

Dual And Plural Formation In Arabic: A Computational Study.

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ABSTRACT

The computational generation of dual and plural from a given singular noun base in Arabic language creates some problem for the learners of the other languages especially for the people who need to know about the way of generation and the way of the getting the dual and Plural from the singular Arabic nouns. In this paper we will describe the computational generation of dual and plural noun morphology from a given singular base noun in regular Arabic language, and also the classification of Arabic nouns.

Using the computational technologies programs that including (Java - JSP – html – Net Beans) will ASSIST generate this method. This study develops and evaluates a linguistically natural computational method for generating dual and plural from a given singular noun base.

Keywords:- Java, Netbeans, Arabic Nouns, Singular, Dual, Plural,

Introduction

Arabic is a morphologically complex language. The morphological analysis of any word consists of determining the values of a large number of features, such as basic part-of-speech (i.e., noun, verb, etc.), gender, person, number, voice, information about the clitics, etc. (Habash,2005). There has been much work on Arabic morphology (see Al-Sughaiyer and Al-Kharashi, 2004). Since, lots of morphological analysis approaches are available now, some of them

have a commercial purpose and the others are available for research and evaluation (Attia, 2006).

We will present an approach for Arabic morphological analysis based on Arabic morphological automaton technique. To construct an Arabic morphological automaton, we used particularities of Arabic morphology that are concretized on multilevel: verbs and nouns are also characterized by a specific representation named the matrix “root– scheme”. Arabic nouns and verbs are derived from roots by applying schemes to these roots to generate Arabic stems and then adding prefixes and suffixes to the stems to form a correct word in Arabic language.

Nowadays, Arabic language faces many challenges.

- (i) The first important challenge is the requirement to analyze Arabic morphology with high quality because it is considered as the essential stage in many NLP applications such as Information Retrieval and Machine Translation.
- (ii) The second challenge is concerning the use of morphology in machine translation systems. Koehn and Hoang (2007) have shown that factored translation models containing morphological information lead to better translation performance. Morphological analysis becomes more important when translating to or from

morphologically rich languages such as Arabic.

- (iii) The third challenge is that morphological analysis is considered as the first step before syntactic analysis.

Aims and Objectives of the Study

Aims:

- This Study will show the important role of noun morphology in Arabic Language through the number (Singular / Dual / Plural) and also to show the similarities and difference between the Arabic language and English language in respect to number.
- This way of study will be used by the developed way by using the computational programs to make it easy to be used especially by the learners of Standard Arabic language.

Objectives:

- (i) The present work by the assistance of the computational linguistics field will know more about both description and comparison of the structure of English and Arabic noun morphology. Such contrastive analysis will find out the similarities and differences between the two languages.
- (ii) In the light of such comparison, the linguistic problems of the Arabic speakers learning English may be solved.
- (iii) Through this comparison, the teacher will be more acquainted with the structures of the two languages in question and the areas of difficulties at the morphological level.

Scope of the Research

In the present work, the focus of the analysis is confined to noun morphology in both languages. The output of this research though should be of practical use for teachers and learners of English and Arabic as a second language. It will also be helpful in the preparation of the textbooks to solve

the problems of the learners at the level of morphology, and to solve the problem of the mother tongue interference.

Problem of the study

- (i) The problem of the study shows how Standard Arabic morphologically can realize equality in number; while in English do not realize such grammatical categories via morphological markers. In another words Standard Arabic, noun morphology inflected for number (singular/dual/plural), while the number of the noun of English language inflected by (Singular / Plural) Because of that there are more morphological forms of nouns in Standard Arabic than in English.
- (ii) This study will show how the learners of the other languages will get the benefits of getting the results of the generation Dual and Plural Arabic nouns easily for the people who need to know about the way of generation and the way of the getting the dual and Plural from the singular Arabic nouns. Through using an electronic device such as the computer then we can get these results as soon as easily.

Hypotheses

- 1- Differences between the Noun morphology in Arabic and English in respect to number as the Arabic language has (Singular, Dual and plural) while English language has only singular and plural.
- 2- By using the electronic device such as (the computer) that making the foreigners of the Arabic language know about how to generate the Dual and Plural Nouns from Singular Arabic nouns.
- 3- By Using this way (computational way of generation) it will be spread all over the world that can know how to generate easily and completely free to get the information.

Procedure and data collection

Computational linguistics draws upon the involvement of many fields as linguists, computer scientists, and experts in artificial intelligence, mathematicians, logicians, philosophers, cognitive scientists, cognitive psychologists, psycholinguists, anthropologists and neuroscientists, among others. Computational linguistics has theoretical and applied components, where theoretical computational linguistics takes up issues in theoretical linguistics and cognitive science, and applied computational linguistics focuses on the practical outcome of modeling human language use.

In order to implement the project we need some requirements (programs to be installed) related to this project and they are:

- (i) Java / JSP (Java Server page) this software program that need a text page to write its tags that will show the needs of the works. It used to compile them into Java code as servlets. At runtime, Jasper detects changes to JSP files and recompiles them.
- (ii) Html (Hyper Text Markup Language) is a markup language that web browsers use to interpret and compose text, images and other material into visual or audible web pages, this program will show for us the result of or works (it works as an input to the java tags, actions and instructions)
- (iii) NetBeans Program It is also an application platform framework for Java desktop applications and others. The NetBeans IDE is written in Java and can run on Windows, OS, Linux, Solaris and other platforms supporting a compatible JVM. The NetBeans Platform allows applications to be developed from a set of modular software components called modules that working as a coordinator among the software programs (Java/JSP – HTML – Tomcat)

- (vi) Apache Tomcat implements several Java EE specifications including Java Servlet, Java Server Pages (JSP), Java, and WebSocket, and provides a "pure Java" web server environment for Java code to run in.

All these programs will work together to build the data in order to make the generation Dual and Plural noun from a given singular noun base.

NOUN MORPHOLOGY ANALYSIS IN ARABIC AND ENGLISH

General overview of Arabic language

Arabic is a Semitic dialect with rich layout morphology. An Arabic word may be made out of a stem (comprising of a consonantal root and a format), in addition to attaches and clitics. The fastens incorporate inflectional markers for strained, sexual orientation, and/or number. The clitics incorporate some (however not all) relational words, conjunctions, determiners, possessive pronouns and pronouns. Some are proclitic (joining to the start of a stem) and some enclitics (connecting to the end of a stem).

Arabic fits in with the Afro-Asiatic gang. The artistic dialect, called Modern Standard Arabic or Literary Arabic, is the main authority type of Arabic. It is utilized as a part of most composed reports and also in formal talked events, for example, addresses and news telecasts. Moroccan Arabic was official in Morocco for quite a while, before the nation joined the Arab League.

Arabic is a Central Semitic dialect, nearly identified with Aramaic, Hebrew, Ugaritic and Phoenician. The institutionalized composed Arabic is unmistakable from and more preservationist than the majority of the talked mixtures, and the two exist in a state known as diglossia, utilized next to each other for distinctive societal capacities.

The current composed dialect (Modern Standard Arabic) is gotten from the dialect of the Quran (known as Classical Arabic or Quranic Arabic). It is broadly taught in schools, colleges and used to differing degrees in working environments, government and the media. The two formal

mixed bags are assembled together as Literary Arabic, which is the official dialect of 26 states and the ritualistic dialect of Islam. Current Standard Arabic to a great extent takes after the syntactic principles of Quranic Arabic and uses a significant part of the same vocabulary. In any case, it has disposed of some syntactic developments and vocabulary that no more have any partner in the talked mixtures and received certain new developments and vocabulary from the talked assortments. A great part of the new vocabulary is utilized to indicate ideas that have emerged in the post-Quranic time, particularly in present day times.

Arabic has affected numerous language around the world all through its history; the absolute most impacted language are Urdu, Persian, Kurdish, Turkish, Somali, Swahili, Bosnian, Kazakh, Bengali, Hindi, Malay, Indonesian, Tigrinya, Pashto, Punjabi, Tagalog, Sindhi and Hausa. Amid the Middle Ages, Literary Arabic was a noteworthy vehicle of society in Europe, particularly in science, math and rationality. Thus, numerous European language have additionally obtained numerous words from it. Numerous expressions of Arabic starting point are additionally found in antiquated language like Latin and Greek. Arabic impact, primarily in vocabulary, is seen in Romance language, especially Spanish, Catalan, Portuguese, and Sicilian, inferable from both the closeness of Christian European and Muslim Arab developments and 800 years of Arabic culture and dialect in the Iberian Peninsula alluded to in Arabic as al-Andalus. Arabic has also borrowed words from many languages, including Hebrew, Greek, Persian and Syrian in early centuries, Turkish in medieval times and contemporary European languages in modern times, mostly from English and French.

Arabic is a morphologically rich and complex language, for nominals, the inflectional variants are as follows:

- Number: singular, dual, plural.
- Gender: Masculine, Feminine
- Case: nominative, accusative, genitive.
- State: definite, indefinite, construct.

Dual Noun Morphology

Introduction to Dual Noun Morphology

Numerous languages make a refinement in the middle of particular and plural: English, for

instance, recognizes man and men, or house and houses. In a few language, notwithstanding such solitary and plural structures, there is additionally a double frame, which is utilized when precisely two individuals or things are implied. In numerous language with double structures, utilization of the double is obligatory, and the plural is utilized just for gatherings more noteworthy than two. Nonetheless, utilization of the double is discretionary in a few language, for example, numerous cutting edge Arabic tongues including Egyptian Arabic lingo.

Overview of using Dual Noun of other languages:

Among living language, Modern Standard Arabic has a required double number, checked on things, verbs and descriptive words. A number of the communicated in Arabic vernaculars have a double checking for things (just), yet its utilization is not required. In like manner, Akkadian had a double number, however its utilization was bound to standard expressions like "two hands", "two eyes", and "two arms".

In different language, for example, Hebrew, the double exists just for words naming time compasses (day, week, and so on.), a few measure words, and for words that normally come in sets and are not utilized as a part of the plural with the exception of in talk: eyes, ears, et cetera. In Slovene, the utilization of the double is compulsory, aside from things that are regular sets, for example, trousers, eyes, for which the plural structure can be utilized.

Albeit moderately couple of language have the double number and most have no number or just particular and plural, utilizing diverse words for gatherings of two and gatherings more noteworthy than two is not extraordinary. English has words recognizing double versus plural number, including: both/all, either/any, and neither/none, between/among, former /first, and latter/last. Japanese, which has no grammatical number, also has words dochira (which of the two) and dore (which of the three or more), etc.

The double in Hebrew has likewise decayed, by and large being utilized for just time, number,

and normal combines even in its most antiquated structure. The double frame is additionally utilized as a part of a few advanced Indo-European language, for example, Scottish Gaelic, Slovenian, Frisian and Sorbian. The double was a typical highlight of all early Slavic language toward the start of the second thousand years CE. The double is additionally found in the Sanskrit dialect.

2.2.3 Generating Dual Arabic Noun Morphology

AlNeqrat (2003: 25) expressed "A double thing is a thing that alludes to two persons or two things" for instance on the off chance that we need to create the double of the word kitab "book" to the double it will be kitaban "two books". He said likewise that there are a few conditions identified with create the double from the solitary things and they are as following:

- (i) The noun must be singular because the dual and plural are not affected by duality.
- (ii) It singular must be suitable to its meaning and form, just like rajulan "two men" its singular rajul "man" while the noun abawan "parent" its singular abo wa umm "father and mother"
- (iii) It must be inflected noun (the nouns that its end is changed according to its location in the sentence), but the structured nouns (the nouns that its end aren't changed according to its location in the sentence as the pronouns example; "you" enta "we" nahnu these nouns are not effected by duality.

Regular dual noun

The regular dual noun is very simple it works by adding suffixes to noun stems and it divided into:

Masculine dual noun:

Masculine Dual nouns are easily identified by their common dual ending. Hanafi Nasif (2008: 63) said; the dual ending is inflected for two cases as follows:

1- Adding -an ending to the noun subject
muṣallim (teacher/male) *muṣalliman* (two teachers/male) in case of subject

Ex: *Jaʔe elmuṣalliman ʔla ellmadraseh* "the teachers (two teachers/male) come to the school"

Ar. Words	<i>jaʔe</i>	<i>elmuṣalliman</i>	<i>ʔla</i>	<i>ellmadrase</i>
Gloss	came	two teachers	to	The school
Represented by	V.+PST	N.+DU+M+SBJ	PRE	DEF+N. SG

2- Adding -ein ending to the OBJ

Muṣallim (teacher/male) *muṣallimein* (two teachers/male) in case of OBJ

Ex: *fahdtu elmuṣallimein* "I saw the teachers (two teachers/male)"

Ar. Words	<i>fahdtu</i>	<i>elmuṣallimein</i>
Gloss	I saw	The two teachers
Represented by	1+V.+PST	M+N.+DU+OBJ

Feminine dual noun:

Before of knowing how to make dual for the noun (Female noun) we have to know important information that the stem of the noun morphology is always (male) Masculine (Abo Baraat AlAnbari, 1981), so in case we want to make it Feminine we have to add -e to the stem (male) for example:

muṣallim (teacher/male) , *muṣallime* (teacher/Feminine)

According to (Hanfi Nasif 2008: 63) In the case of making dual noun morphology for Feminine we will do the following:

1- Adding -tan to the noun in the case of Subject.

muṣallime (teacher/Feminine) *muṣallimetan* (two teachers/Feminine)

Ex: *Jaʔet elmuṣallimetan ʔla ellmadrasa* "the teachers (two teachers/Feminine) come to the school"

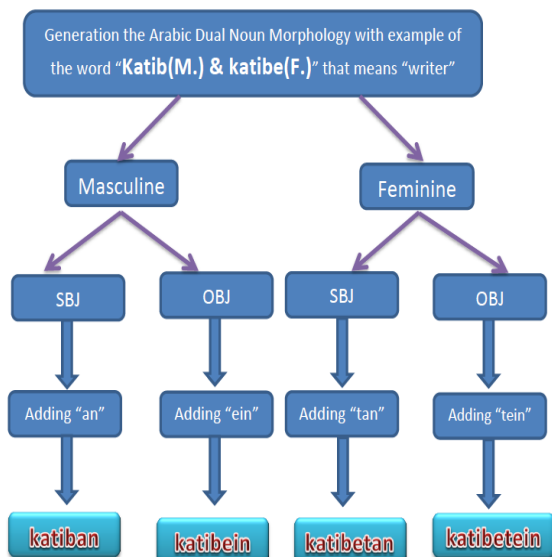
Ar. Words	<i>jaʔet</i>	<i>elmuṣallimetan</i>	<i>ʔla</i>	<i>ellmadrase</i>
Gloss	came	two teachers	to	The school
Represented by	V.+PST	N.+DU+F+SBJ	PRE	N. SG

2- Adding -tein to the noun in the case of OBJ.
muṣallime (teacher/Feminine) *muṣallimetein*
(two teachers/Feminine)

Ex: *ḥadtu elmuṣallimetein* (two teachers/Feminine) “I saw the teachers (two teachers/Feminine)”

Ar. Words	<i>ḥadtu</i>	<i>elmuṣallimetein</i>
Gloss	I saw	The two teachers
Represented by	1+V.+PST	F+N.+DU+OBJ

The following Chart will illustrate the Dual generation in Arabic language:



2.2.3.2 Irregular dual noun morphology

There is an important note we have to mention it before going on with the generation the dual noun in Arabic that “**Irregularly behaving nouns in Arabic are three types**” and they are:

I. Shortened Nouns

Saeed AlAfghani (2003:142) “A shortened noun is a noun which ends with an *ḥalif* denoting a long vowel *-aa*. Such *ḥalif -aa* is also called “extended *ḥalif*. The *-aa* or “weak *ḥalif*” *-aa*” so extended *ḥalif -aa* assumes either one of two figures when it comes at the end of a word, in

Arabic they have different two shapes but with the same pronunciation, their shapes in English as the following:

حَا	تَا
-aa	-aa

Examples of shortened nouns:

Stick	<i>asaa</i>
Dew	<i>nadaa</i>
Dock	<i>marsaa</i>
Hospital	<i>mustashfaa</i>
Forces	<i>qiwaa</i>

II. Extended Nouns

An extended noun is a noun which ends with a long vowel *ḥalif -aa* that is followed by a glottal stop consonant that we called *hamza* in Arabic that represented by the symbol (ʔ). (ibid: 143) this kind of nouns has many ways of making dual from the singular (means there is no one fix rule for this kind of nouns).

Examples for the extended Nouns:

Water (M.)	<i>maf</i>
Heaven (F.)	<i>samaʔ</i>
Supper (M.)	<i>ʔashaʔ</i>
Desert (F.)	<i>sahraʔ</i>
Friends (PL M.)	<i>ʔsdiqaʔ</i>

Those words are called extended words because the presence of the *hamza*(ʔ) at their ends allows the extended *ḥalif -aa* to be fully pronounced; contrary to the case of shortened nouns. Thus the *ḥalif -aa* here is still called extended *ḥalif -aa* as usual.

III. Defective Nouns

A defective noun is a noun which ends with a long vowel -ii that is original letter and belongs to the root. Proper names cannot be defective nouns; and defective nouns are always masculine unless a Feminine marker was attached. (ibid: 144)

Example for the Defective Nouns in Arabic:

Judge	<i>qaadii</i>
Sponsor	<i>raaʔii</i>
Attorney	<i>mufaamii</i>
Snakes (plu. F.)	<i>afaʔa</i>

For the details of generation the irregular Dual Arabic Noun Morphology as the following:

Shortened Nouns

Shortened nouns are nouns that end with a long vowel -aa. It also can be divided into:

A-Shortened Nouns With Three Letters

The weak *ʔalif* -aa of the ending will be changed back to its origin (either w or y).

-aa → -aw-dual ending
-aa → -ay-dual ending

Singular	Dual	
	Subject	OBJ
-aa	-awaan(i)	-awein(i)
-aa	-ayaan(i)	-ayein(i)

B- Shortened Nouns With More Than Three Letters

The weak *ʔalif* -aa will be always changed to y when attaching the dual ending, regardless of its origin.

-aa → -aY-dual ending

SG	Dual	
	SBJ	OBJ
-aa	-ayaan(i)	-ayein(i)
-aa		

Introduction to Computational Linguistics

Computational semantics draws upon the association of numerous fields as language specialists, PC researchers, and specialists in counterfeit consciousness, mathematicians, philosophers, rationalists, subjective researchers, psychological therapists, psycholinguists, anthropologists and neuroscientists, among others.

Computational semantics has hypothetical and connected parts, where hypothetical computational etymology takes up issues in hypothetical phonetics and subjective science, and connected computational phonetics concentrates on the reasonable result of displaying human dialect utilization.

The present study has a tendency to demonstrate the development of computational etymology and the inspirations of its presence, the field which it alludes to, its hypothetical and connected parts, its connection to regular dialect comprehension, focal points and weaknesses of normal dialect preparing, probably the most critical applications, with reference to its part in showing and learning procedures and the issues confronting them. Computational etymology is a handle ranges in the middle of semantics and software engineering with the assistance of brain science and rationale. It utilizes PCs to streamline treating with phonetic issues. It is considered as a branch of software engineering and also of phonetics. Nonetheless; it ought to be collaboration between software engineering and semantics. (McGuigan, 2006)

The point of the study is to highlight on the field of computational etymology and its aptitudes focusing on phonetics with the reference to PC uses concerning showing and the part of today instructors towards the understudies of the electronic age.

The study should be essential for both instructors and understudies who are occupied with dialect studies. Furthermore, it is likewise critical to attract consideration regarding the peril of being electronically dead.

It is an invitation to begin examination with the experts of software engineering so as to get the most extreme advantage concerning phonetic subjects.

The growth of Computational Linguistics.:

Martin Kay (2003) says that computational etymology maybe first started in 1949 concerning machine interpretation. The primary meeting on machine interpretation was in 1952. The primary diary of "Mechanical Translation" was in 1954. Anyway, the expression "computational phonetics" started to be utilized as a part of 1965 when it showed up as a sub-title of the diary "Mechanical Translation and Computational Linguistics". It was composed in little sort. In 1974, the name of the diary "Mechanical Translation and Computational Linguistics" was changed into "The American Journal of Computational Linguistics". Additionally, in 1980, it got the opportunity to be "Computational Linguistics" which is still alive.

Two fundamental inspirations were past the exercises of computational semantics:

(i) Theoretical: It originated from the reasoning that embracing computational points would bring about critical advance in semantics.

(ii) Technological: It originated from the yearning to create an innovation to serve the viable requirements for interpretation, data extraction, linguistic use checking -and so on.

None of these endeavors can be accomplished by the selection of etymological techniques alone.

What does the field of Computational Linguistics refer to?

Computational etymology which is still viewed as another field interfaces semantics with software engineering. Specialists of C.L. are partitioned into two groups: One of them apply their involvement in software engineering to etymology indicating individuals what they ought to know with a specific end goal to comprehend a characteristic dialect, how they discover this information and how they ought to utilize this learning. The second apply their involvement in etymology to software engineering with the goal that PCs can comprehend regular human dialect and interpretation. They additionally manage PCs semantically under the name of regular dialect handling NLP. (Wintner, 2004)

By and large; C.L. could be seen as an equivalent word of programmed handling of normal dialects which is concerned with developing PC projects to process words and messages in common dialects. Yet; the absence of programming learning is still an issue. Proficient language specialists can't clarify the information structures which the project ought to utilize. Masters in C.L. with a decent foundation in etymology can gainfully work in distinctive undertakings, for example, registering tables and word references or working in an interdisciplinary group or figuring out some other new thought or methodology which can be extremely valuable to comprehend the writing on the subject. (Bolshakov, 2004)

Components of Computational Linguistics.:

Computational linguistics is ranging between cognitive sciences and artificial intelligence. It has theoretical and applied components. The theoretical component depends on theoretical linguistics and cognitive science. Since the linguistic theories have nowadays become so

complex, linguists decided to simplify them by employing computers. Thus; they began to cooperate with the computational programmers with the aid of cognitive psychology in order to develop computational models for the formal linguistic theories. The applied component develops practical models of human language depending on artificial intelligence. This is also to be put under the terms "Language Engineering" or "(Human) Language Technology". The function of applied computational linguistics is to find a program which can improve the interaction between human and machine so that human and computers can communicate easily. (Uszkoreit, 2000).

The Role of Computational Linguistics in Language Teaching and Learning Processes:

Computer-assisted language learning is a means of teaching and learning processes. It is referred to by CALL. It has been used for more than forty years. Lee (2000) divided the period of using CALL into three stages. Each stage shows the level of technology and the pedagogical theories of its age:

a. behaviorist CALL which first began in the 1960s and 1970s basically depended on repetitive language drills.

b. communicative CALL which emerged in the 1970s and 1980s, they focused on generating original utterances instead of the old means using repetition drills.

c. integrative CALL which is the recent stage has moved away from a cognitive view of communicative language teaching to a socio-cognitive view in which a meaningful authentic context of real language use is emphasized. This stage also emphasizes on the integration of the four skills of language learning (listening, speaking, writing, and reading) and the integration of technology.

The accompanying depiction for CALL is cited from Wikipedia, (2006): "Commonplace CALL projects display a jolt to which the learner must react. The jolt

may be exhibited in any mix of content, still pictures, sound, and movement feature. The learner reacts by writing at the console, guiding and clicking with the mouse, or talking into a mouthpiece. The PC offers input, showing whether the learner's reaction is correct or off-base". Such projects can either be picked up with CDs or by the web.

Some of the Most Important Applications of Computational Linguistics:

(i) Programmed hyphenation: McIntosh (1990) characterizes the hyphen: "it is that little even bar which is utilized either to join two components of compound words (the connection hyphen), or to flag that a word is being part toward the end of a line of printing (the bill hyphen)". This system is the framework which parts long words appropriately which can't fit inside of the acknowledged edge of the line. Toward the starting; they relied on upon basic calculations in part long words, for example, putting a hyphen after the third, fifth or seventh character in any word. Be that as it may, this brought about "bonehead breaks", e.g. "photographic" would be part into either "pho" and "tographic", "photograph" and "realistic" or "photogr" and "aphic". With a specific end goal to enhance writing writings; Microsoft Word utilized the menu thing "Hyphenation". Projects of such sort need etymological data about morphemic structure of words, vowel and consonant letters.

(ii) Spell checking: It is the procedure of discovering and remedying blunder happened in writing a certain content. A large number of clients get advantage from this project. The spell checker focuses to the slips, then issues some proposed words from which the client can pick the one suits the connection e.g. on the off chance that "present" erroneously composed "presen", the spelling checker would give the accompanying choices "present", "preset" and "pressmen" from which the client can pick the suitable one.

(iii) Grammar checking: It is the procedure of figuring out and amending syntactic mistakes mulling over either the entire sentence or the neighboring words, for example, subject concurrence with verbs, modifiers intensifiers, relational words et cetera. Punctuation checkers should be so valuable to tackle such issues however there are still just basic and business ones. A valuable punctuation checker ought to hold up under a complete syntactic investigation (parsing) arrangement of a content with a specific end goal to be a dynamic collaborator to the client.

Sentence structure checkers have encountered much advance particularly the particular case that is incorporated in Microsoft Word. Yet; it is still not culminate however it is to a degree supportive. In any case; it is the obligation of the client to make sure of what he/ she is composing in light of the fact that occasionally the language structure checker gives cautions where no blunder or propose a preposterous redress.

(iv) Style checking: Each artistic class has its own particular style of composing. In official composition; one ought to pick developments a long way from slang dialect. The style checker furnishes the client with the right decision. It likewise parses the content consequently to figure out the wrong syntactic developments.

(v) References to words and word blends: The client can access to an arrangement of words which are semantically identified with a certain one. This is accomplished via independent on-line word references and other which are manufactured in. The client can get advantage from such references to pick the most proper word for his/ her content.

(vi) Information recovery: It is the system which is intended to hunt down significant data which may be in different sorts of archives. Distinctive routines for exploration are utilized in view of the immense yearning to hunt down exploratory

articles which exist in reports. (Wikipedia, 2006).

Natural Language Processing (NLP)

NLP is a field of software engineering, computerized reasoning, and phonetics concerned with the collaborations in the middle of PCs and human (normal) dialects. Thusly, NLP is identified with the zone of human-computer connection. Numerous difficulties in NLP include regular dialect understanding, that is, empowering PCs to get significance from human or characteristic dialect info, and others include common dialect era.

Current NLP calculations are in view of machine adapting, particularly measurable machine learning. The ideal model of machine taking in is unique in relation to that of most former endeavors at dialect preparing. Former usage of dialect preparing undertakings normally included the immediate hand coding of expansive arrangements of tenets. The machine-learning ideal model calls rather for utilizing general learning calculations — frequently, albeit not generally, grounded in factual induction — to naturally learn such guidelines through the examination of expansive corpora of common true illustrations. A corpus (plural, "corpora") is a situated of records (or in some cases, individual sentences) that have been hand-clarified with the right values to be learned.

A wide range of classes of machine learning calculations have been connected to NLP errands. These calculations take as info a vast arrangement of "highlights" that are created from the data information. A portion of the soonest utilized calculations, for example, choice trees, delivered frameworks of hard if-then standards like the frameworks of written by hand decides that were then normal. Progressively, on the other hand, exploration has concentrated on factual models, which make delicate, probabilistic choices in view of appending genuine esteemed weights to every data highlight. Such models have the point of

interest that they can express the relative conviction of a wide range of conceivable answers as opposed to stand out, delivering more solid results when such a model is incorporated as a part of a bigger framework.

Frameworks in light of machine-learning calculations have numerous focal points over hand-delivered guidelines:

(i) The learning methods utilized amid machine adapting consequently concentrate on the most widely recognized cases, while when composing standards by hand it is regularly not evident at all where the exertion ought to be coordinated.

(ii) Automatic learning techniques can make utilization of measurable induction calculations to deliver models that are hearty to new info (e.g. containing words or structures that have not been seen before) and to incorrect information (e.g. with incorrectly spelled words or words unintentionally precluded). By and large, taking care of such information effortlessly with manually written guidelines — or all the more for the most part, making frameworks of transcribed tenets that settle on delicate choices — is to a great degree troublesome, mistake inclined and prolonged.

(iii) Systems in light of naturally taking in the tenets can be made more exact essentially by supplying more info information. Nonetheless, frameworks in light of transcribed principles must be made more precise by expanding the many-sided quality of the guidelines, which is an a great deal more troublesome undertaking. Specifically, there is a farthest point to the intricacy of frameworks in light of hand-created guidelines, past which the frameworks turn out to be more unmanageable. In any case, making more information to info to machine-learning frameworks just obliges a comparing increment in the quantity of worker hours met expectations, by and large without critical increments in the multifaceted nature of the annotation process.

Natural Language Understanding:

It is one of the major tasks of Natural Language Processing (NLP). Linguists complain against lacking in artificial intelligence that they are forced to search a replacement which is known as "Natural Language Processing". And since natural language understanding is a synonym to computational linguistics, it is important to know its essential aims. It is to:

- (i) Generate and produce contents in any natural language in any domain,
- (ii) Support multilingual services.

There are two lines of research concerning natural language understanding. One is towards text-based applications and the other is towards dialogue-based applications. Text-based applications imply the processing of all kinds of written texts such as books, articles, messages, magazines---etc. in such a way that they can be easily read by users. Thus; researchers are continuously developing different means of information access to such texts as:

- (i) Finding relevant documents on the desired subject from a database of texts, e. g. finding relevant books in a library,
- (ii) Taking information out of some kind of text on a certain topic, e. g. building a database of all adequate on-line information written in the news on a certain day,
- (iii) Translating documents from one language to another.
- (iv) Changing long texts into short summaries.

The following are the applications of dialogue-based ones:

- (i) Question-answering system,
- (ii) Automated customer service over the telephone,
- (iii) Tutoring systems in which the student can interact with the machine. (Bolshakov; 2004)

Natural language processing and drawbacks:

One of the most important problems that investigators suffer is the misunderstanding of machines for natural languages. Natural language processing is complex because

there will be misunderstanding in the application of computational programs concerning:

Phonology and phonetics

It is concerned with pronunciation. The problem of computational programs concerning this field is that some words have the same pronunciation with different meanings such as "weak" and "week". Computers cannot differentiate between the two words.

Morphology

It is concerned with the inner structure of words in their written (graphemic) form and spoken (phonemic) form. It has two essential functions:

a. Inflection: It is related to the grammatical function of words of the same part of speech; e. g. the paradigm of the verb play for the present simple; 1st and 2nd persons, plays for the present simple; 3rd person, played for the past simple and the past participle, playing for the present participle.

b. Derivation: It is related to the production of new words of different parts of speech; e. g.

nation ----- (a noun)
national----- (an adjective)
nationalize----- (a verb)

A morphological analyzer should be intelligent enough to know and extract the base forms from inserted documents in computers. The applications which are achieved in this respect are:

a: hyphenation (segmenting words into their morphs),

b: spelling correction,

c: stemming which reduces the related words as possible.

The problem of such computational programs is the input which should be very broad. Other forms of application are parsing and generating natural language utterances in written or spoken form and machine translation. (Trost, 2006)

Syntax

It is concerned with the structure of sentences. Sometimes; word order of some kinds of structure causes misleading such as the following examples:

(1) I saw her *with* a telescope.

The word "*with*" may either be an adjunct with the verb "*saw*" or with the pronoun "*her*".

(2) The article covers the rights of women *and* childhood.

The conjunction "*and*" is understood as conjoining the two nouns "*women*" and "*childhood*". But; it may also be understood as conjoining the phrase "*the rights of women*" with the noun "*childhood*", and this is incorrect. This is considered as one of the problems faced in translation by computer.

Semantics

It manages the implications of words, expressions and sentences. Anyhow, since a word may have a few implications like "spreads" which implies "to stow away", "to spread over" or "to manage, it would likewise be an issue in interpretation by PC.

Pragmatics

It manages the implications of articulation relying upon the connection. Ordinarily the implications of the sentence words are clear yet the translation relies on upon its connection.

For instance; (3) We are holding up. The sentence may bear any of the various types of translation as indicated by its setting: a. an normal certainty, b. a guarantee and c. a danger.

Computational interpretation can't recognize those sorts of understanding which portray humorous (talking the inverse of goal) or allegorical (indicating expressions which are actually not exist) phenomena as in the accompanying illustrations;

(4) You are clever enough to achieve this. (Ironic)

(5) He looks wood-minded. (Metaphoric)

The problems mentioned above show they can neither be solved by computer science

alone nor by linguistics alone. (Wintner, 2004)

Machine Translation

General introduction to Machine Translation:

The automation of interpretation has been one of humankind's most established dreams. In the twentieth century it has turned into a reality, as PC projects fit for deciphering a wide mixture of writings from one normal dialect into another. Anyway, as ever, the truth is not great. There are no 'interpreting machines' which, at the touch of a couple catches, can take any content in any dialect and produce an impeccable interpretation in whatever other dialect without human mediation or help. That is a perfect for the far off future, in the event that it is even achievable on a basic level, which numerous uncertainty. What has been accomplished is the advancement of projects which can deliver "crude" interpretations of writings in generally all around characterized subject spaces, which can be overhauled to give great quality deciphered writings at a monetarily reasonable rate or which in their unedited state can be read and saw by experts in the subject for data purposes. Sometimes, with suitable controls on the dialect of the information writings, interpretations can be created consequently that is of higher quality requiring practically no correction.

These are strong accomplishments by what is currently customarily called Machine Translation (from now on in this book, MT), however they have frequently been clouded and misjudged. People in general view of MT is mutilated by two great positions.

From one viewpoint, there are the individuals who are unconvinced that there is anything troublesome about examining dialect, since even youthful youngsters have the capacity to learn dialects so effortlessly; and who are persuaded that any individual who knows an outside dialect must have the

capacity to interpret without breaking a sweat.

Henceforth, they are not able to admire the challenges of the errand or what amount has been accomplished. Then again, there are the individuals who accept that in light of the fact that programmed interpretation of Shakespeare, Goethe, Tolstoy and lesser abstract creators is not plausible there is no part for any sort of PC based interpretation. They are not able to assess the commitment which not as much as immaculate interpretation could make either in their own work or in the general change of worldwide correspondence.

Some preliminary definitions

The term Machine Translation (MT) is the now conventional and standard name for automated frameworks in charge of the creation of interpretations from one common dialect into another, with or without human help. Prior names, for example, 'mechanical interpretation' and 'programmed interpretation' are presently once in a while utilized as a part of English; however their reciprocals in different dialects are still basic (e.g. French traduction automatique, Russian avtomatiëskii perevod). The term does exclude PC based interpretation devices which bolster interpreters by giving access to word references and remote wording databases, encouraging the transmission and gathering of machine-comprehensible messages, or communicating with word handling, content altering or printing gear. It does, nonetheless, incorporate frameworks in which interpreters or different clients help PCs in the generation of interpretations, including different blends of content planning, on-line communications and ensuing modifications of yield.

The limits between Machine-Aided Human Translation (MAHT) and Human-Aided Machine Translation (HAMT) are regularly questionable and the term Computer-Aided (or Computer-Assisted) Translation can once in a while spread both. In any case, the

focal center of MT itself is the computerization of the full interpretation process.

In spite of the fact that the perfect may be to deliver top notch interpretations, practically speaking the yield of most MT frameworks is updated (post-altered). In this admiration, MT yield is dealt with no uniquely in contrast to the yield of most human interpreters which is typically modified by another interpreter before spread.

Then again, the sorts of mistakes delivered by MT frameworks do vary from those of human interpreters. While post editing is the standard, there are sure circumstances when MT yield may be left unedited (as a crude interpretation) or just gently amended, e.g. on the off chance that it is proposed just for authorities acquainted with the subject of the content. Yield might likewise serve as an unfinished copy for a human interpreter, as a pre-translation.

The interpretation nature of MT frameworks may be enhanced — not just, obviously, by growing better systems — by forcing certain confinements on the info. The framework may be composed, for instance, to manage writings constrained to the sublanguage (vocabulary and sentence structure) of a specific subject field (e.g. polymer science) and/or archive sort (e.g. licenses). Then again, include writings may be composed in a controlled dialect, which decreases potential ambiguities and limits the unpredictability of sentence structures. This alternative is frequently alluded to as pre-editing, yet the term can likewise be utilized for the stamping of info writings to demonstrate legitimate names, word divisions, prefixes, postfixes, phrase limits, and etc.

At long last the framework itself may allude issues of uncertainty and determination to human administrators (as a rule interpreters, however a few frameworks are intended for

utilization by the first creators) for determination amid the procedures of interpretation itself, i.e. in an intuitive mode.

Methodology of Generation the Dual and Plural Arabic Noun Morphology

Computational linguistics draws upon the inclusion of numerous fields as etymologists, PC researchers, and specialists in counterfeit consciousness, mathematicians, philosophers, logicians, intellectual researchers, subjective clinicians, psycholinguists, anthropologists and neuroscientists, among others.

Computational phonetics has hypothetical and connected parts, where hypothetical computational etymology takes up issues in hypothetical semantics and intellectual science, and connected computational semantics concentrates on the viable result of displaying human dialect utilization.

With a specific end goal to actualize the task we require a few necessities (projects to be introduced) identified with this undertaking and they are:

- Java/ JSP (Java Server page) this product program that need a content page to compose its labels that will demonstrate the needs of the works. It used to arrange them into Java code as servlets. At runtime, Jasper recognizes changes to JSP records and recompiles them.
- Html (Hyper Text Markup Language) is a markup dialect that web programs utilization to decipher and make content, pictures and other material into visual or discernable pages, this system will demonstrate for us the consequence of or works (it functions as an information to the java labels, activities and guidelines)
- NetBeans Program It is additionally an application stage structure for Java desktop applications and others. The NetBeans IDE is composed in Java and can keep running on Windows, OS , Linux, Solaris and different stages supporting a good JAVA. The NetBeans Platform permits applications to be produced from an arrangement of

measured programming segments called modules that filling in as an organizer among the product programs (Java/JSP – HTML – Glassfish/Tomcat)

Level One:

Through the steps of work above we get the look below that can work by the browser and according to this results of the level 1 we can mention the benefits of this work and what the needs of it.

GENERATION OF THE DUAL AND THE PLURAL FORMS
FROM SINGLAR NOUN BASE OF ARABIC LANGUAGE

Dual Sub Masc
Dual Obj Masc
Dual Sub Fem
Dual Obj Fem
Plural Sub Masc
Plural Obj Masc
Plural Sub Fem
Plural Obj Fem

Advantages points:

- Get the correct information by following the rules that we fixed in the JSP pages.
- Easy to be used
- Clear to any user especially for the foreigners of Arabic language.
- Can be worked with all platforms
- Can be worked with any browser
- The data followed all kinds of standard Arabic nouns

Disadvantages points:

- It is not fulfill for all Arabic nouns like the irregular nouns
- Both dual and plural are mixed in one table that makes the users in confused which button he pressed.
- Very simple design

Level Two

By doing some modifications to the level one and taking care for the disadvantages that occurred in that level we can get these shape to the work, the chage that occur to the work as following:

- By using the tag `<body bgcolor="#f0f000">` to change the color of

the back ground of the page, and also we can change it to any color that we like by changing that number (#f0f000).

- Separate the tables of the Dual and Plural to be easy for reading and clear to the user, this separation had done by using the tag `
` between the syntax that related to the Dual from the syntax that related to the Plural.

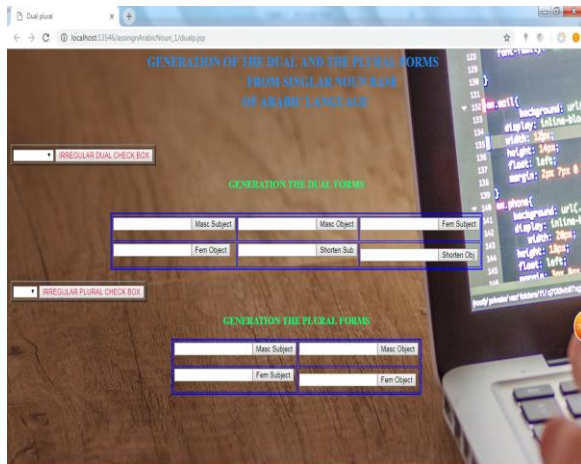
- Adding new two rows that related to the (irregular nouns) that was not included through the first level because it was related to the regular nouns only. One row represented the irregular nouns in Dual check box and the second row represented the plural irregular nouns check box.

The syntax that used to add this table is:

```
<table border="5" align="left">
< tr><form method="get" action
="input11.jsp" >
<tr><td> <select name="singlar1">
<option value=" " ></option>
<option value="Asawan" >Asa</option>
<option value="khadrawan"
>khadra'a</option>
<option value="samrawan"
>samra'a</option>
<option value="moomiyawan"
>moomiya'a</option>
<option value="sawdawan"
>sawda'a</option></select>
<input type="Submit"
value="IRREGULAR DUAL CHECK
BOX"></form> </tr></td>
```

Through this syntax we can see that in case the input was the word (Asa) which means “stick” it is irregular noun then the output will be (Asawan) to generate it into dual and so on to the other words by dual or by the plural that followed the same procedures.

This **output screen** will show us the changes that occur from First Level to the Second Level by color, adding row and separation the Dual and the plural.



Advantages points:

- Get the correct information by following the rules that we fixed in the JSP pages.
- Easy to be used
- Clear to any user especially for the foreigners of Arabic language.
- Can be worked with all platforms
- Can be worked with any browser
- The data followed all kinds of standard Arabic nouns
- It is fulfill for all Arabic nouns (regular and irregular nouns) this by adding to previous design a field that related to the check box of irregular nouns.
- Dual and plural blanks are separated to be easy for using and clear.

Disadvantages points:

- The foreigner of Arabic language cannot distinguish which word is regular and which word is irregular and using that check box for the irregular nouns will make some confusing, because he has to check the words in the (irregular check box) then he can use the normal blanks.
- This procedure will take time to get the information by searching in the irregular check box then check it by the required field.

Level Three

- This level will process the disadvantages that are as following:

1- The ambiguity that occurs to the user in which it is (is this word regular or irregular) and checking them by the irregular check boxes the go with the required fields. So through this level we reduce the process to be already checked and getting results, this way had done by adding the syntax (if – else) to the algorithm of the branch pages that provide the main page, this algorithm is:

```
<%
    String      book      =
request.getParameter("book");
if(book.equals("khadraa"))
{out.println("khadrawan");}
else
if(book.equals("sawda'a"))
{out.println("sawdawan");}
else
if(book.equals("asa"))
{out.println("asawan");}
else
if(book.equals("samraa"))
{out.println("samrawan");}
else
if(book.equals("moomiya'a"))
{out.println("moomiyawan");}
else
{out.println(book + "an");}
%>
```

Through that syntax by using the way of (if – else) we can conclude that if we insert the word (samara) to the input of the data, then we will get the output as (samrawan) as it appeared in:

```
if(book.equals("samraa"))
{out.println("samrawan");}
else
```

at the last (in case no one of the words above we can back to the main syntax by adding (an) to the noun to generate the Male Dual Subject.

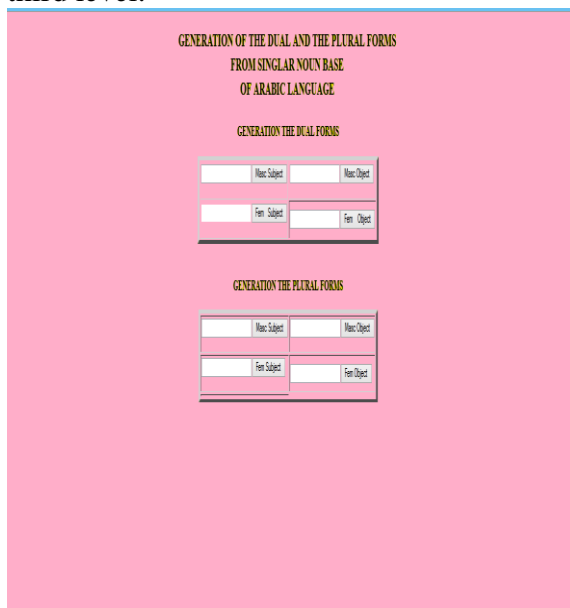
This way will implemented to the all blanks or the fields that required to be generate for the Dual and Plural and each one has its own different words.

2- Through this Level we can get the information with no delay because we

overcome the step of checking the by the irregular checking box and this also will reduce from the time of getting the result that occur in the second level.

3- This level is clearer to the user than the second level, this happened by deleting the rows in which the confusion to the user is deleted also.

Finally we can say that this level has processed the disadvantages that occur in the previous levels (1st and 2nd levels) the below picture with show the shape of the third level:



Advantages points:

- Get the correct information by following the rules that we fixed in the JSP pages.
- Easy to be used
- Clear to any user especially for the foreigners of Arabic language.
- Can be worked with all platforms
- Can be worked with any browser
- The data followed all kinds of standard Arabic nouns
- It is fulfill for all Arabic nouns (regular and irregular nouns) this by adding to previous design a field that related to the check box of irregular nouns.
- Dual and plural blanks are separated to be easy for using and clear.

- Making new step to the blanks that make matching between the irregular check box and the normal blanks and because of that no need for the (irregular check box) because that matching will be internally.

- No delay for getting the required information.

Disadvantages points

- There is no corpus for the data that includes all the Arabic nouns , in which it can make the user feel it is totally completed and depend on it in his/her using.

Conclusion, Suggestions and Future works

This study is concerned with generation the dual and plural forms from the given singular form nouns, it focus on the noun morphology in respect to number, gender and case. The following points are the main conclusions to this study:

Theoretical Conclusion

A- From the theoretical conclusion we can say that the surveying how certain grammarians approach categorizing the number of nouns in Arabic as (Singular, Dual and Plural) the categorization process gets much complicated owing to the different criteria employed in categorizing these three word classes.

B- This study also will show how Standard Arabic morphologically can realize duality in number; while in English do not realize such grammatical categories via morphological markers. In standard Arabic we can find that the noun morphology inflected for number (singular/dual/plural), while the number of the noun of English language inflected by (Singular / Plural) Because of that there are more morphological forms of nouns in Standard Arabic than in English.

Practical Conclusion

A- From the practical conclusion we can say that the learners of the other languages will get the benefits of getting the results of the generation Dual and Plural Arabic nouns easily for the people who need to know about the way of generation and the way of the getting the dual and Plural from the singular Arabic nouns. Through using an electronic device such as the computer then we can get these results as soon as easily.

B- This study develops and evaluates a linguistically natural computational method for generating dual and plural from a given singular noun base. This study will make the operation of this generation very easy by using the computer, mobile phone, tablet etc... because the data base will be published by the internet (html.) or to make it as software program (exe.).

5.2 Recommendation and suggestion

There are some suggestions have been brought by the end of the research in order to get the best results and to overcome of some problems, they are as the following:

1. The user should have at least general knowledge about Arabic language, especially about the nouns and its classifications in respect to number, gender and case.
2. The user should have some experiences about how to use the electronic devices such as the computer, and how to use the internet through World Web Wide (WWW).
3. This study has some limits that it concerned to the generation of noun morphology of Arabic language in respect to number, gender and case.
4. Writing Arabic texts requires that the writer has full knowledge of Standard Arabic and Islamic jurisprudence, according to that the output of the data must give the right and exact result and that depends on the right and exact input.

Suggestion for future research

The first part of this study is concerned on the analysis and generation processes for the Arabic noun morphology and its categories (Singular / Dual / Plural), and the second part of the study is concerned to the computational study as implementing the program that can generate the dual and plural forms from the given singular. According to these two parts we have some notes that are related to the future works:

- A- For analyzing and generation part of the study, we advise for carrying out a similar contrastive study for forms of particular and specific indication can complement the present study.
- B- For the computational study as implementing the program, we advise to add a corpus for the data that can include all the nouns (regular and irregular) in the date to be more benefit for the learner or the user of this data.

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