

International NooJ'17 Conference MOROCCO

MISC
Laboratory presents :

FORMALIZING ARABIC INFLECTIONAL AND DERIVATIONAL VERBS BASED ON *ROOT AND PATTERN* APPROACH USING NOOJ PLATFORM

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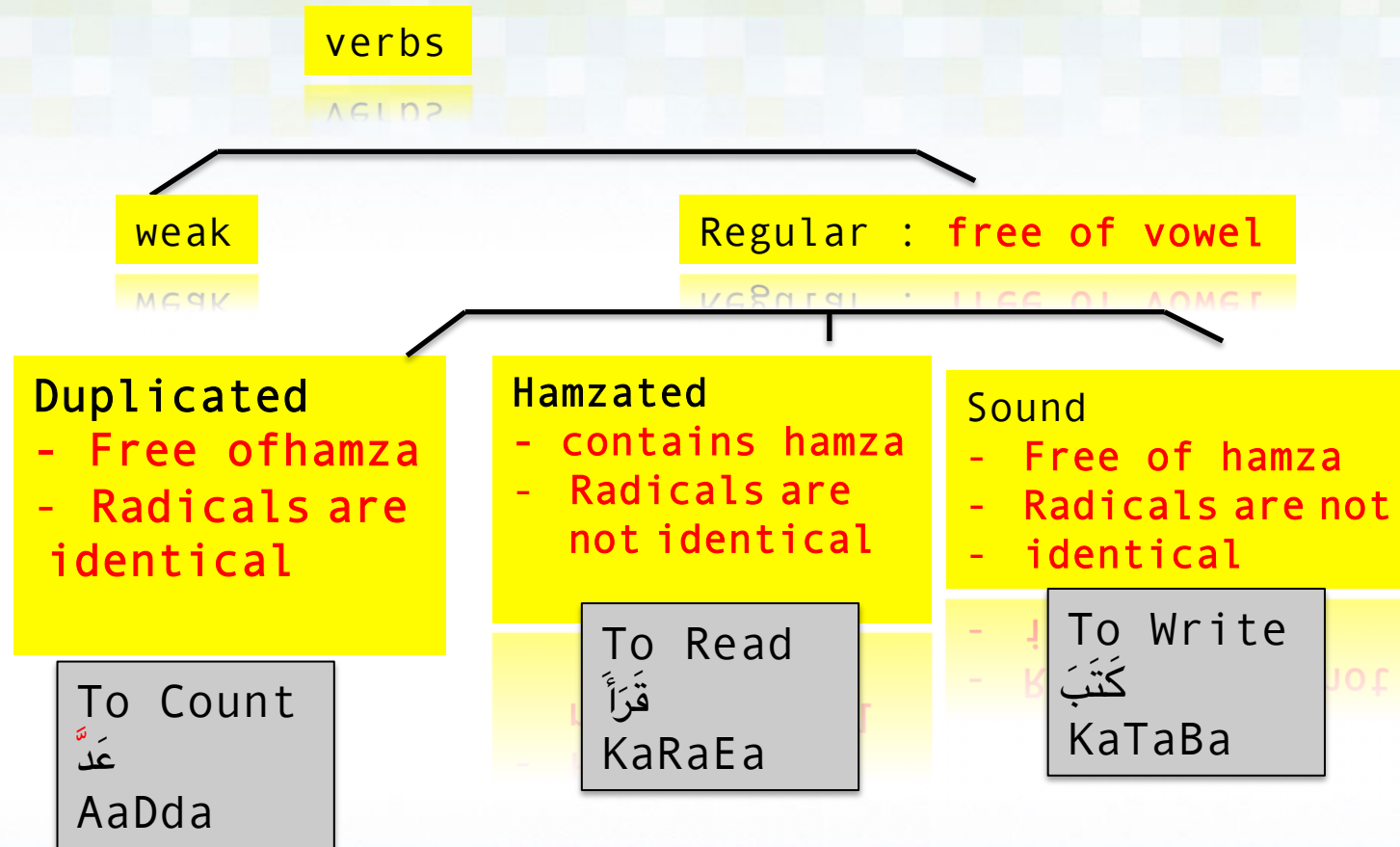
• PLAN

- 1 • Arabic Verbs Classification
- 2 • Arabic Verbs Morphological properties
- 3 • Why Root & Pattern Approach
- 4 • Lemma approach VS Root approach
- 5 • dictionary & Inflectional/Derivational paradigms
- 6 • Conclusion and perspectives

Arabic Verbs Classification

Vowels : ا ي و
Hamza : ا

حرف علة : ا



Arabic Verbs Classification

Vowels : ا ي و
Hamza : ا

حرف علة : ا ي و

verbs

weak

deficient
3rd radical {و, ي}

Assimilated
1st radical {و, ي}

Hollow
2nd radical {و, ي}

To invite
دَعَى
DaEaA

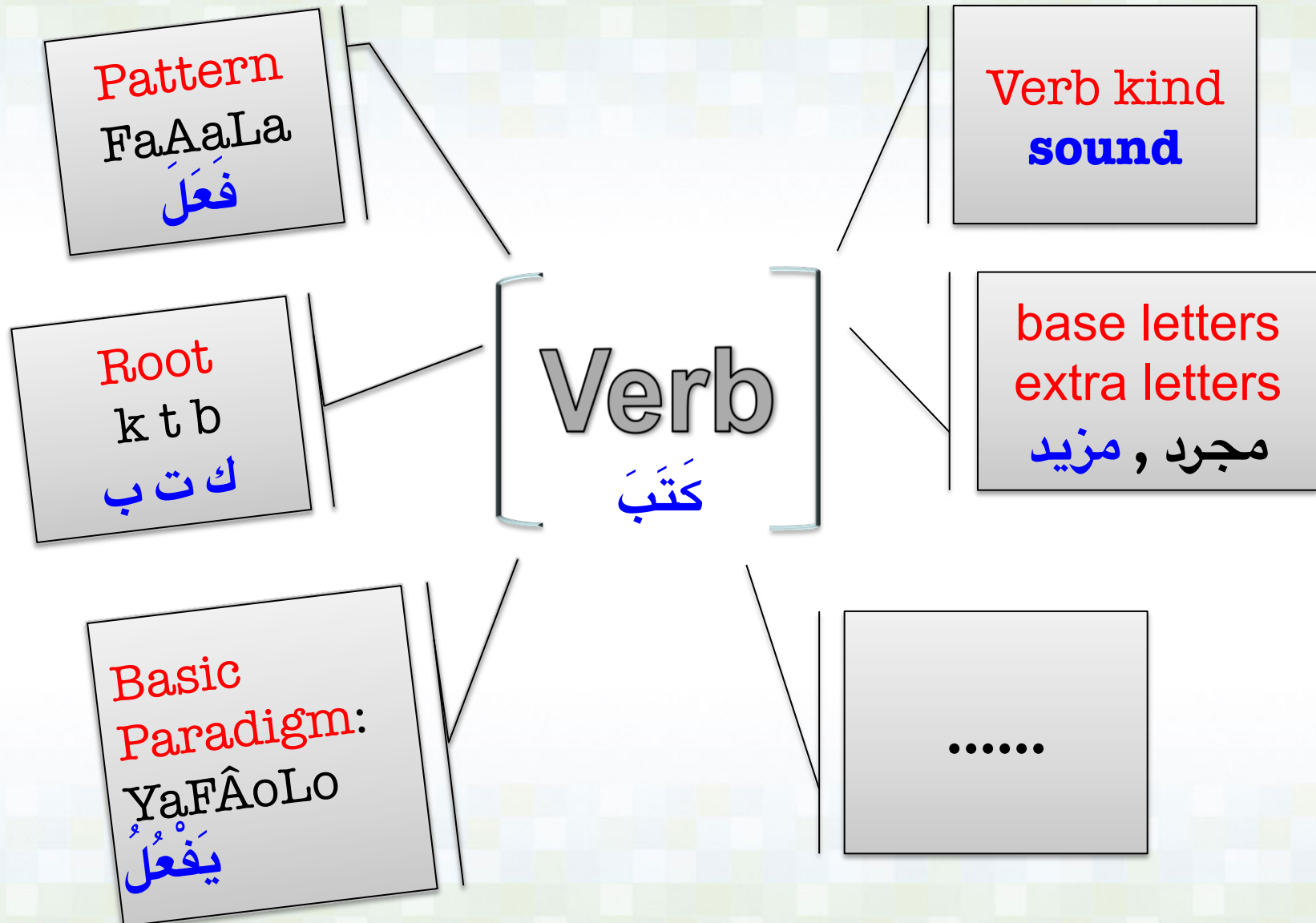
To Arrive
وَصَلَ
WaSaLa

To say
قَالَ
KaALa

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• Arabic Verbs Morphological properties



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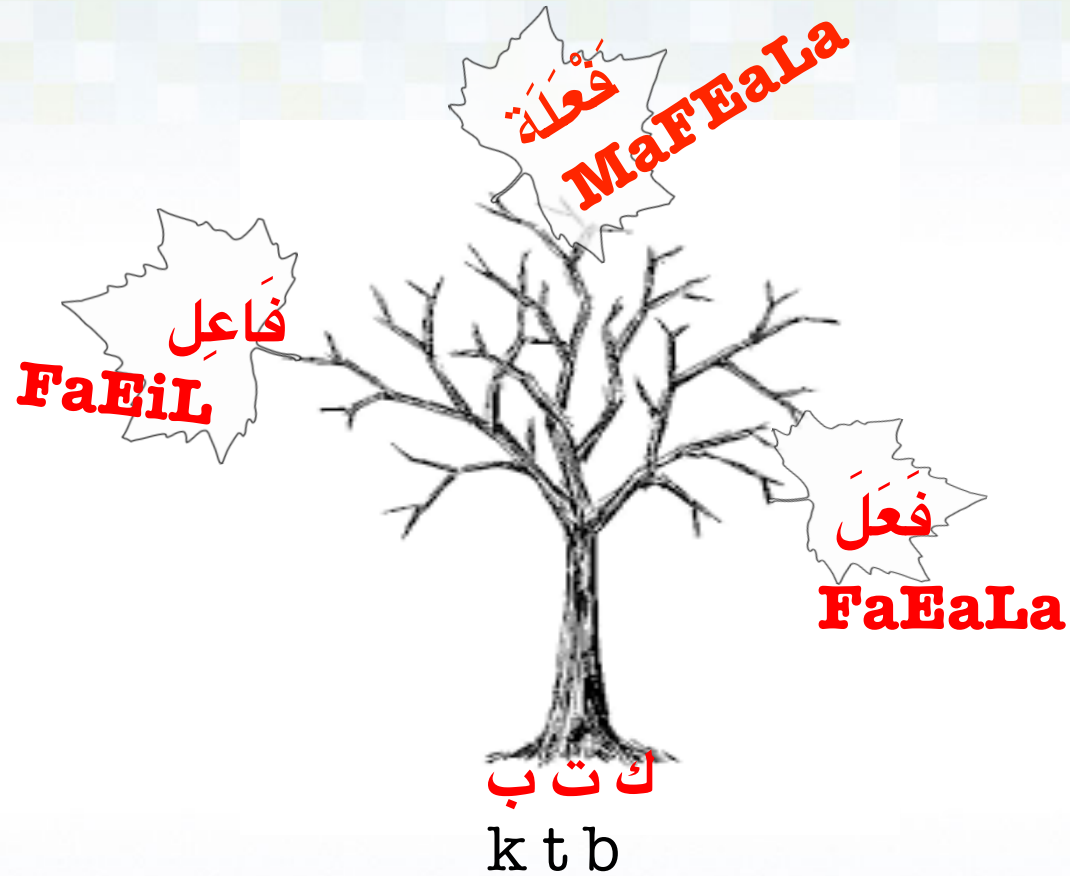
- Why Root & Pattern Approach

PATTERNS



ROOT

- Why Root & Pattern Approach



x مَفْعَلَةٌ
ك ت ب

Library مَكْتَبَةٌ

x فَاعِلٌ
ك ت ب

كَاتِبٌ writer



x فَعَلٌ
ك ت ب
كَتَبَ To write



Morphological information : Pattern

Library
MaKT**aBa**
مَكْتَبَة

Pattern
MaFa**La**
مَفْعَلَة

Pattern
INFORMATION

Syntactical information : Tr, InTr ,V,N.....

To Write
KaTa**Ba**
كَتَبَ

Tr,V

Semantic information : pattern meaning

Pattern
MaFa**La**
مَفْعَلَة

Place

Pattern
KaTa**Ba**
فَعَلَّ

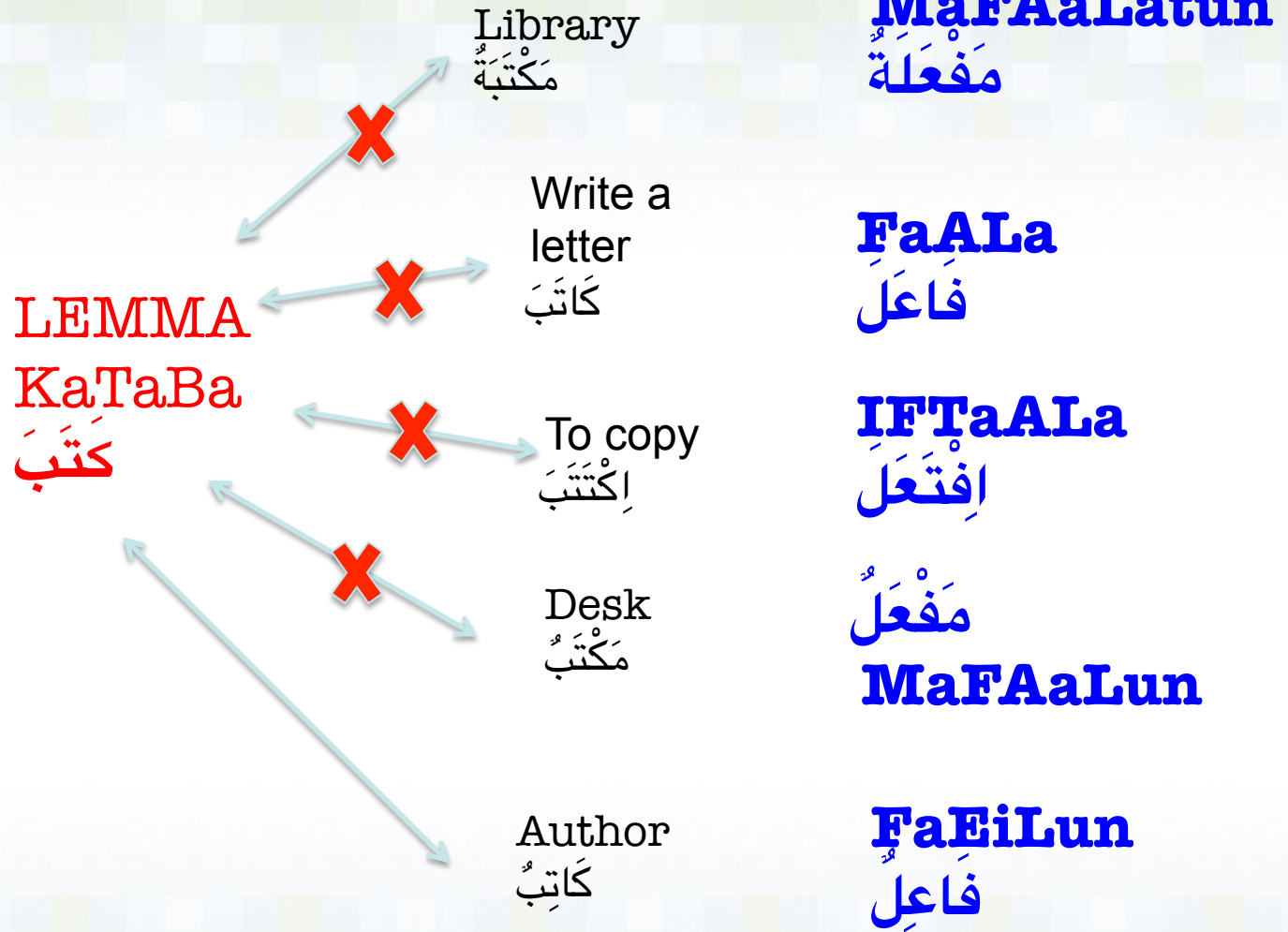
Action

	فَعَلَ	فَعَّلَ	فَعِّلَ	فَاعِلٌ	تَفَاعَلَ	<i>Pattern</i>
ح ص ن	×	حَصَّنَ To protect	×	حَاصِنٌ protector	×	
ك ت ب	كَتَبَ To write	×	×	كَاتِبٌ writer	تَكَاتَبَ Sending a message ...	
ض ر ب	ضَرَبَ To hit	×	×	ضَارِبٌ hitter	تَضَارَبَ Hit each other ...	

Root ↓

Arabic Lexicon

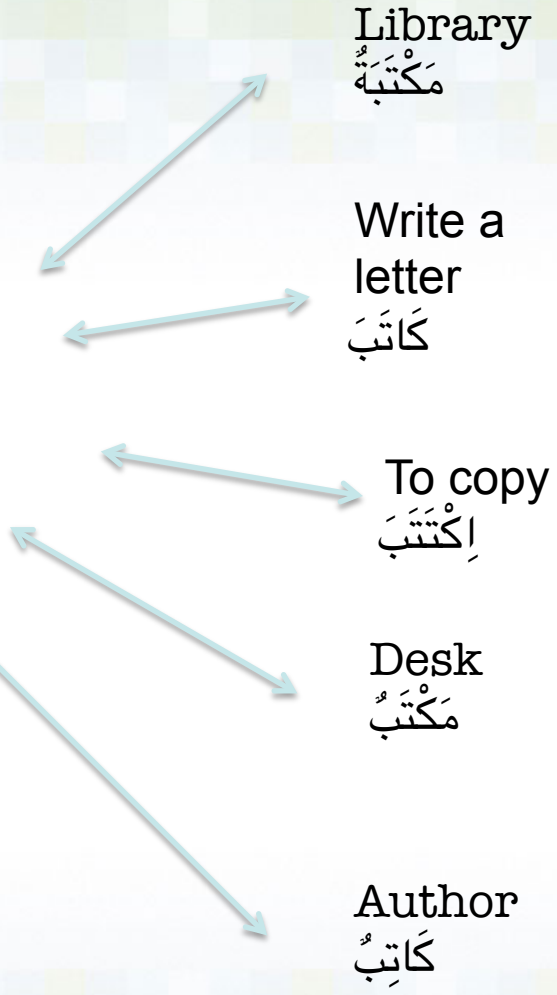
• Why Root & Pattern Approach



Author is inflected from the verb to write

• Why Root & Pattern Approach

ROOT
K T B
كَتَبَ



PATTERN
MaFAaLatun
مَفْعَلَةٌ

FaALa
فَاعِلٌ

IFTaALa
اِفْتَعَلَ

مَفْعَلٌ
MaFAaLun

FaEiLun
فَاعِلٌ

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- Lemma approach VS Root approach

- Root approach

King's Prime **writes** to the king
complain his State Secretary

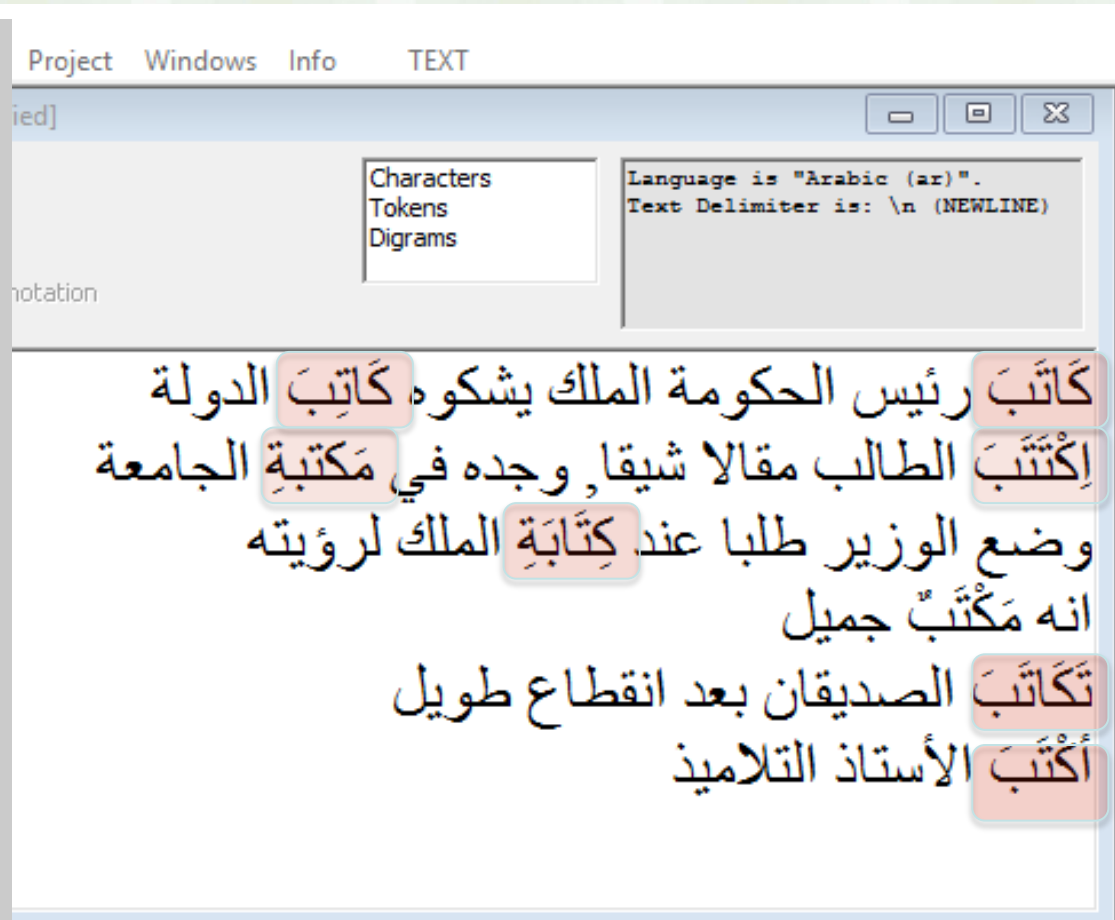
Student **copies** an interesting
article , he found it in
University **Library**

the Minister submits a
demand in king **secretary**
asking for an appointment to
see him

Such a beautiful desk

two friends **write** to each other
after a long time

The professor **dictates** his
students



- Lemma approach VS Root approach

- Root approach

Locate a pattern in 1

Pattern is:

a string of characters:
 a PERL regular expression:
 a NooJ regular expression:

Syntactic Analysis

Index

Shortest matches
 Longest matches
 All matches

Limitation

All occurrences
 Only: occ.
 1 occ. per match

Reset Concordance

N o o J

- Lemma approach VS Root approach

- Root approach

C:\Users\toshiba\Documents\Noo\ar\Projects\exempleil.not

- 1 + / 7 TUs

Characters
Tokens
Digrams

Show Text Annotation Structure

Language is "Arabic(ar)".
Text Delimiter is: \n (NEWL)
Text contains 7 Text Units
34 tokens including:

كَاتِبَ رَئِيسَ الْحُكُومَةِ الْمَلِكِ يَشْكُوهُ كَاتِبَ الدَّوْلَةِ
 اِكْتَتَبَ الطَّالِبُ مَقَالًا شَيْقًا وَجَدَهُ فِي مَكْتَبَةِ الْجَامِعَةِ
 وَضَعَ الْوَزِيرُ طَلْبًا عِنْدَ كِتَابَةِ الْمَلِكِ لِرُؤْيَتِهِ
 اَنَّهُ مَكْتَبٌ جَمِيلٌ
 تَكَاتَبَ الصَّدِيقَانِ بَعْدَ انْقِطَاعِ طَوِيلِ
 اِكْتَتَبَ الْاَسْتَاذُ التَّلَامِيذُ

Concordance for Text C:\Users\toshiba\Documents\Noo\ar\Projects\exemplei...

Reset Display: characters before, and 5 after. Display: Matches Outputs

word forms

Text	After	Seq.	Before
	الدولة اِكْتَتَبَ الطَّالِبُ مَقَالًا شَيْقًا	كَاتِبَ	كَاتِبَ رَئِيسَ الْحُكُومَةِ الْمَلِكِ يَشْكُوهُ

Query 1/1

- Lemma approach VS Root approach

- Lemma approach

Locate a pattern in فاعل

Pattern is:

- a string of characters:
- a PERL regular expression:
- a NooJ regular expression:

Syntactic Analysis

Index

- Shortest matches
- Longest matches
- All matches

Limitation

- All occurrences
- Only: occ.
- 1 occ. per match

Reset Concordance

N o o J

- Lemma approach VS Root approach

- Root approach

Concordance for Text لئل.not [Modified]

Reset Display: 5 characters before, and 5 after. Display Matches Outputs

After	Seq.	Before
رئيس الحكومة الملك يشكوه	كَاتَبَ	ة الملك يشكوه
الدولة اِكْتَتَبَ الطالب مقالا	كَاتِبَ	ه كَاتِبَ الدولة
الطالب مقالا شيقا, وجده في	اِكْتَتَبَ	ه كَاتِبَ الدولة
الجامعة وضع الوزير طلبا	مَكْتَبَةِ	نيقا, وجده في
الملك لرؤيته انه مَكْتَبٌ جمي	كِتَابَةِ	وزير طلبا عند
الصديقان بعد انقطاع طويل	تَكَاتَبَ	ه مَكْتَبٌ جميل
الأستاذ التلاميذ	اَكْتَبَ	انقطاع طويل

- Lemma approach VS Root approach

- Pattern search : craft

AiBaDa
The
عِبَادَةٌ
worship

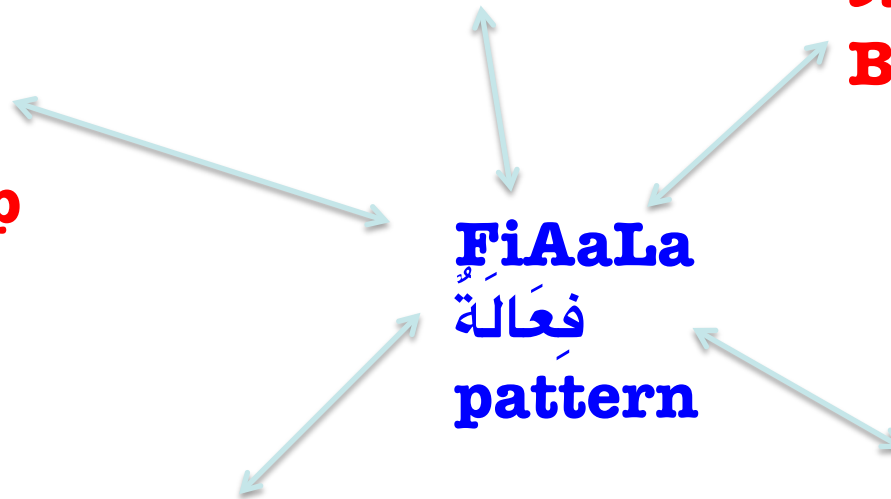
KiTaBa
كِتَابَةٌ
writing

HiDaDa
حَدَادَةٌ
Blacksmith

FiAaLa
فِعَالَةٌ
pattern

DiRaSa
The study
دِرَاسَةٌ
study

NiJaRa
نِجَارَةٌ
Carpentry



- Lemma approach VS Root approach

- Pattern search

Same Pattern

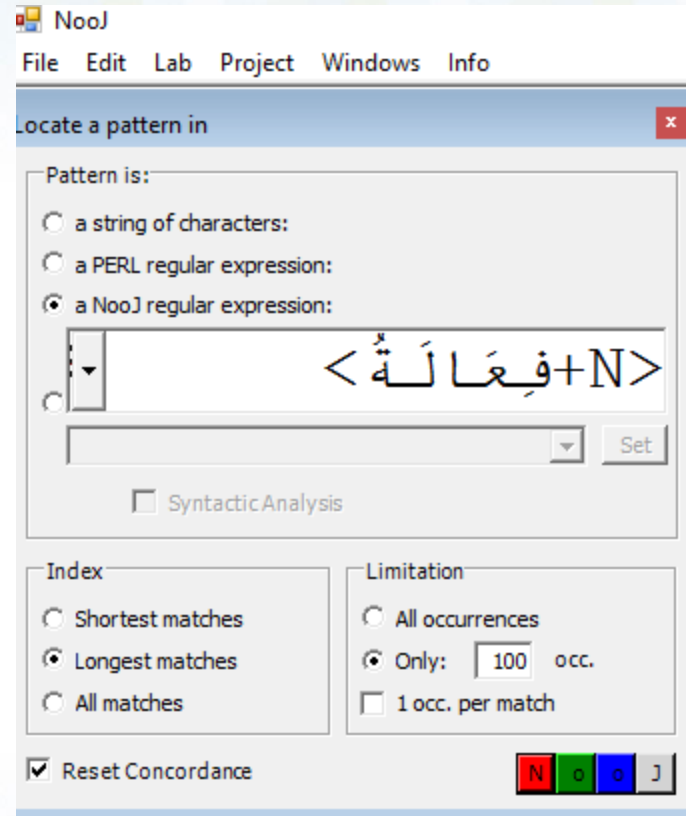
Pattern semantic INF = craft

The screenshot shows the Nooj software interface. The main window displays Arabic text with several segments highlighted in blue boxes. Below the text, a grey box contains the English translations for these segments, with some words in red. The translations are:

- The **worship** of idols is widespread
- Decision-making requires an in-depth **study**
- The worker mastered two craft : wood **carpentry** and **blacksmith** windows

- Lemma approach VS Root approach

- Pattern search



- Lemma approach VS Root approach

- Pattern search

Concordance for Text SEARCH-BY-PATTERN.not [Modified]

Reset Display: characters before, and after. Display: Matches Outputs

word forms

After	Seq.	Before
عبادة الاصنام منتشرة. - اتخاذ القرار		worship
دراسة معمقة. - يجيد هذا العامل حرفته		study
نجارة الابواب و حدادة الشبابيك. - ك		carpentry
حدادة. الشبابيك. - كتابة الأمثلة متعب		blacksmith

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5

- dictionary & Inflectional/Derivational paradigms

5

- dictionary

كَتَبَ, كَتَب, V, INFO+FLX=FLXN1+DRV=DRVN:FLXN2

- Inflectional/Derivational paradigms

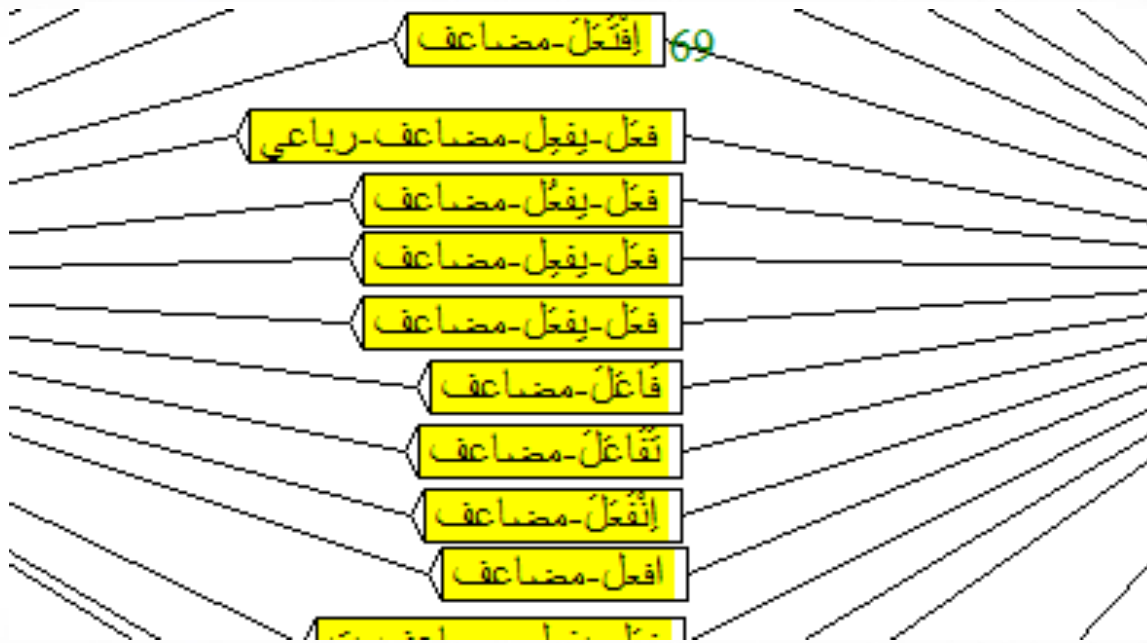
Verbs Model

Sound

Duplicated
Hamzated

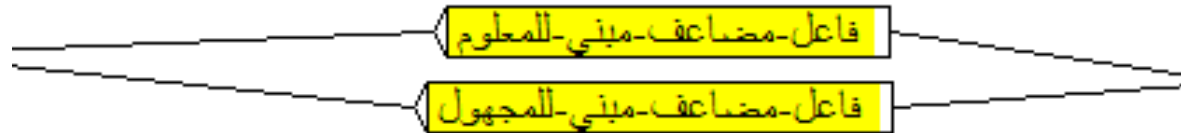


- dictionary & Inflectional/Derivational paradigms



All possible patterns for each duplicated root

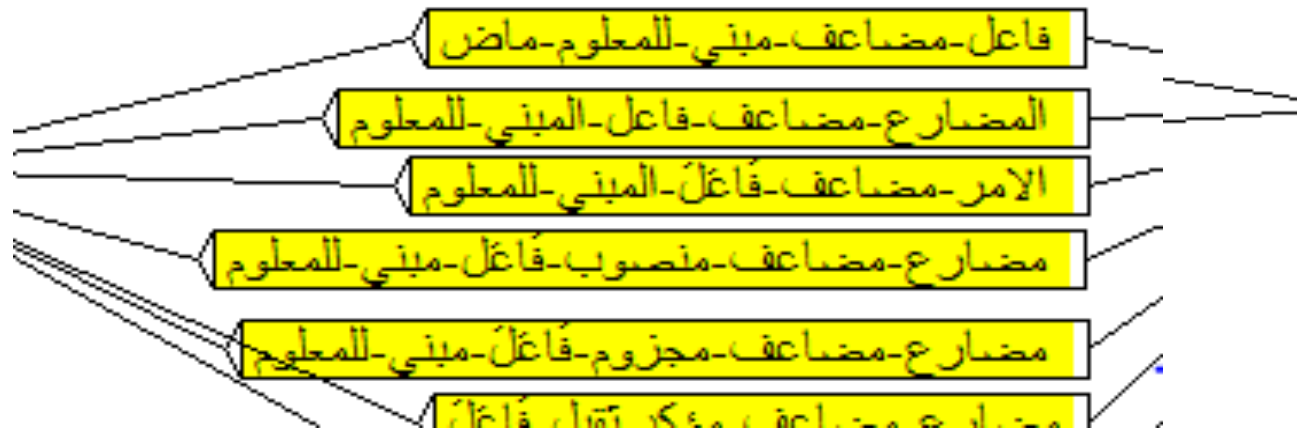
- dictionary & Inflectional/Derivational paradigms



Active & passive voice

- dictionary & Inflectional/Derivational paradigms

All possible active voice tenses



- dictionary & Inflectional/Derivational paradigms

260 VERB MODEL \cong ALL ARABIC VERBS MODEL

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- Conclusion and perspectives

- Conclusion

- fully Arabic verbs recourses

- perspectives

- extend our dictionary to the inflections of nouns, adjectives
- Reduce the number of verbs model

THANK YOU

