/ 'supermarket' as a result the voiceless stop /t/ is neutralized in voicing to be voiced palato-alviolar affricate /J/ in the context of the following /J/.In case of word boundry such as /Seix.ɣa.ri:b/→ /Seiɣ.ɣa.ri:b/ 'foreign oldman', voicing of the segment /x/ which is in coda position is neutralized to be /ɣ/ in the context of the following /ɣ/. This process is called medial or coda neutralization of voicing contrast as the coda voiceless /x/ becomes voiced /ɣ/ and together with the following onset /ɣ/ to be geminated. Moreover, the post lexical rank of resyllabification in Arabic bans aligning /x/ to the right to be an onset of the following syllable /Sei.xɣa.ri:b/ as a try to maintain its voicelessness. In intrasyllabic inadjacent constituents,consonants at the right edge of the word are in the onset of an empty nucleus specially when they are preceded by tense vowel (Harris,1990) so prosodically the two b's of the word /ba:b/ 'door' are belonging to two different syllables which are licensed by different nucleuses as a result licensing relation between the two onsets is at foot level therefore stressed syllable that has tense vowel licenses unstressed one that has an empty nucleus,hense the two daughters(syllables) of the foot that has the two b's are in strong asymmetry.This kind of asymmetrical relationship between segments in inter or intrasyllable is phonologically determined or viewed as a form of prosodic licensing in that the head of governing relation licenses its complement (Cyran,1995) and when it comes to realizing consonantal contrasts,the central element is the universal difference between onsets and codas (Beckman,1998) and (Lombardi ,1999,2001) as in the following figure.

Figure (1) shows the onset of the empty nucleous (Harris, 1990)



The most important thing is that how we can specify asymmetry if both onset and coda are of the same sonority. If so, it can be phonetically manipulated by phonetic prominence that is licensed by cues (Steriade, 1997). .Figure (2) below shows distribution of classical Arabic margins and more evidence will be shown in table (1) below.



To the best of my knowledge , the model hasn't been formulated before.

Table (1) Single Segment Margins

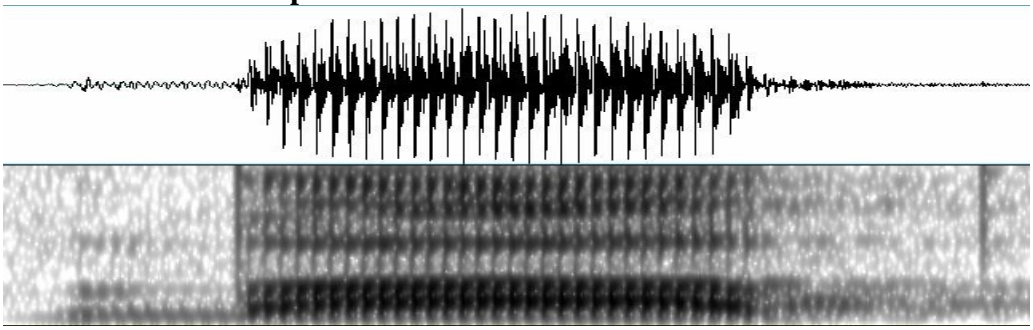
Template	Example	Gloss
G-V-L	/wayl/	Woe
G-V-N	/yawm/	A day
L-V-N	/lawn/	Colour
L-V-L	/layl	Night
N-V-F	/mawz/	Banana
N-V-L	/na:r/	Fire
F-V-F	/xawf/	Fear
F-V-N	/θu:m/	Garlic
S-V-S	/ba:b/	Door
S-V-F	/qaws/	Bow

3 Licensing by cues

Since phonology needs interactions between phonological processes and their conditions to determine the kind and the place of contrast, phonetics has laws to map phonological representation into articulatory forms and to compute the acoustic measurements of these forms so contrast and loss of contrast are identified by phonetic factors or cues and specifically the perceptual ones.Licensing by cues is used to clear up different phonetic properties of different environments and the way they are distributed as far as production and perception is concerned. The approach of Steriade (1999) is invested to realize voicing asymmetry and voicing neutralization of sounds. A Position that has more cues is more salient or more perceptible than that of less cues or does not have (Wheeler, 2005).There are seven cues to voicing contrast in obstruent stops distributed on the basis of the following two environments (vowel- obstruent- vowel) and (vowel- obstruent- sonorant). They are closure voicing, closure duration, duration of preceding sonorant, F1 values in preceding vowel, burst duration and

amplitude, voicing onset time (VOT), and F0 as well as F1 values at onset of voicing in a following sonorant (Steriade, 1997, 1999). By going back to the previous example /ba:b/, it can be determined that the onset- coda voicing contrast is through two contexts of cues; the onset cues and the offset cues (Steriade, 1997). The onset cues are; longer burst duration, voice onset duration of the following vowel and fundamental frequency as well as the first formant transition to the following vowel, the offset cues of coda are in first formant values of preceded vowel, duration of preceded vowel and short period of burst or sometimes no audible release of the coda /b/. It can be concluded that cues of the onset voicing is stronger than that of the offset, so consonant voicing contrast is signaled in consonant – vowel transition /ba:/ more than vowel – consonant transition /a:b/ (Wheeler, 2005) as a result the onset /b/ in /ba:b/ is in asymmetrical relation with the coda /b/ in the same word though the two phonemes are of the same place of articulation, manner of articulation and the same state of the vocal cords. The following figura of the word /ba:b/ shows voicing cues of (onset – coda) voiced stops /b/.

Figure (2) initial-final voiced stop in /ba:b/



In intervocalic sequence of obstruents, stops are affected by what is following not by what is preceding so in (v+stop-obstruent+v), the voicing perception of the stop is affected by the voicing of the obstruent whereas in (v+obstuent.stop+v) the stop voicing is not affected by the preceding obstruent but by the following vowel and the acoustic measurements show that the burst and transition of (stop+vowel) override that of (v+stop) because voicing of the latter is influenced or chopped by the following obstruent as in /mɪb.rad/. ‘file’ and /mɪr.baʇ/, ‘peg’.

Figure (3) shows the spectrographic analysis of the word /mɪb.rad/.

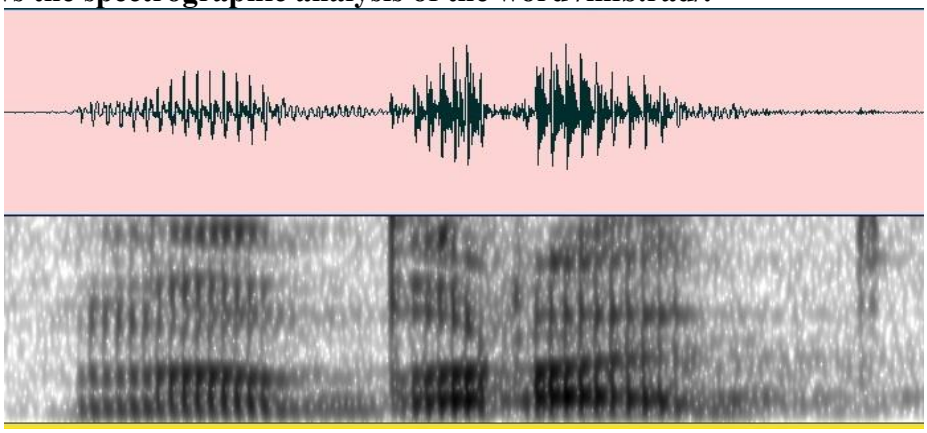
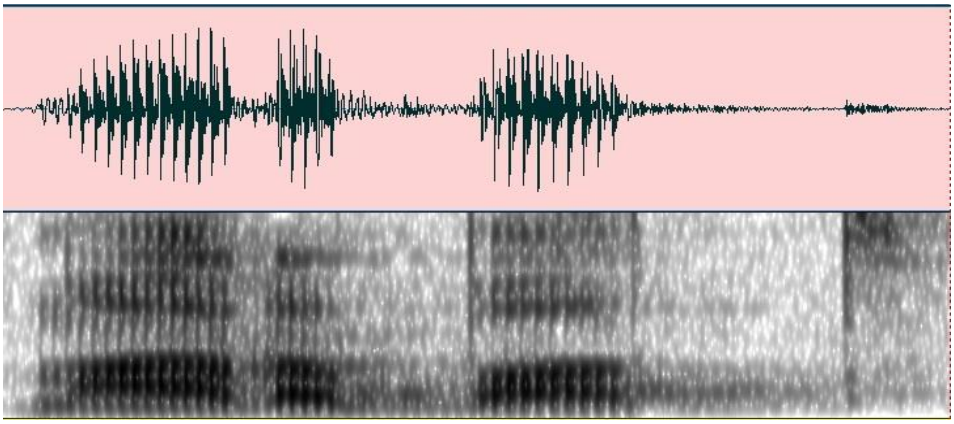


Figure (4) shows the spectrographic analysis of the word /mɪr.baʇ/

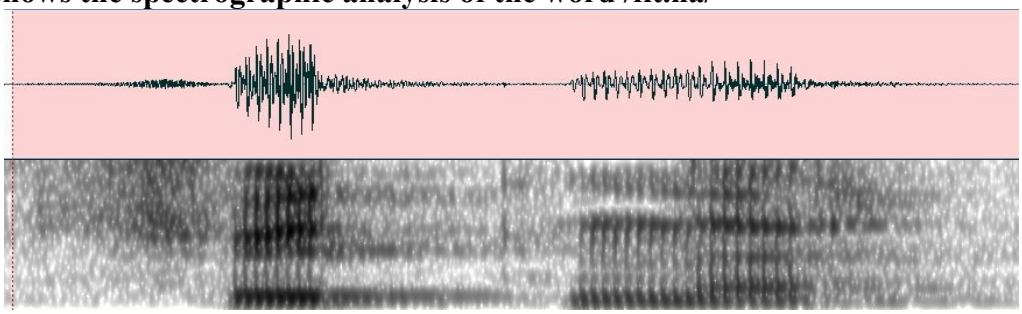


By checking the quality of voicing cues, it can be also noticed that there is a distinction between the onset and the offset of voicing cues of the stops between vowels as in /ʔak.bar/, 'older' as the onset cues of /b/ needs transition of /b/ to the following vowel whereas the offset needs transition of the preceding vowel to /k/. The onset cues of /b/ dominates the offset cues of /k/ and because they are scattered in phonetic representation, onset is perceived whereas offset is not as a result in /ʔak.bar/ we only form /k/ but produce /b/ by which the voicing asymmetry of stops between vowels is shown.

3-1 Voiceless stops

Since aspiration of fortis plosives delays the voicing onset time of the following vowel or sonorant, it is cued by the period of its transitional voicelessness to that vowel or sonorant so Aspirates gain their voicing contrast by the absence of the vowel or sonorant onset cues (Steriade.D.1997). Sonorants are the best to be modified as they are not contrastively voiced, but they are devoiced clearly. In the Arabic word /ħık.mah/, 'judgement' or the word /fit.nah/, 'majic', the aspiration of voiceless stop /k/ and /t/ after burst delays the voicing onset time of /m/, /n/ and devoices them the reason that makes them lose their onset cues and shows the voicing cues of aspiration contrast. The above mentioned phenomenon can be cleared up by measuring the closure voicing of /t/, duration of its closure and burst, its amplitude as well as the duration and F_0, F_1 values of the preceding vowel of the word /fit.na/ by PRAT.

Figure (5) shows the spectrographic analysis of the word /fıt.na/

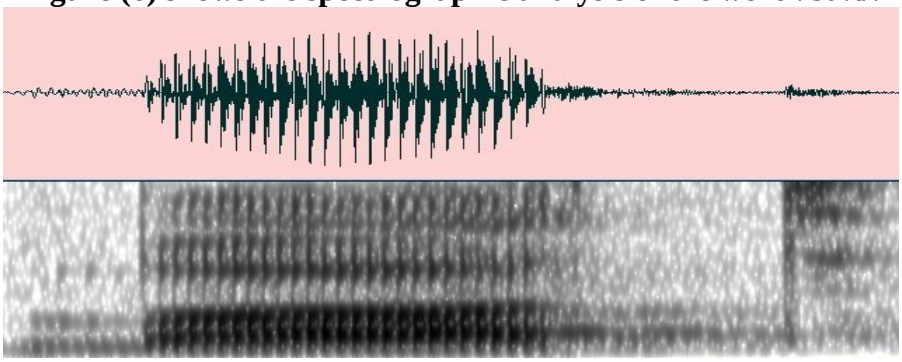


[1]In case a stop is followed by a vowel, cues of aspiration are manifested on that vowel such as the word initial stop /ta:J/, 'crown' the aspirated /t/ affects the following vowel just like that of the previous example, but checking word by PRAT needs knowing the F_0, F_1 values of the following vowel at voice onset time 'VOT'.

In case a word final voiceless stop is preceded by a vowel, there is no neighbouring segment to be devoiced by the aspiration in a sense aspiration is done before burst which causes the preceding vowel to be shorter. The process of pre- fortis clipping can be checked by measuring the burst duration and amplitude, closure voicing and closure duration of the final voiceless stop /t/ in the word /ba: t/ 'slept' by PRAT. Voicing of /t/ is identified by the duration and F_0, F_1 values of the preceding vowel.

1- F0 for fundemantal frequency, F1 for first formant, PRAT IS a program by which we measure pitch, intensity etc.

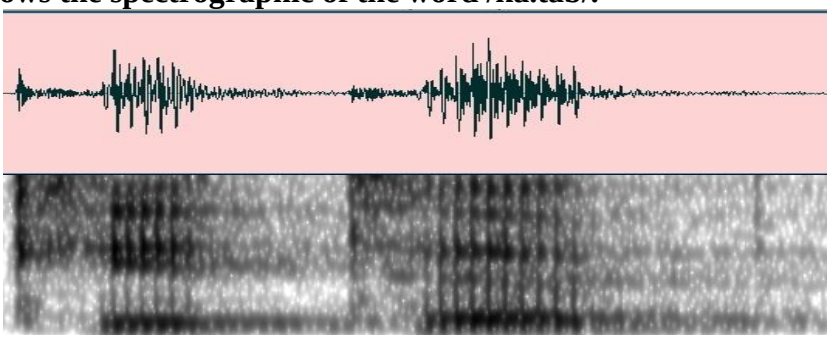
Figure (6) shows the spectrographic analysis of the word /ba:t/.



Though both possess all cues of voicing, voiceless stop /t/ in the onset position of /ta:j/ and in the coda position of /ba:t/ are in asymmetrical relation ship. The final /t/ clips the preceding vowel in accordance with the 'pre-fortis clipping principal' and is of low perceptibility because of low noise release whereas aspiration of the initial one delays VOT of the following vowel and it is of high perceptibility as it is accompanied by high noise release.

In case of an intervocalic aspirated stop, aspiration is usually after burst and this aspiration affects the following vowel at VOT. Analysing the word /ka.tab/ ' he wrote' by PRAT shows the period of delay in vibration of /a/ after /t/ because of the aspiraton of the preceding /t/ through checking duration and F_1 value of /a/ before /t/, burst duration and amplitude of /t/ and F_0, F_1 value of /a/ after /t/ at VOT.

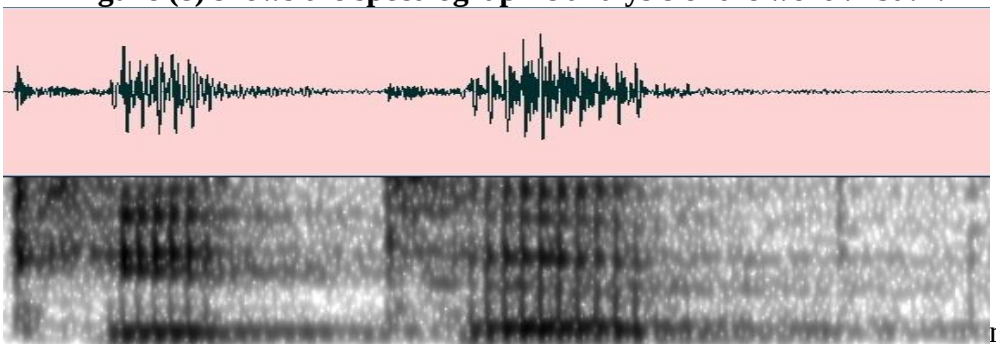
Figure (7) shows the spectrographic of the word /ka.tab/.



Pre-consonantal voiceless stop in an onset position of the syllable, post-consonantal voiceless stop in a coda position of the syllable and interconsonantal voiceless stop of a syllable boundry or word boundary lack the audible burst so the result cue of aspiration is omitted.

The interconsonantal voiceless stop is banned as there is no sequence of three consonant segments in Arabic at all. A post-consonantal voiceless stop is found in classical Arabic such as /safk/, 'shed' whereas pre-consonantal voiceless stop is found in Iraqi Arabic such as /k/ in the word /kba:r/, ' the old'.The closure voicing and closure duration of the voiceless stop /k/ can be measured by PRAT to assure the lack of aspiration noise as a result /k/ in both words is neutralized.

Figure (8) shows the spectrographic analysis of the word /kba: r/



r/,

Finally, nonaspirated voiceless stop /t/ after /s/ before a vowel, (s+stop+vowel), Such as /sta:d/, 'teacher' in Iraqi Arabic gives a chance for/s/ which prevents aspiration of /t/ to allow more time for

the voicing of the following vowel to be initiated there-by there is no reason for any delay in VOT of the following vowel that's why cues of aspiration are omitted as in figure (9)

Figure (9) shows the spectrographic analysis of the word /sta:d/.

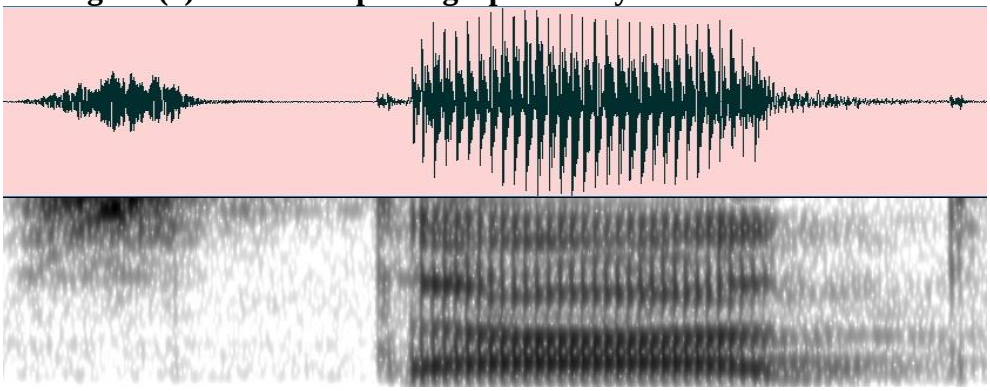
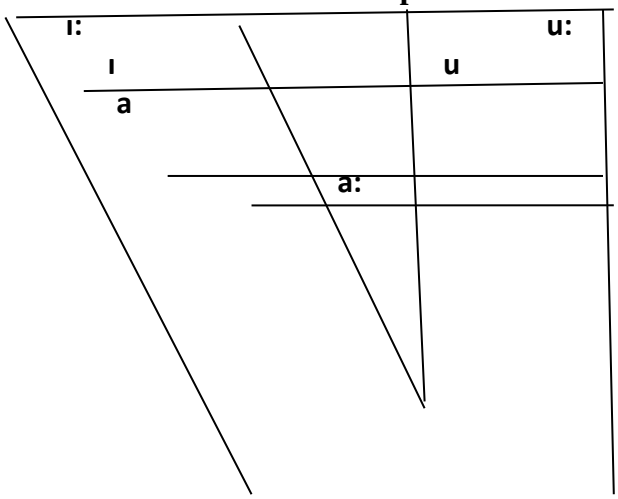


Table (2) Arabic Phonemes

Manner of articulation	Place of articulation										
	Bi-labial	Labio-dental	Dental	Alvio-dental	alviolar	Palate-alviolar	palatal	velar	uvular	pharyngeal	glotal
Stop normal emphatic	B			t d ŧ dˤ				k	q		ʔ
Nasal	m				n						
Fricative norm Emphatic		F	ϴ ə əˤ		s z ṣ	š			X ɣ	ħ ʕ	h
Africate						J					
Lateral					L						
Approximant	W				r		y				

Chart (1)

Ajustment in regions of vowels of Arabic Front central back Close Half-close Half-open



4 Conclusion

The researcher concludes that segments of classical Arabic words are distributed asymmetrically between syllables, single consonant segment as an onset and one or two consonants as a coda. The asymmetrical relationship between their positions is licensed by cue or by prosody so by distribution of

obstruent stops between onset and coda positions of monosyllabic words,the voicing cues of obstruent stops in an onset position are more than that of in a coda position as contrast is signaled by obstuent-vowel transition more than vowel-obstruent transition. In medial sequence of aspirated obstruent stops and voiced sounds, voicing cues of aspiration are gained by losing the voicing cues of the following voiced sounds as the aspiration delays the voicing onset time of the following voiced sound so in any medial Arabic obstruents, stops are influenced by what is followed not by what is preceded.

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