EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

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14. Text Annotation Structure (Advanced)

This series of tutorials is based upon work from COST Action
Multi3Generation CA18231, supported by COST
(European Cooperation in Science and Technology).

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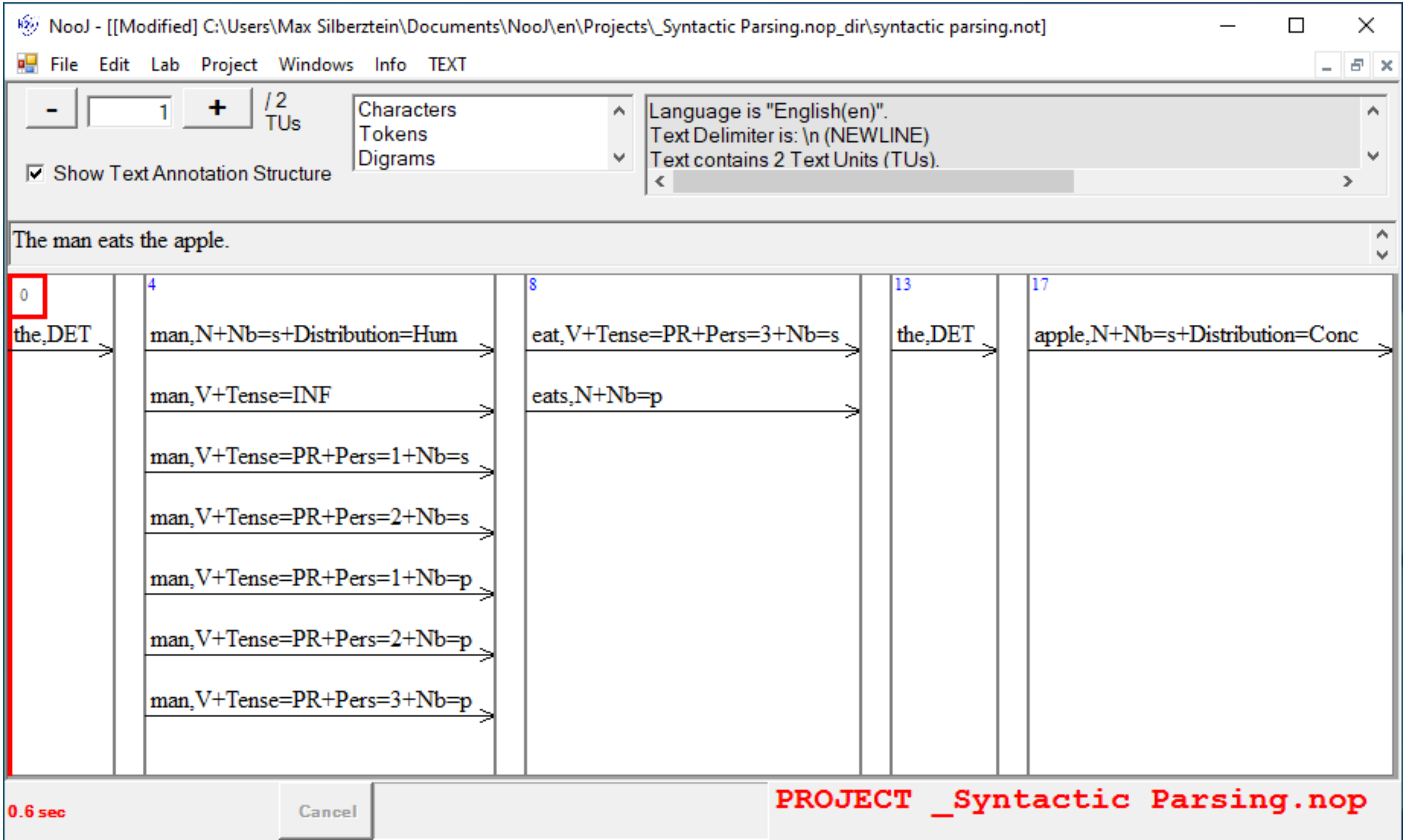
Text Annotation Structure

- When applying any linguistic resource to a text, NooJ adds, or removes annotations to the Text Annotation Structure (TAS)
- During the lexical analysis, NooJ applies dictionaries and morphological grammars to the text, to add annotations that represent ALUs into the TAS
- When applying syntactic grammars to a text, NooJ can add annotations (e.g., structural), or remove annotations (*e.g.*, lexical hypotheses).

Syntactic Analysis

Text, right after the lexical analysis

man: noun or verb (several forms); *eat*: noun or verb


NooJ - [[Modified] C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntactic Parsing.nop_dir\syntactic parsing.not]
File Edit Lab Project Windows Info TEXT
-
1
+
/ 2 TUs
☑ Show Text Annotation Structure
Characters
Tokens
Digrams
Cancel

Language is "English(en)".
Text Delimiter is: \n (NEWLINE)
Text contains 2 Text Units (TUs).

The man eats the apple.

0
the,DET

4
man,N+Nb=s+Distribution=Hum
man,V+Tense=INF
man,V+Tense=PR+Pers=1+Nb=s
man,V+Tense=PR+Pers=2+Nb=s
man,V+Tense=PR+Pers=1+Nb=p
man,V+Tense=PR+Pers=2+Nb=p
man,V+Tense=PR+Pers=3+Nb=p

8
eat,V+Tense=PR+Pers=3+Nb=s
eats,N+Nb=p

13
the,DET

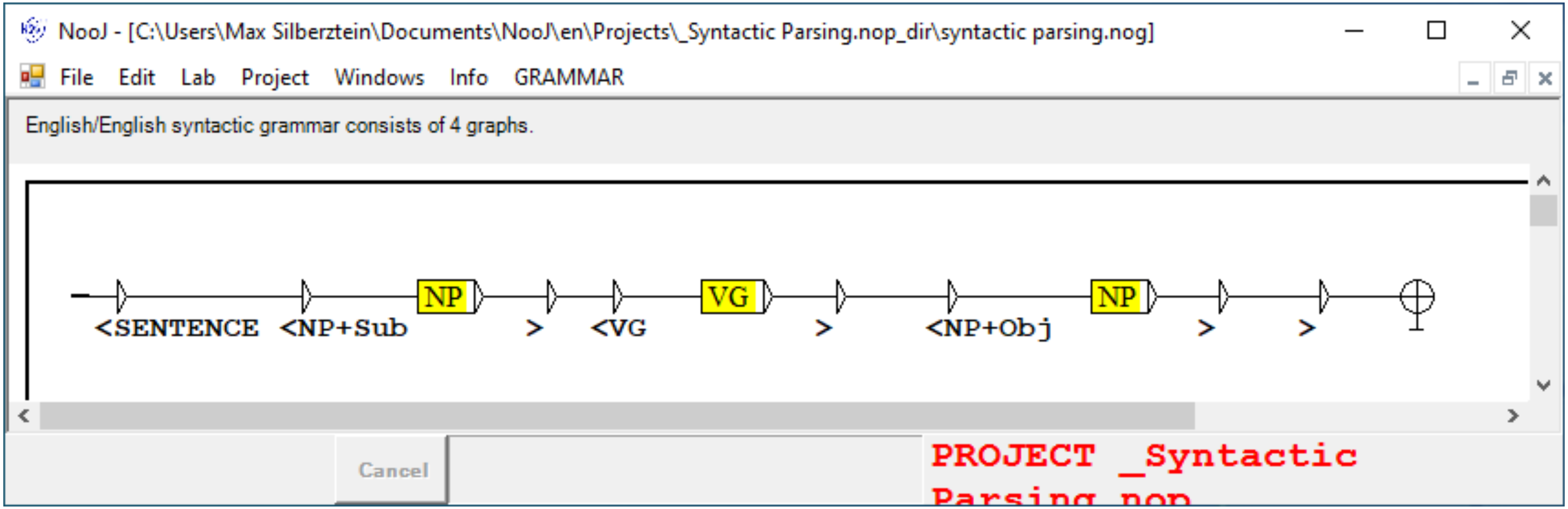
17
apple,N+Nb=s+Distribution=Conc

0.6 sec

PROJECT _Syntactic Parsing.nop

Syntactic Analysis

Syntactic grammar produces structural annotations



NooJ - [C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntactic Parsing.nop_dir\syntactic parsing.nog]
File
Edit
Lab
Project
Windows
Info
GRAMMAR

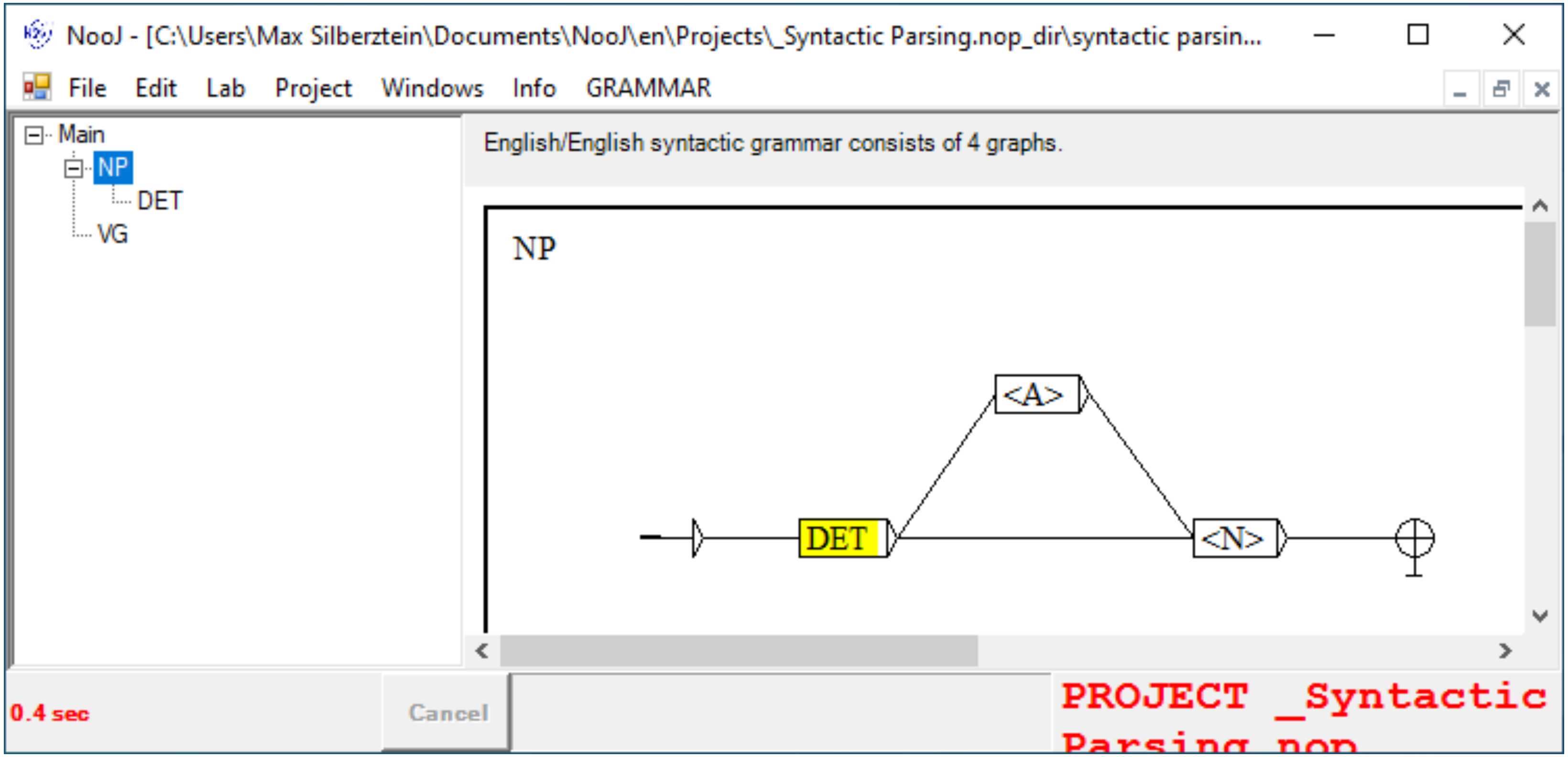
English/English syntactic grammar consists of 4 graphs.

<SENTENCE
<NP+Sub
NP
>
<VG
VG
>
<NP+Obj
NP
>
>
Cancel
PROJECT _Syntactic
Parsing.nop

- Annotation <SENTENCE>
- Annotation <NB+Sub>
- Annotation <VG>
- Annotation <NB+Obj>

Syntactic Analysis

Syntactic grammar produces structural annotations



NooJ - [C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntactic Parsing.nop_dir\syntactic parsin...
File
Edit
Lab
Project
Windows
Info
GRAMMAR
Main
NP
DET
VG
NP
DET
<A>
<N>
0.4 sec
Cancel

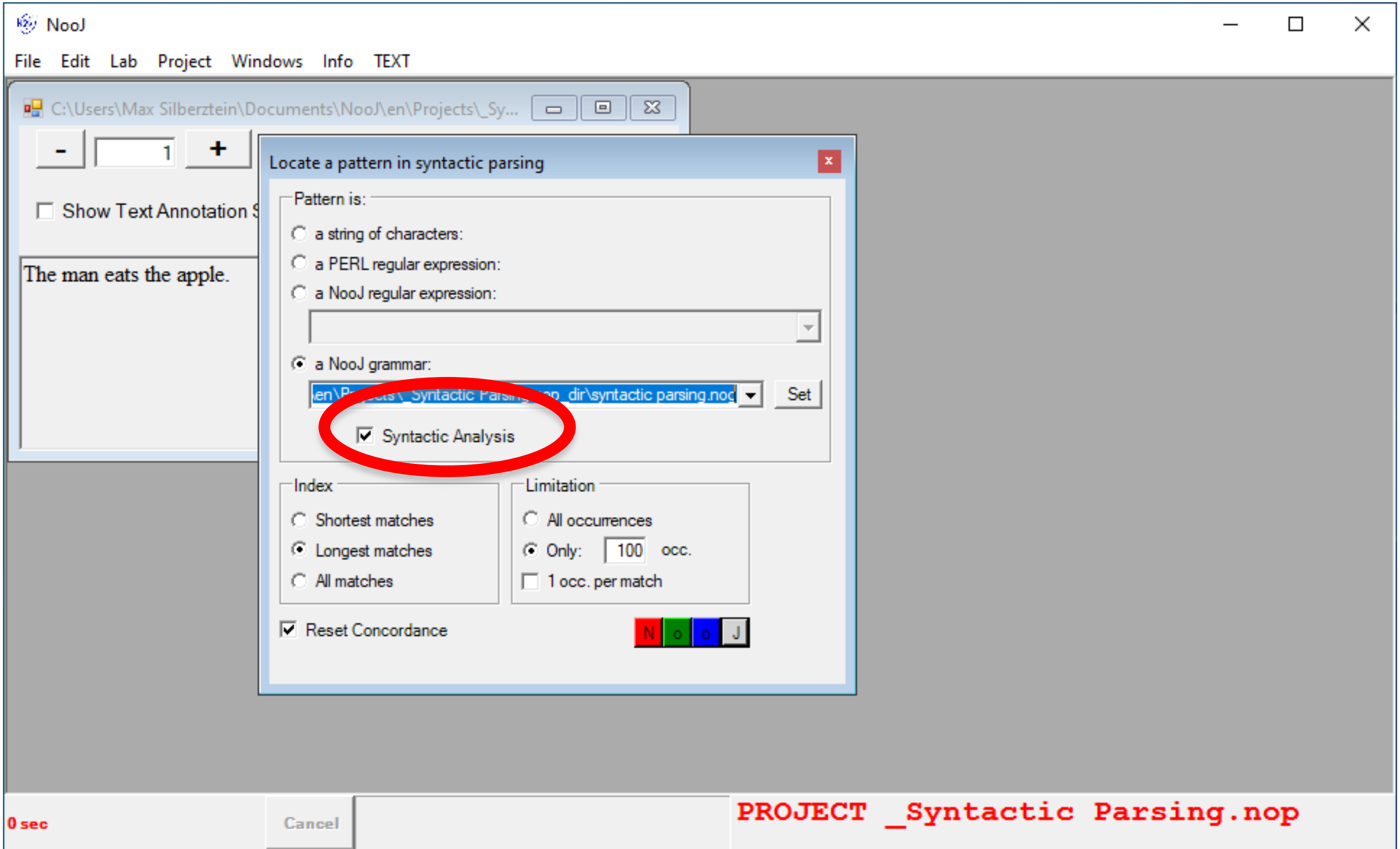
English/English syntactic grammar consists of 4 graphs.

PROJECT _Syntactic Parsing.nop

- Several embedded grammars

Syntactic Analysis

Applying grammar to text



☐ Show Text Annotation S

The man eats the apple.

Locate a pattern in syntactic parsing

Pattern is:

○ a string of characters:

○ a PERL regular expression:

○ a NooJ regular expression:

● a NooJ grammar: \en\Projects_Syntactic Parsing.nop_dir\syntactic parsing.nod

☑ Syntactic Analysis

Index

○ Shortest matches

● Longest matches

○ All matches

Limitation

○ All occurrences

● Only: 100 occ.

☐ 1 occ. per match

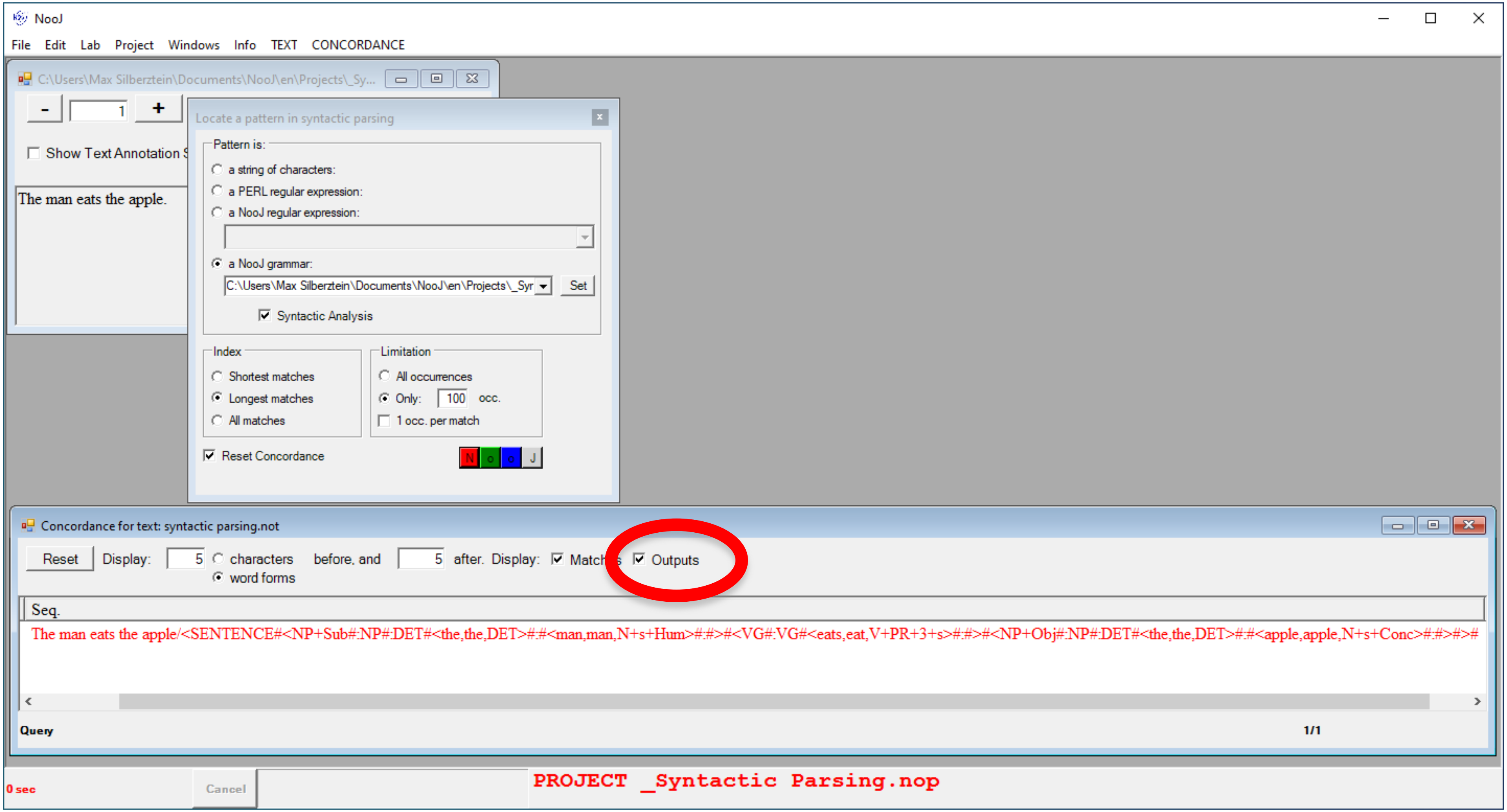
☑ Reset Concordance

0 sec

PROJECT _Syntactic Parsing.nop

Syntactic Analysis

Applying grammar to text


NooJ
File Edit Lab Project Windows Info TEXT CONCORDANCE
C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Sy...
- 1 +
Set
Reset
Query
1/1
0 sec
Cancel

☐ Show Text Annotation S

The man eats the apple.

Locate a pattern in syntactic parsing

Pattern is:

○ a string of characters:

○ a PERL regular expression:

○ a NooJ regular expression:

● a NooJ grammar: C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syr

☑ Syntactic Analysis

Index

○ Shortest matches

● Longest matches

○ All matches

Limitation

○ All occurrences

● Only: 100 occ.

☐ 1 occ. per match

☑ Reset Concordance

🟥 N 🟩 o 🟦 o J

Concordance for text: syntactic parsing.not

Display: 5 ○ characters ● word forms before, and 5 after. Display: ☑ Matches ☑ Outputs

Seq.

The man eats the apple/<SENTENCE#<NP+Sub#:NP#:DET#<the,the,DET>#:#<man,man,N+s+Hum>#:#>#<VG#:VG#<eats,eat,V+PR+3+s>#:#>#<NP+Obj#:NP#:DET#<the,the,DET>#:#<apple,apple,N+s+Conc>#:#>#>#

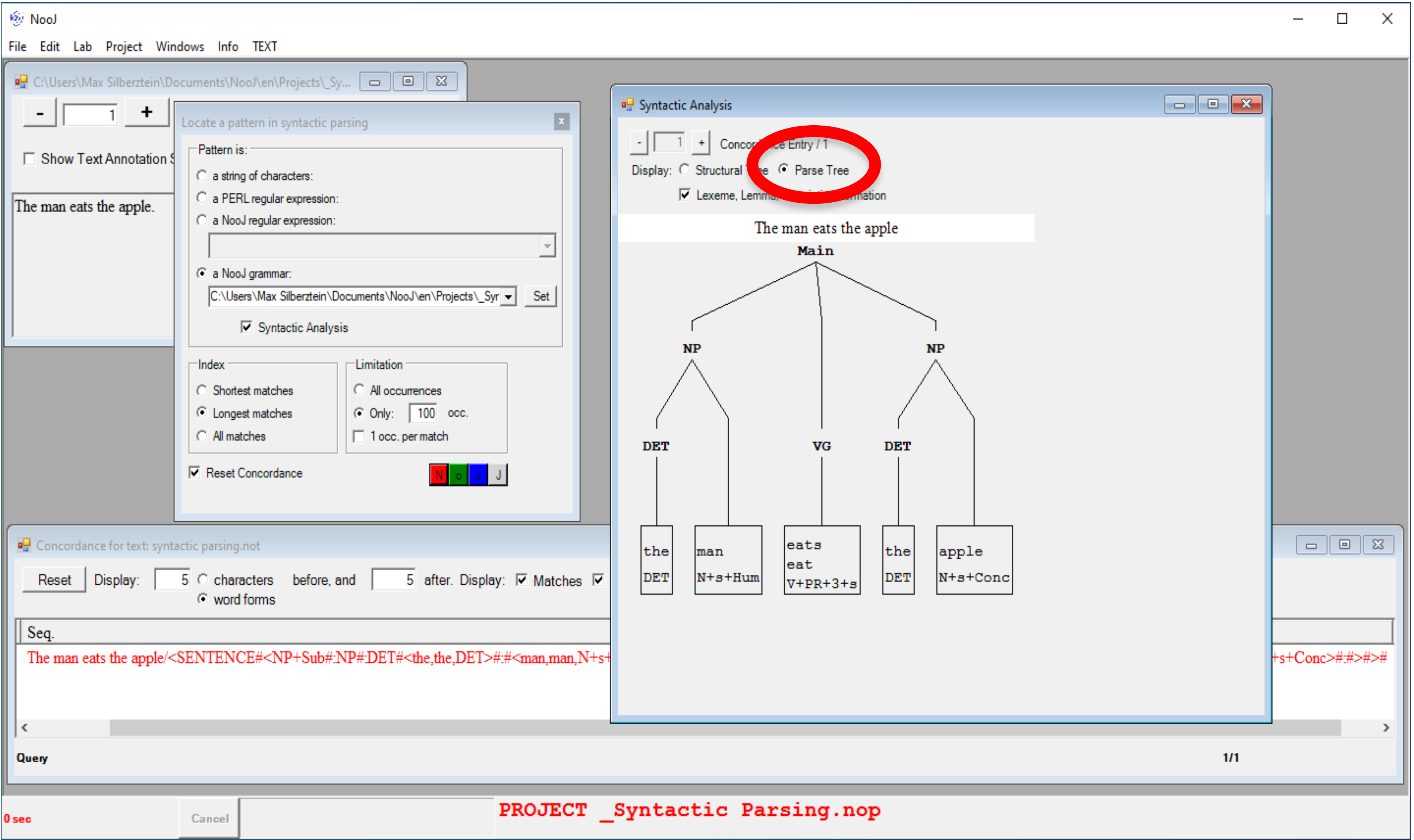
PROJECT _Syntactic Parsing.nop

The output represents the structure produced by the annotations

Syntactic Analysis

CONCORDANCE > Display Syntactic Analysis

NooJ displays the parse tree:



C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Sy...

- 1 +

☐ Show Text Annotation S

The man eats the apple.

Locate a pattern in syntactic parsing

Pattern is:

○ a string of characters:

○ a PERL regular expression:

○ a NooJ regular expression:

● a NooJ grammar:

C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syn Set

☑ Syntactic Analysis

Index

○ Shortest matches

● Longest matches

○ All matches

Limitation

○ All occurrences

● Only: 100 occ.

☐ 1 occ. per match

☑ Reset Concordance

Syntactic Analysis

- 1 + Concordance Entry / 1

Display: ○ Structural Tree ● Parse Tree

☑ Lexeme, Lemma, ... Information

The man eats the apple

the DET	man N+s+Hum	eats eat V+PR+3+s	the DET	apple N+s+Conc

Concordance for text: syntactic parsing.not

Display: 5 ○ characters before, and 5 after. Display: ☑ Matches ☑

● word forms

Seq.

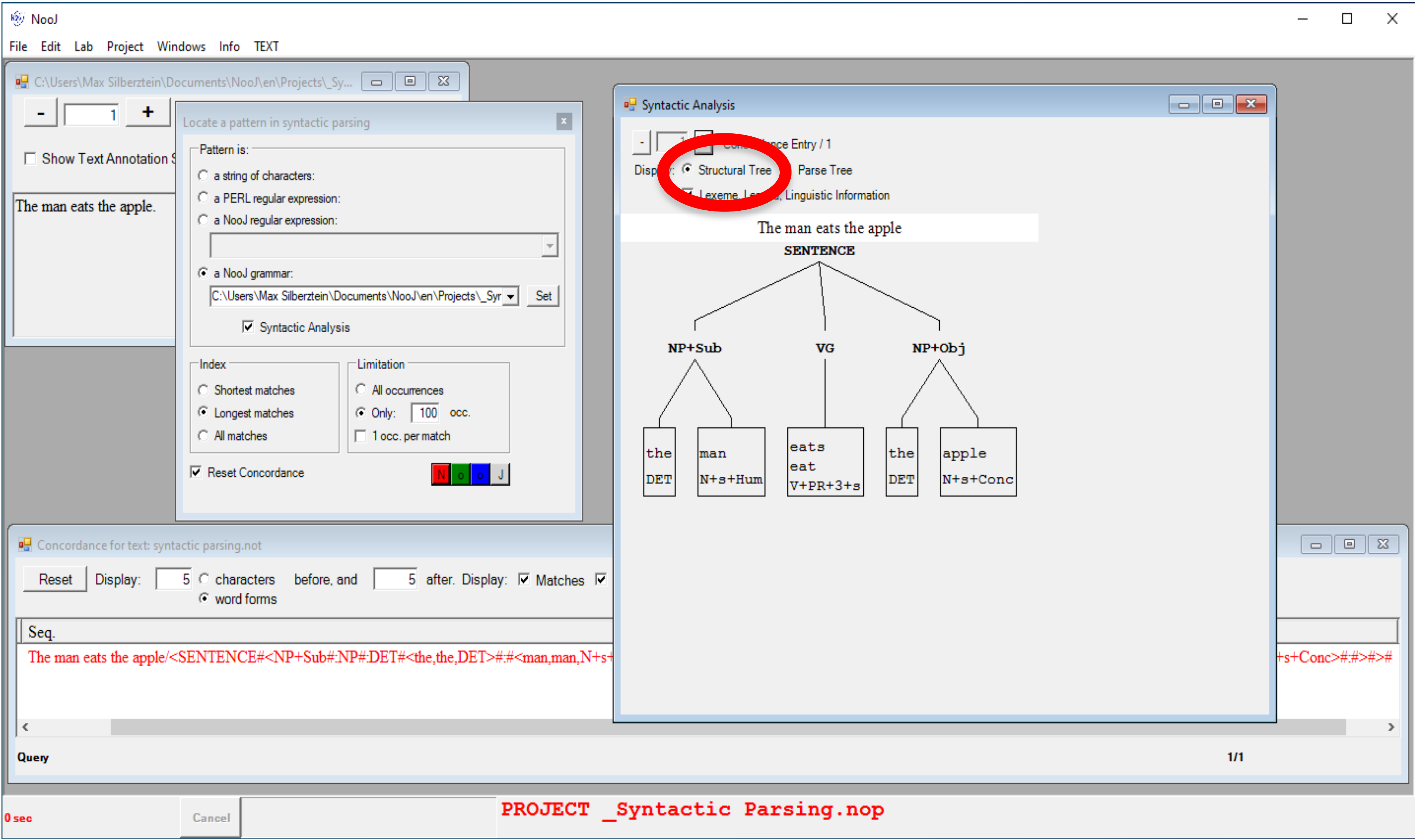
The man eats the apple/<SENTENCE#<NP+Sub#:NP#:DET#<the,the,DET>#:#<man,man,N+s+ ... +s+Conc>#:#>#>#

PROJECT _Syntactic Parsing.nop

Syntactic Analysis

CONCORDANCE > Display Syntactic Analysis

The TAS is displayed as a tree:


NooJ
File Edit Lab Project Windows Info TEXT
C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Sy...
- 1 +
Locate a pattern in syntactic parsing
Syntactic Analysis
Concordance for text: syntactic parsing.not
Reset
Seq.
Query
1/1
0 sec
Cancel
N o o J
SENTENCE
NP+Sub
VG
NP+Obj
the
DET
man
N+s+Hum
eats
eat
V+PR+3+s
the
DET
apple
N+s+Conc

☐ Show Text Annotation S

The man eats the apple.

Pattern is:

○ a string of characters:

○ a PERL regular expression:

○ a NooJ regular expression:

● a NooJ grammar: C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syr

☑ Syntactic Analysis

Index: ○ Shortest matches ● Longest matches ○ All matches

Limitation: ○ All occurrences ● Only: 100 occ. ☐ 1 occ. per match

☑ Reset Concordance

Display: ● Structural Tree ○ Parse Tree

☑ Lexeme, Lemma, Linguistic Information

The man eats the apple

Display: 5 ○ characters ● word forms before, and 5 after. Display: ☑ Matches ☑

The man eats the apple/<SENTENCE#<NP+Sub#:NP#:DET#<the,the,DET>#:#<man,man,N+s+ … +s+Conc>#:#>#>#

PROJECT _Syntactic Parsing.nop

Syntactic Analysis
Parse *vs.* Structural trees

- The **parse tree** represents the structure of the grammar, rather than the structure of the sentence.

➢ It is useful to debug a grammar, as it shows how the grammar was explored during parsing

- The **structural tree** represents the TAS. It is produced by annotations in the grammar, and is independent from the structure of the grammar.

➢ It is useful to accumulate and share grammars, as it is independent from how linguists want to organize their grammar; it also allows NooJ to optimize grammars (*e.g.*, remove useless rules and recursions, etc.) without any consequence

Syntactic Analysis
Atomic Linguistic Units

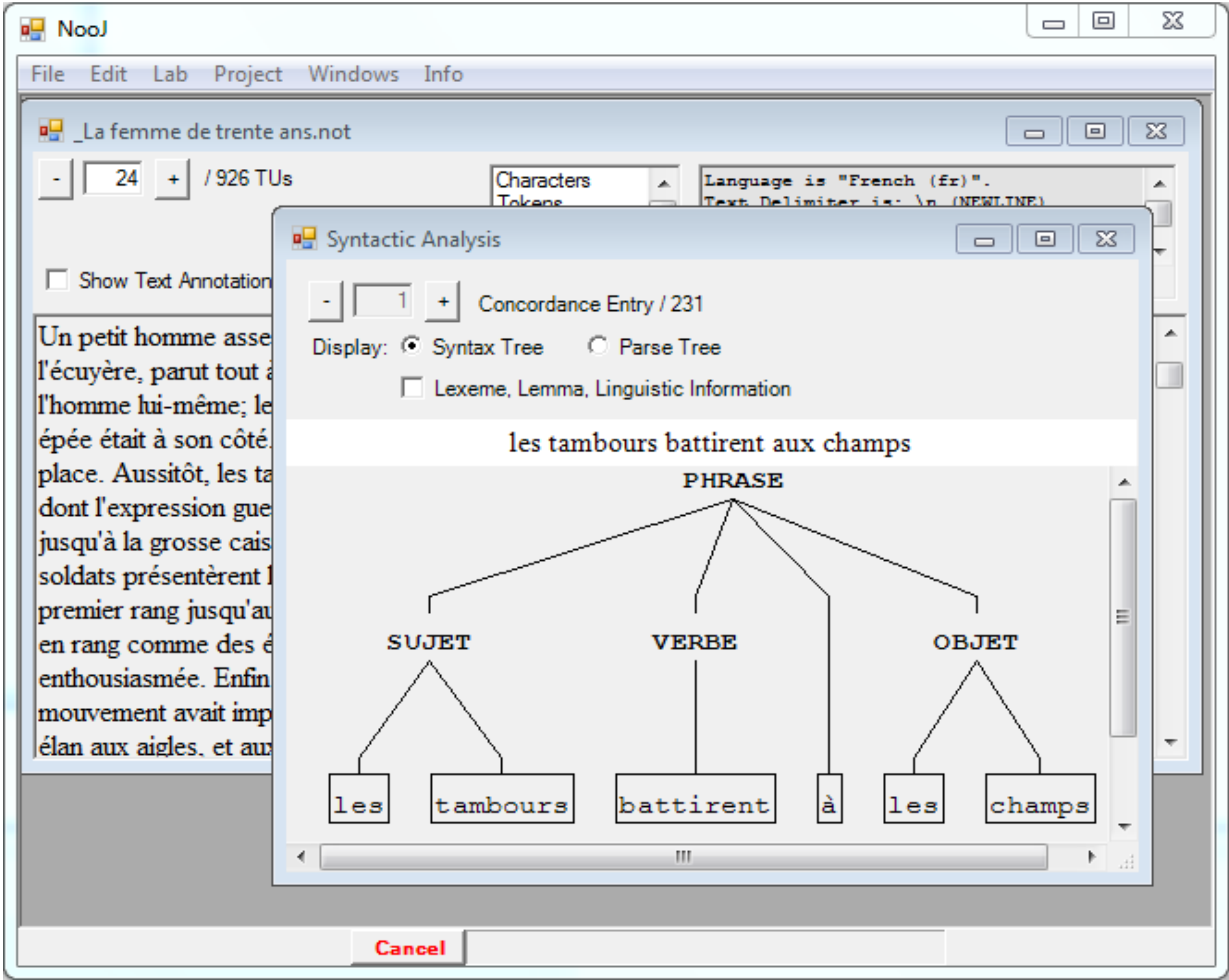
- There are four types of ALUs: affixes, simple words, multiword units and discontinuous expressions.

➢ ALUs are represented by annotations in the TAS

- Syntactic trees must represent the ALUs

Syntactic Analysis
Contracted and agglutinated forms

In French, *aux* is a contracted form of *à les*


NooJ
File Edit Lab Project Windows Info
_La femme de trente ans.not
- 24 + / 926 TUs
Characters
Tokens
☐ Show Text Annotation
Syntactic Analysis
- 1 + Concordance Entry / 231
Display: ● Syntax Tree ○ Parse Tree
☐ Lexeme, Lemma, Linguistic Information
PHRASE
SUJET
VERBE
OBJET
les
tambours
battirent
à
les
champs
Cancel

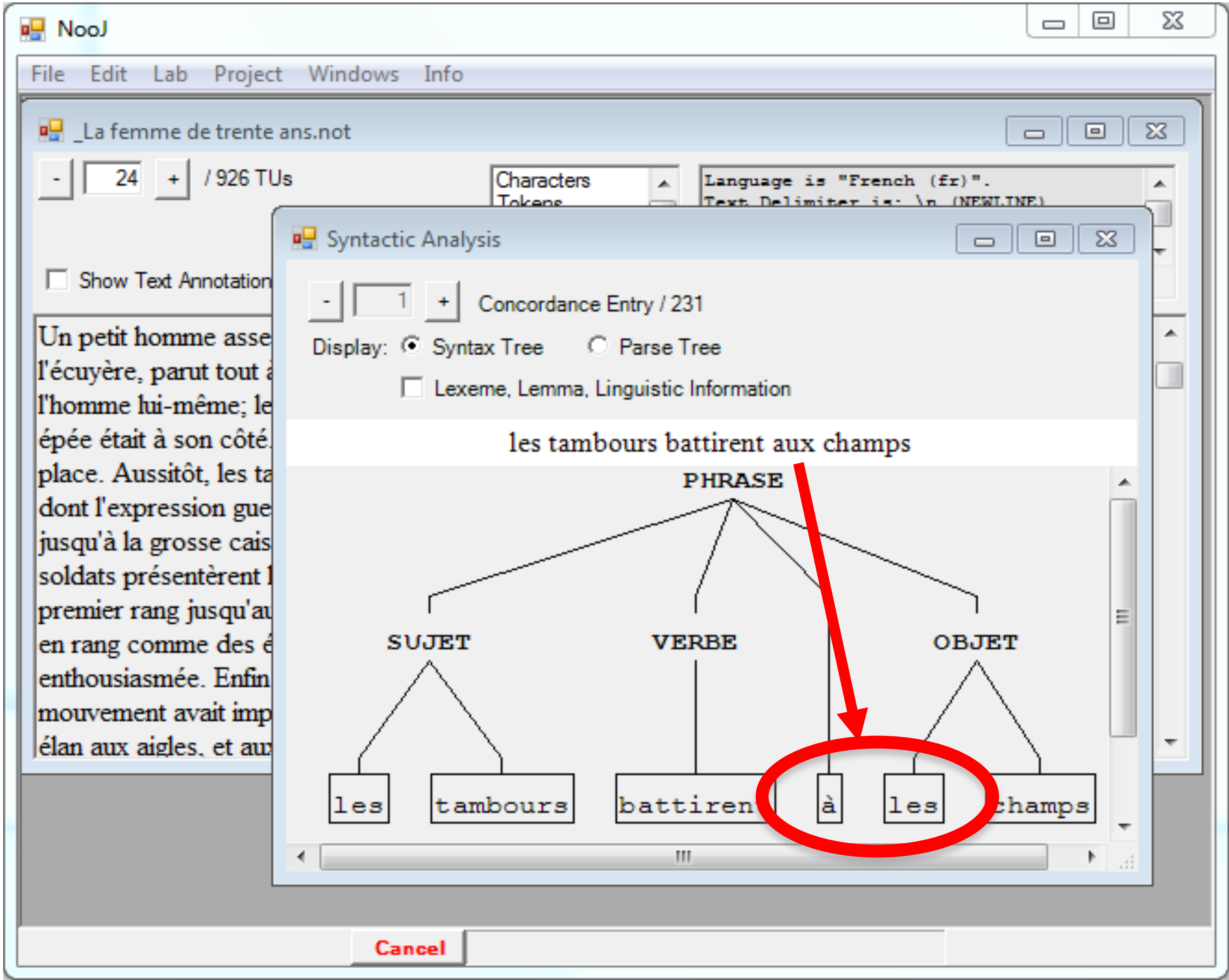
Language is "French (fr)".
Text Delimiter is: \n (NEWLINE)

Un petit homme asse
l'écuyère, parut tout à
l'homme lui-même; le
épée était à son côté
place. Aussitôt, les ta
dont l'expression gue
jusqu'à la grosse cais
soldats présentèrent l
premier rang jusqu'au
en rang comme des é
enthousiasmée. Enfin
mouvement avait imp
élan aux aigles, et aux

les tambours battirent aux champs

Syntactic Analysis
Contracted and agglutinated forms

In French, *aux* is a contracted form of *à les*



- 24 + / 926 TUs

Language is "French (fr)".
Text Delimiter is: \n (NEWLINE)

☐ Show Text Annotation

Un petit homme asse
l'écuyère, parut tout à
l'homme lui-même; le
épée était à son côté.
place. Aussitôt, les ta
dont l'expression gue
jusqu'à la grosse cais
soldats présentèrent l
premier rang jusqu'au
en rang comme des é
enthousiasmée. Enfin
mouvement avait imp
élan aux aigles, et aux

- 1 + Concordance Entry / 231

Display: ● Syntax Tree ○ Parse Tree

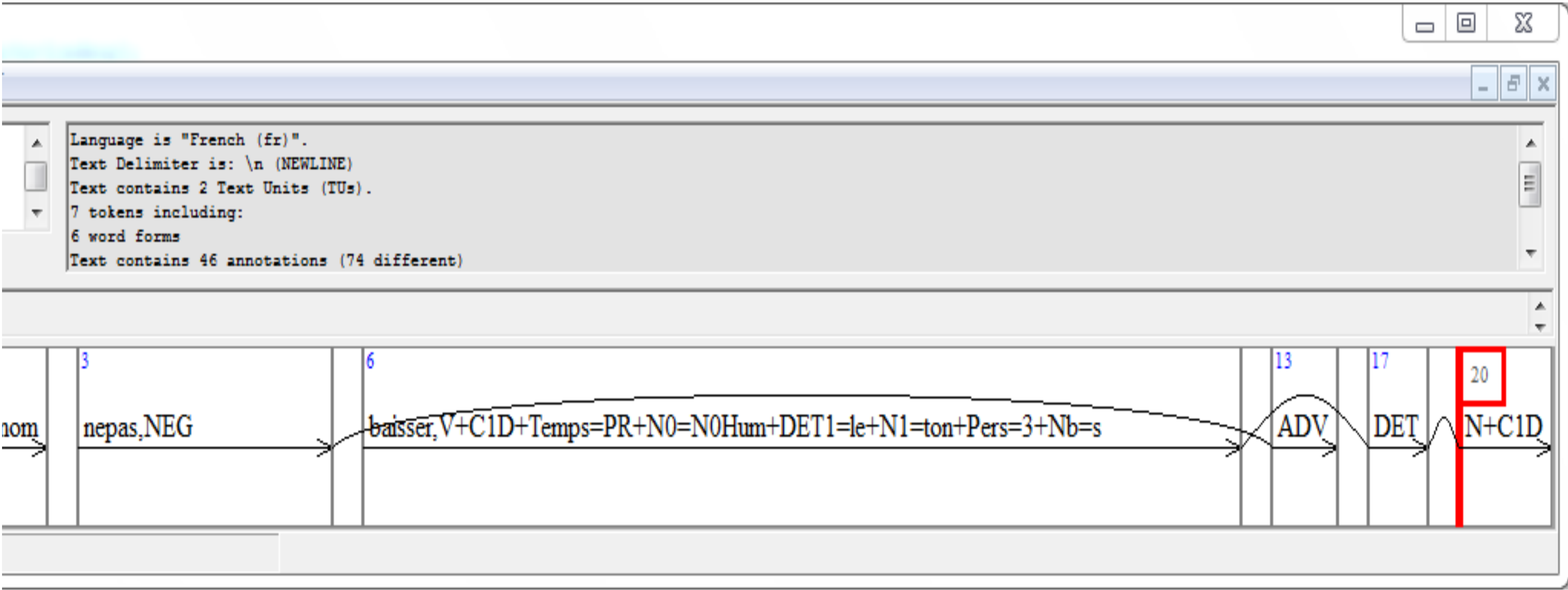
☐ Lexeme, Lemma, Linguistic Information

les tambours battirent aux champs

Syntactic Analysis
Discontinuous expressions

- *Il ne baisse pas le ton* [he does not lower his voice]
- In French, the negation *ne ... pas* is discontinuous.
- In French, the frozen expression *baisser ... le ton* is discontinuous.

The TAS:

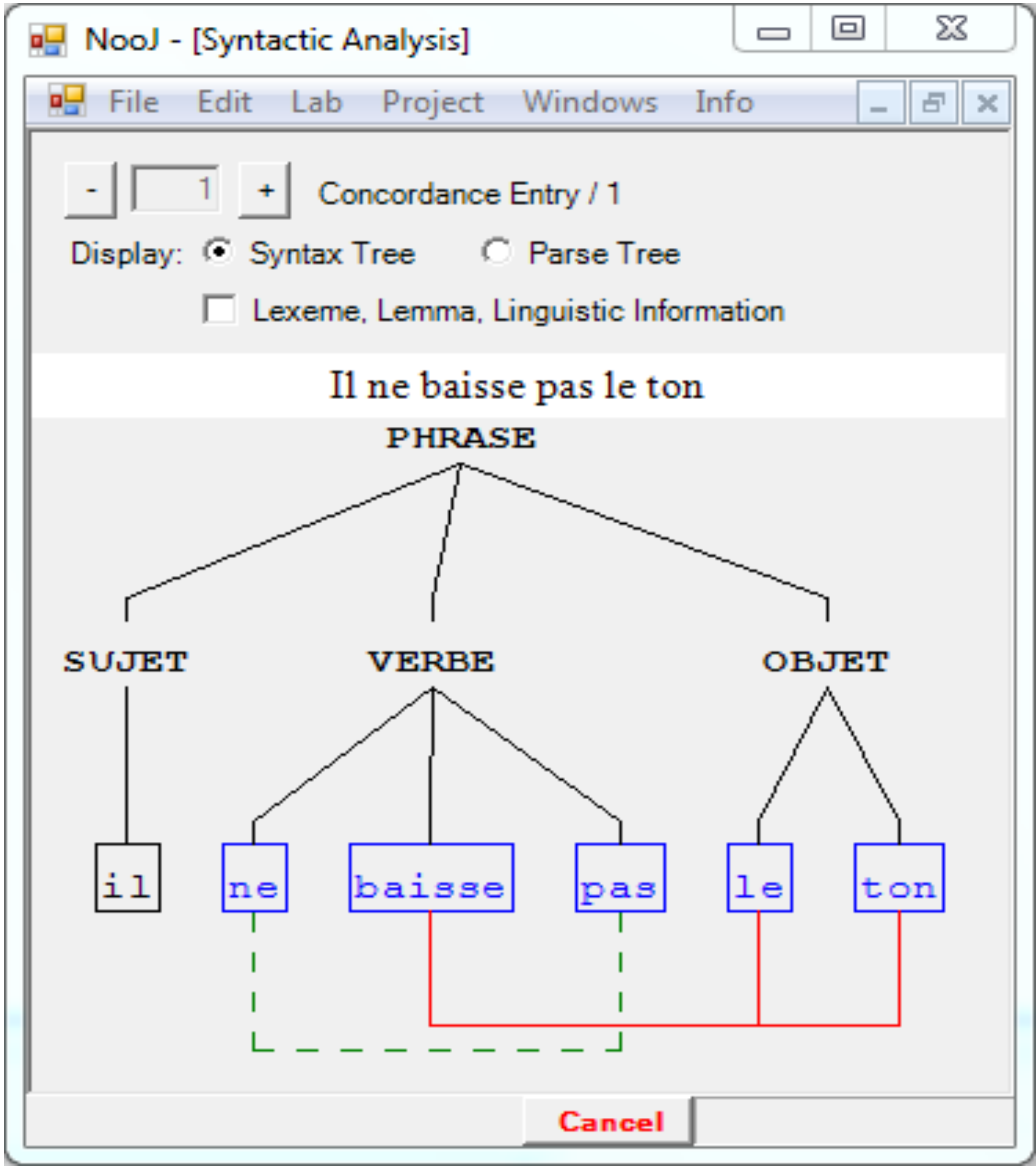


```
Language is "French (fr)".
Text Delimiter is: \n (NEWLINE)
Text contains 2 Text Units (TUs).
7 tokens including:
6 word forms
Text contains 46 annotations (74 different)
```

Syntactic Analysis
Discontinuous expressions

- The negation *ne ... pas* is discontinuous.

- The frozen expression *baisser ... le ton* is discontinuous.



Concordance Entry / 1

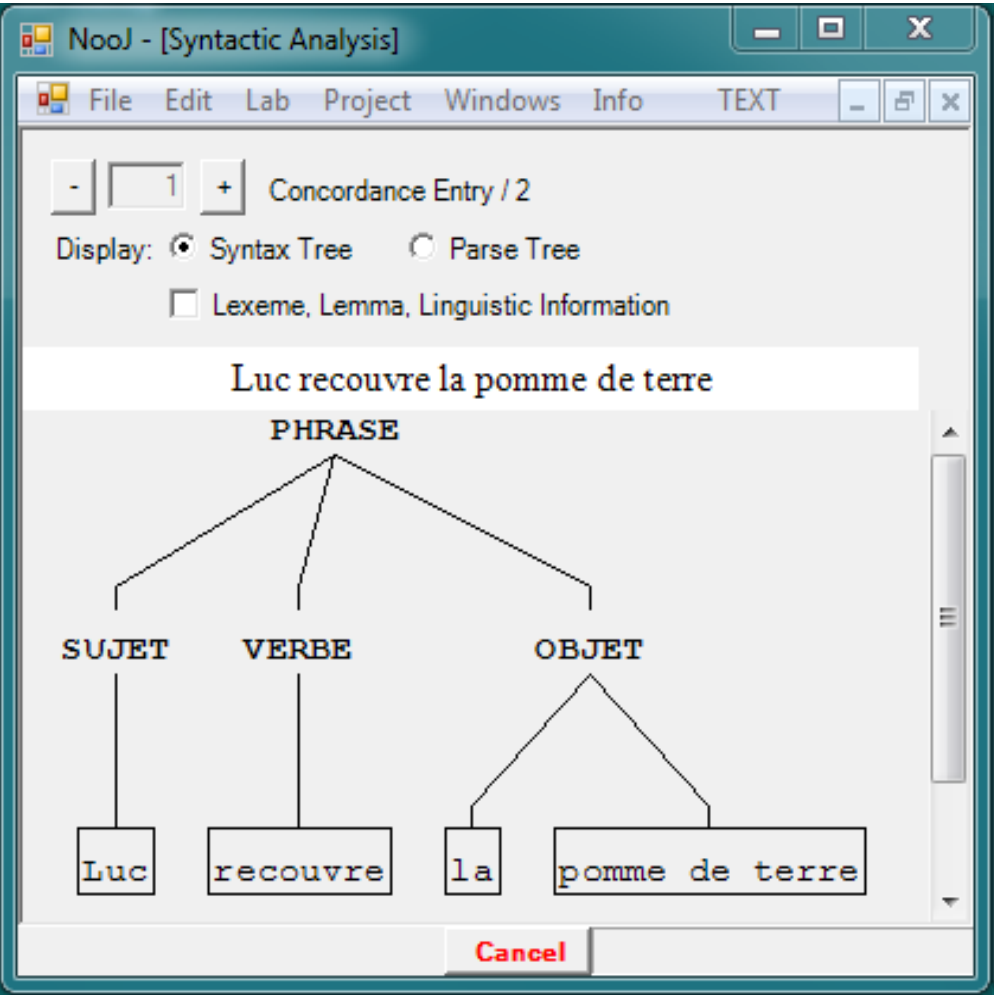
Display: ● Syntax Tree ○ Parse Tree

☐ Lexeme, Lemma, Linguistic Information

Il ne baisse pas le ton

Syntactic Analysis
Ambiguities

Luc recouvre la pomme de terre
[Luc covers the apple with earth] or *[Luc covers the potato]*

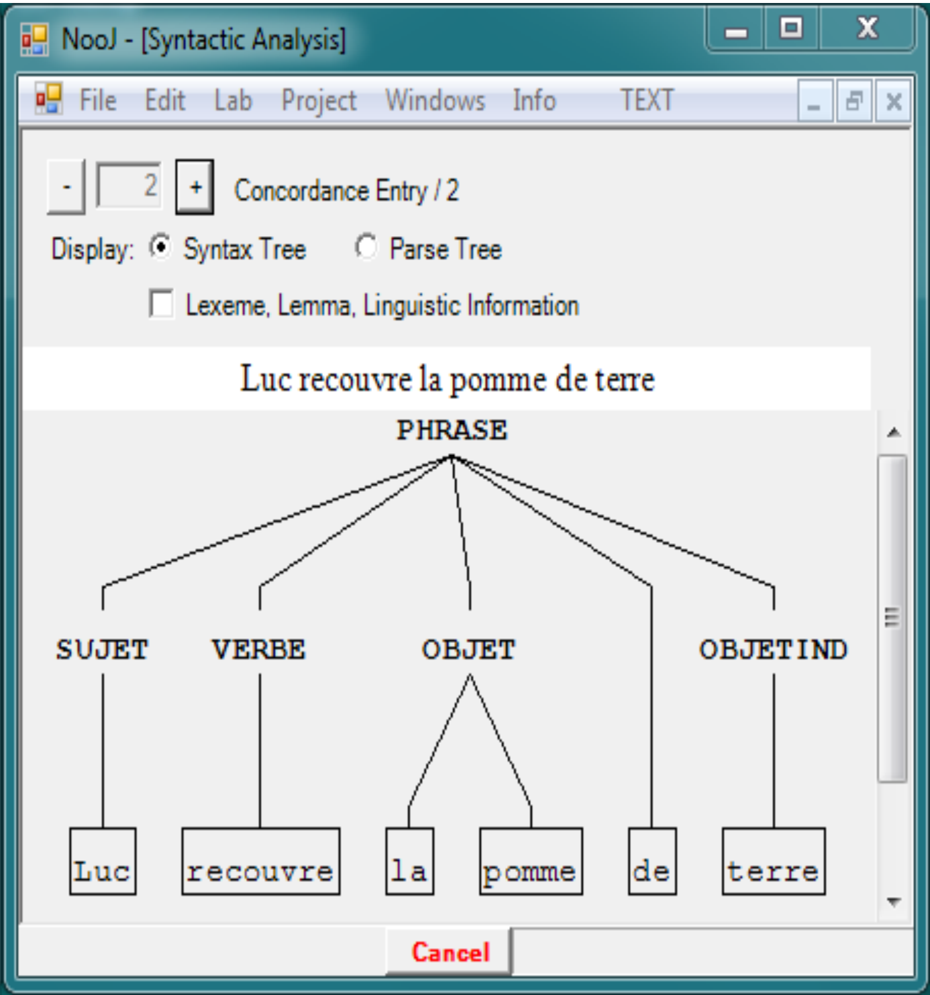

NooJ - [Syntactic Analysis]
File Edit Lab Project Windows Info TEXT
PHRASE
SUJET
VERBE
OBJET
Luc
recouvre
la
pomme de terre
Cancel

- 1 + Concordance Entry / 2

Display: ● Syntax Tree ○ Parse Tree

☐ Lexeme, Lemma, Linguistic Information

Luc recouvre la pomme de terre


NooJ - [Syntactic Analysis]
File Edit Lab Project Windows Info TEXT
PHRASE
SUJET
VERBE
OBJET
OBJETIND
Luc
recouvre
la
pomme
de
terre
Cancel

- 2 + Concordance Entry / 2

Display: ● Syntax Tree ○ Parse Tree

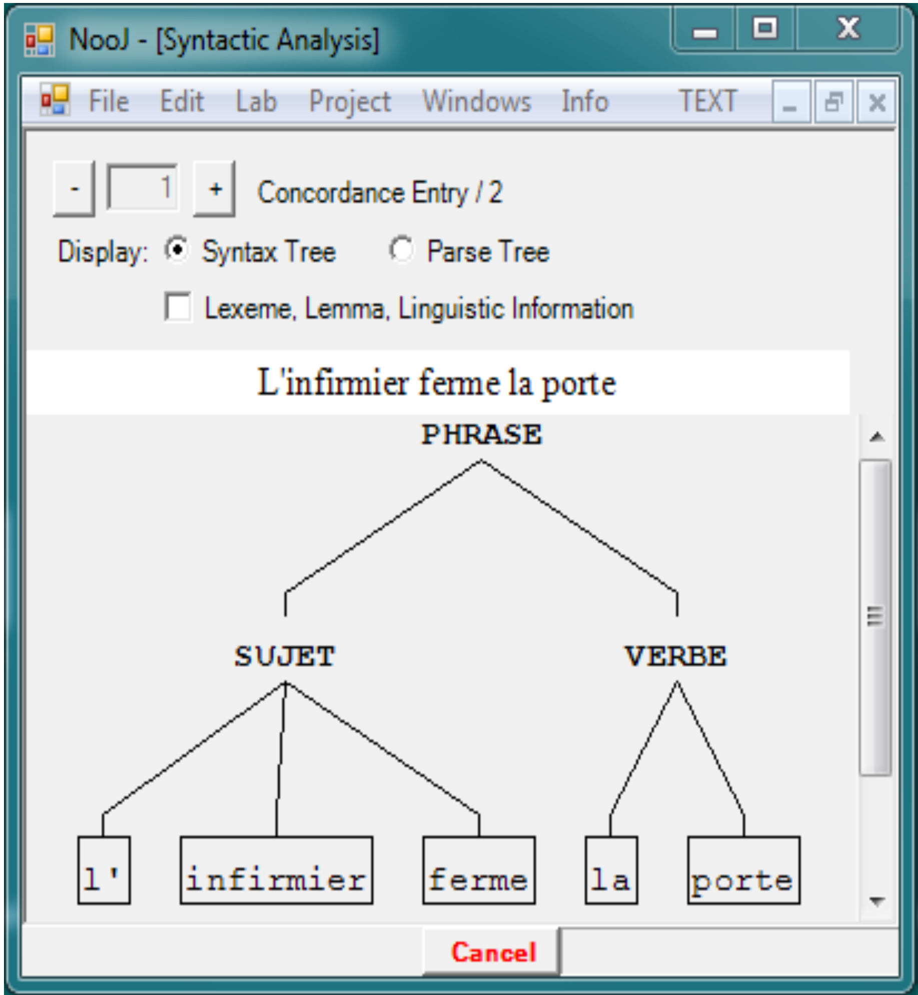
☐ Lexeme, Lemma, Linguistic Information

Luc recouvre la pomme de terre

Syntactic Analysis
Ambiguities

L'infirmier ferme la porte

[The nurse closes the door] or *[the firm nurse carries her]*



Concordance Entry 1 / 2

Display: ● Syntax Tree ○ Parse Tree

☐ Lexeme, Lemma, Linguistic Information

L'infirmier ferme la porte

NooJ - [Syntactic Analysis]
File Edit Lab Project Windows Info TEXT
PHRASE
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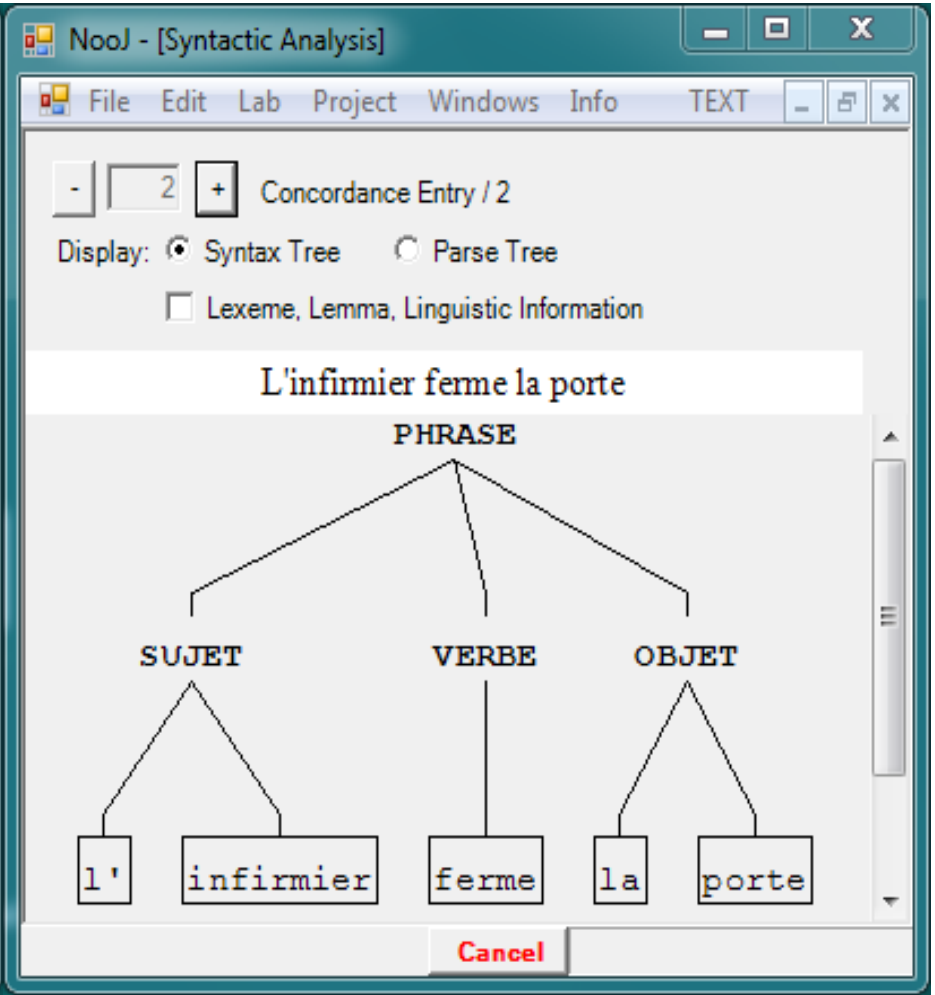
l'
infirmier
ferme
la
porte
Cancel



Concordance Entry 2 / 2

Display: ● Syntax Tree ○ Parse Tree

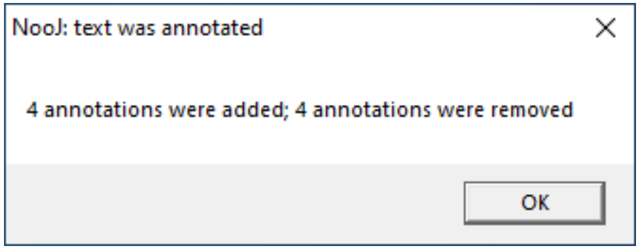
☐ Lexeme, Lemma, Linguistic Information

L'infirmier ferme la porte

NooJ - [Syntactic Analysis]
File Edit Lab Project Windows Info TEXT
PHRASE
SUJET
VERBE
OBJET
l'
infirmier
ferme
la
porte
Cancel

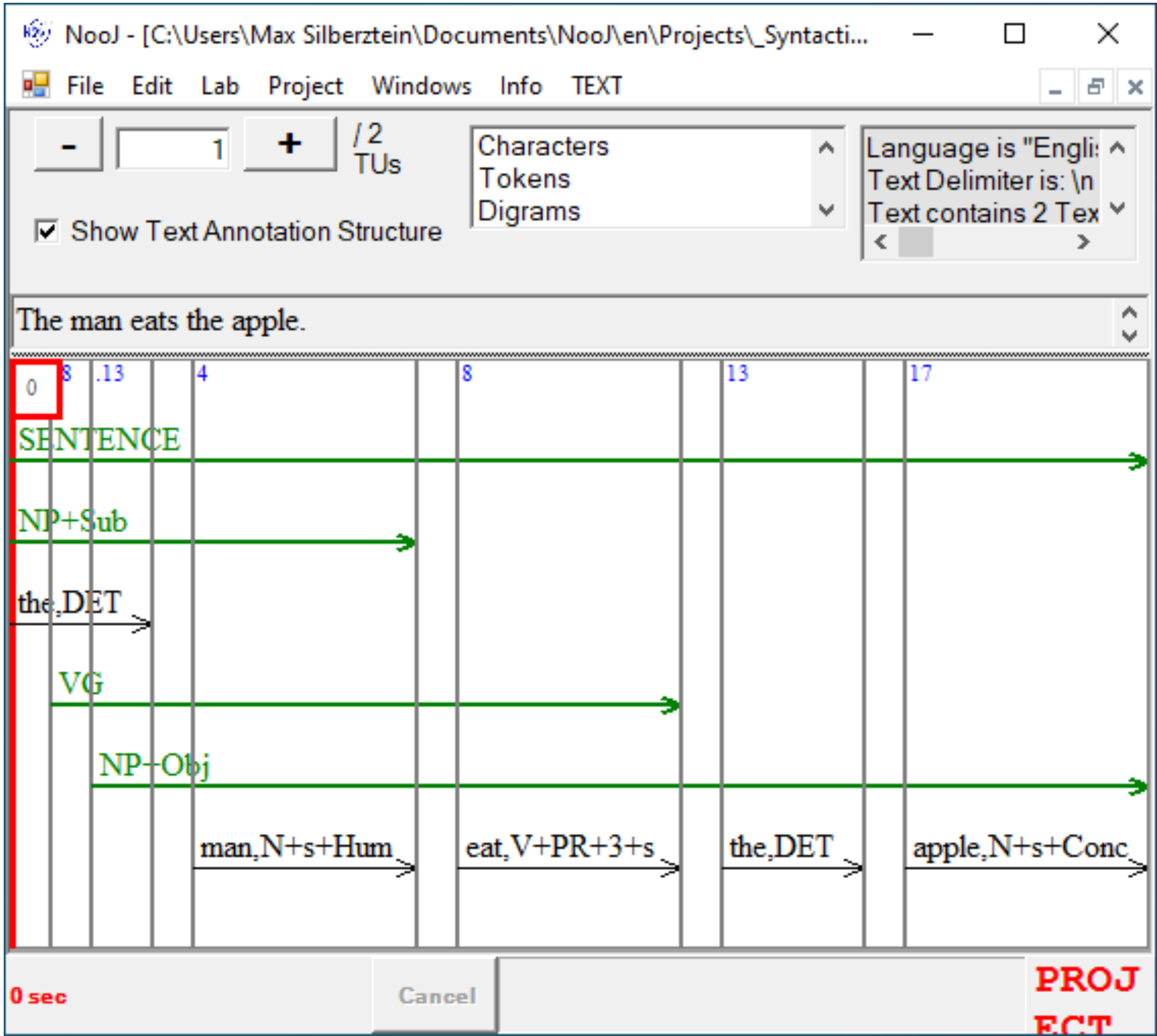
Syntactic Analysis
Disambiguation

CONCORDANCE > Annotate Text (add/remove annotations)



NooJ: text was annotated

4 annotations were added; 4 annotations were removed



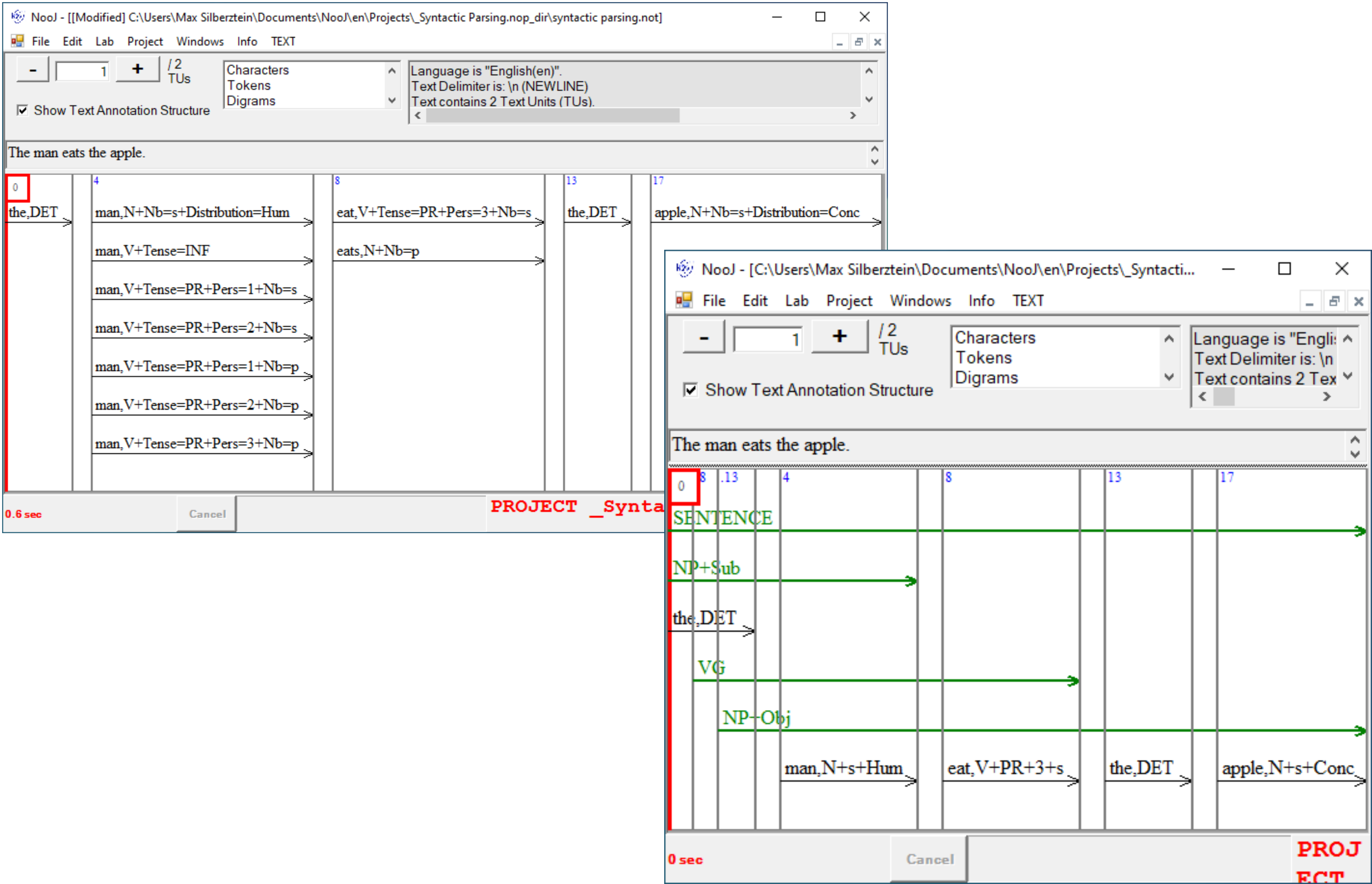
NooJ - [C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntacti...

☑ Show Text Annotation Structure

Language is "Engli
Text Delimiter is: \n
Text contains 2 Tex

The man eats the apple.

Syntactic Analysis
Disambiguation: before and after



NooJ - [[Modified] C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntactic Parsing.nop_dir\syntactic parsing.not]

Language is "English(en)".
Text Delimiter is: \n (NEWLINE)
Text contains 2 Text Units (TUs).

The man eats the apple.

0	4	8	13	17
the,DET	man,N+Nb=s+Distribution=Hum	eat,V+Tense=PR+Pers=3+Nb=s	the,DET	apple,N+Nb=s+Distribution=Conc
	man,V+Tense=INF	eats,N+Nb=p		
	man,V+Tense=PR+Pers=1+Nb=s			
	man,V+Tense=PR+Pers=2+Nb=s			
	man,V+Tense=PR+Pers=1+Nb=p			
	man,V+Tense=PR+Pers=2+Nb=p			
	man,V+Tense=PR+Pers=3+Nb=p			

0.6 sec

PROJECT _Synta

NooJ - [C:\Users\Max Silberztein\Documents\NooJ\en\Projects_Syntacti...

Language is "Engli
Text Delimiter is: \n
Text contains 2 Tex

The man eats the apple.

0 8 13 4 8 13 17

SENTENCE

NP+Sub

the,DET

VG

NP+Obj

man,N+s+Hum

eat,V+PR+3+s

the,DET

apple,N+s+Conc

0 sec

PROJ
ECT

CONGRATULATIONS

You know how to perform various lexical, morphological, syntactic and semantic analyses by annotating texts with various types of information