

12. Graphical Grammars

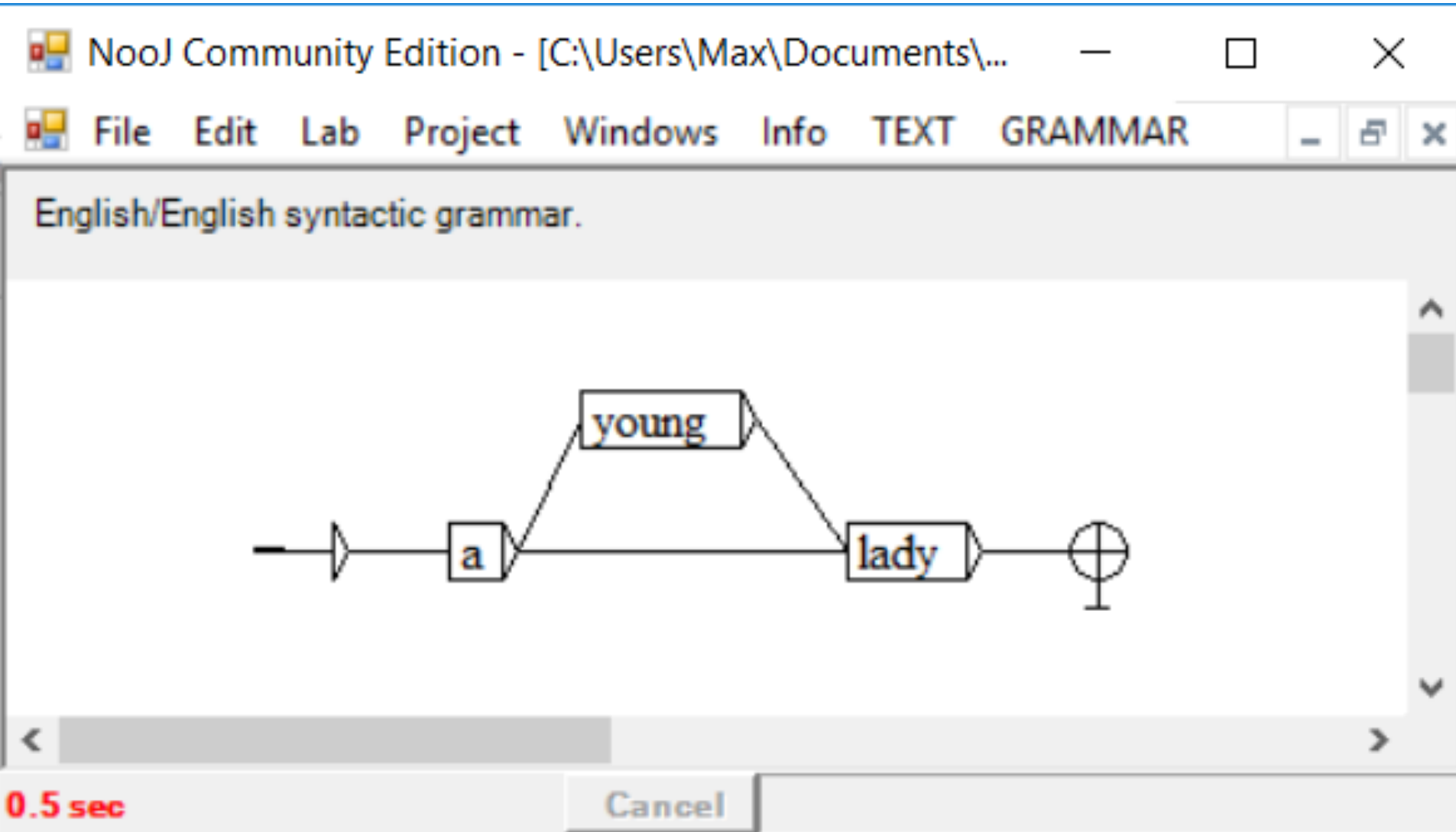
This series of tutorials is based upon work from COST Action
Multi3Generation CA18231, supported by COST
(European Cooperation in Science and Technology).

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation, cf. www.cost.eu

Graph Editor

- A grammar is represented by a set of **graphs**
- A graph is a set of **nodes**
- Two special nodes: the **initial node** and the **terminal node**
- Nodes are **labeled**
- Nodes can be connected
- Connections are **oriented**

File > New > Grammar > Graphical Editor > Syntax

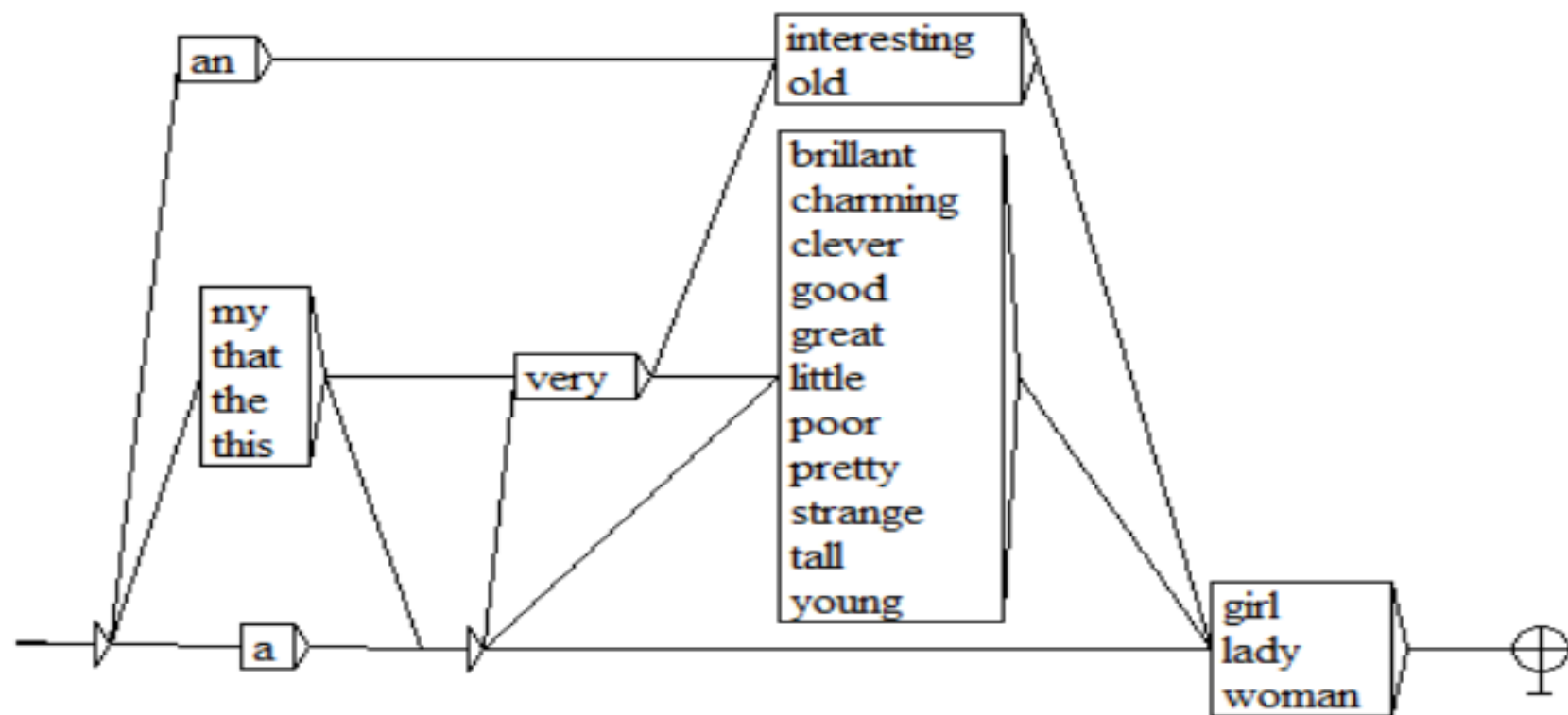


TEXT > Locate > NooJ Grammar

Graph Editor

- Ctrl-Click in empty space to create a node
- Ctrl-Click in a node to start editing its label
- Ctrl-Enter to validate the edition of a label
- **WARNING: do not double-click!**
- Click two nodes to connect them
- **WARNING: Connections are oriented!**
- Click two nodes to disconnect them
- **UNDO (Ctrl-Z) and REDO (Ctrl-Y)**

English/English syntactic grammar.



0.7 sec

Cancel

C:\Users\Max\Documents\Noo\en\Projects_The portrait of...

- 4086 + / 4646 TUs

Characters
Tokens
Digrams

Language is
Text Delimi
Text contain
285992 toke
285992 toke
< >

☐ Show Text Annotation Structure

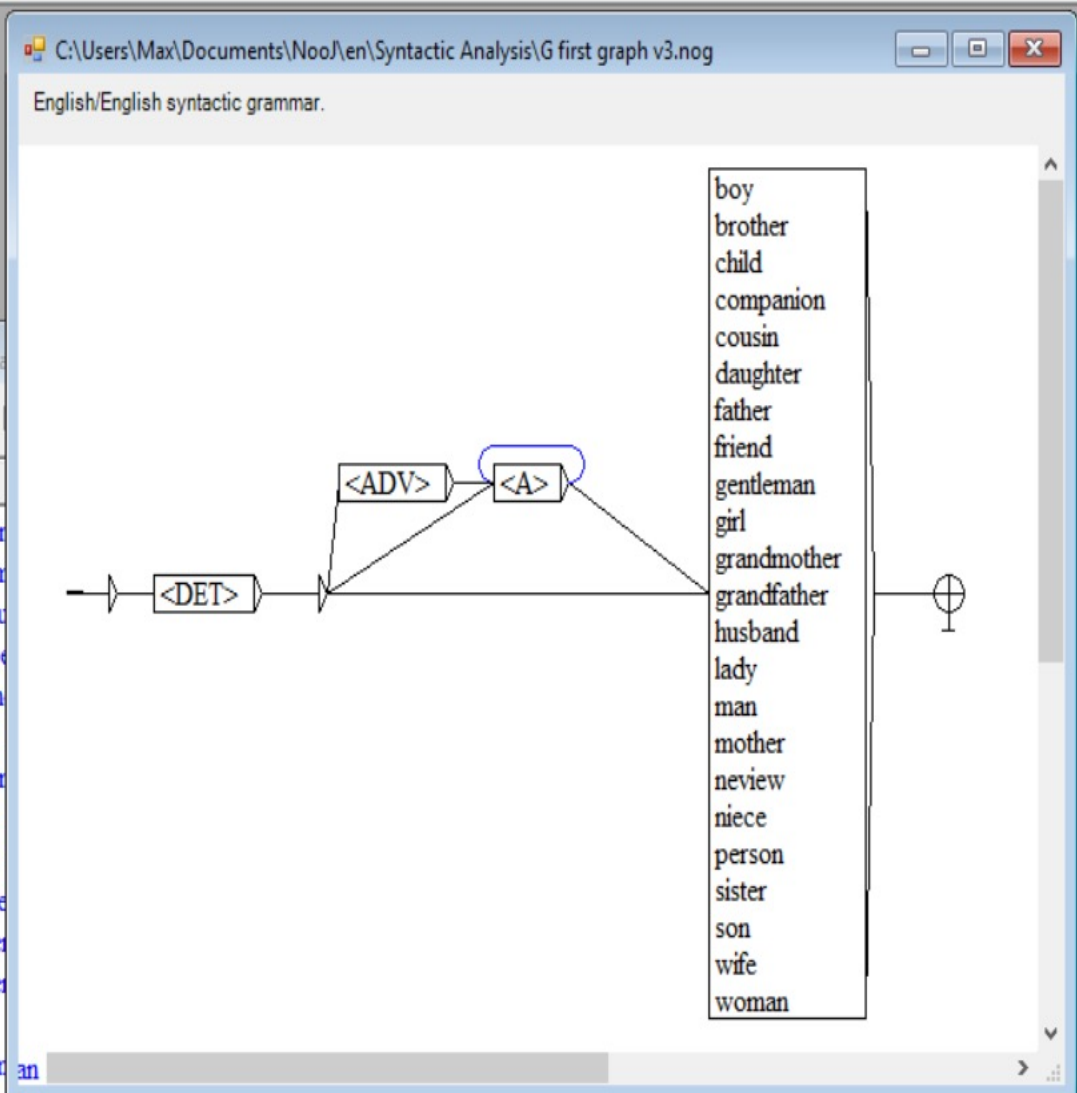
Isabel sat there looking up at her, without rising; her face was almost a

Concordance for Text C:\Users\Max\Documents\Noo\en\Projects_The portrait of a la

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

☒ word forms

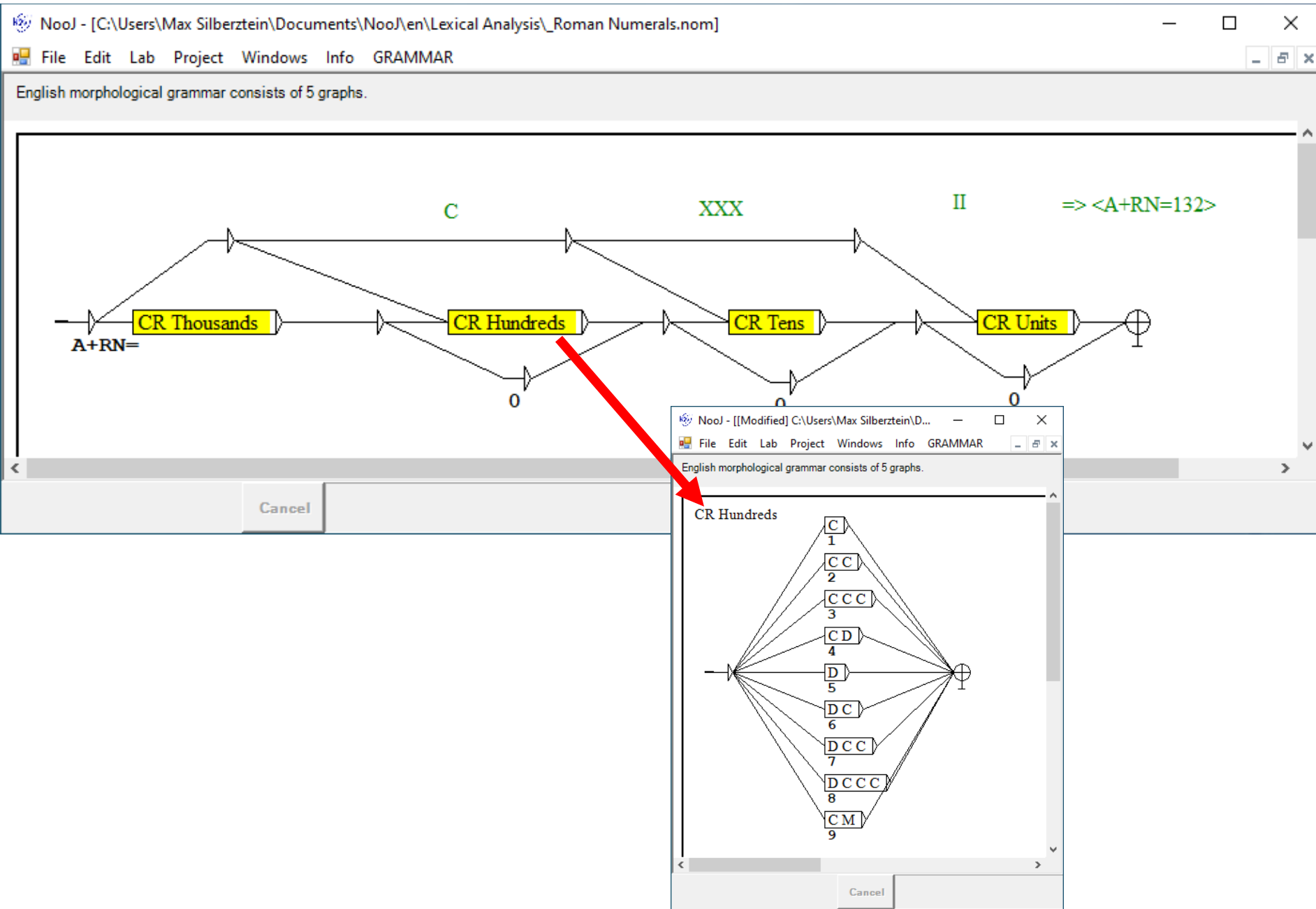
Text	Before	Seq.
conclusion. She was provided with	a	trusty companion
his splendid range of suggestion,	a	very agreeable m
Touchett answered. 'Lord Warburton's	a	very amiable you
about you.' Isabel thought her	a	very attractive pe
unhappy as she-I've	a	very bad husban
his hand. His cousin was	a	very brilliant girl
briefly silent. 'I call Henrietta	a	very brilliant wor
you're mistaken. He's	a	very clever man
a thoroughly grand man and	a	very dear friend
worthy of Isabel.' 'You're	a	very devoted frie
now, in her own eyes,	a	very different pe
had seen hitherto, but was	a	very different pe
of these impressions. 'He's	a	very fine man
a very amiable young man--	a	very fine young r an
life and she had been	a	very fortunate person
her in. She has been	a	very good friend

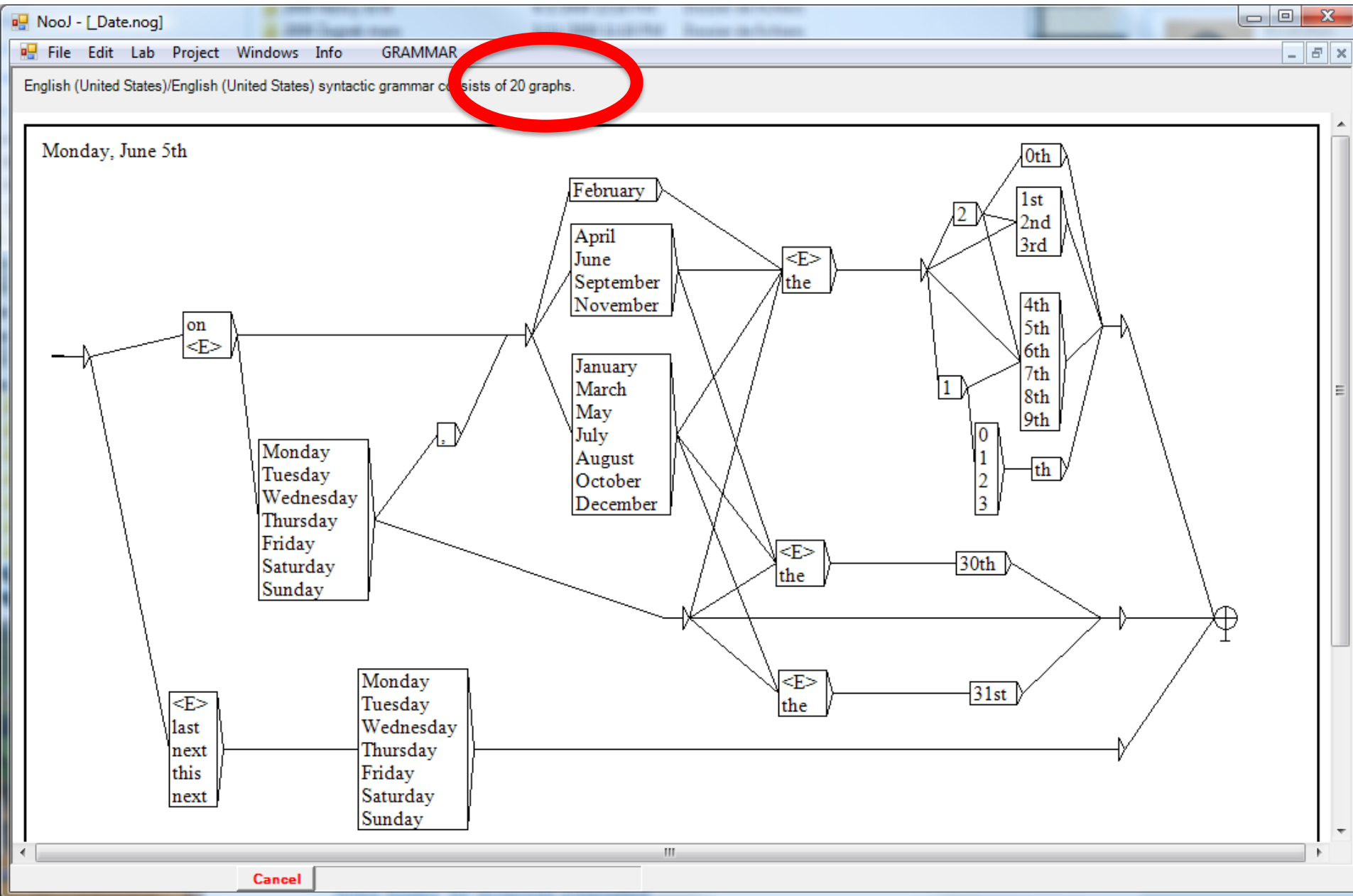


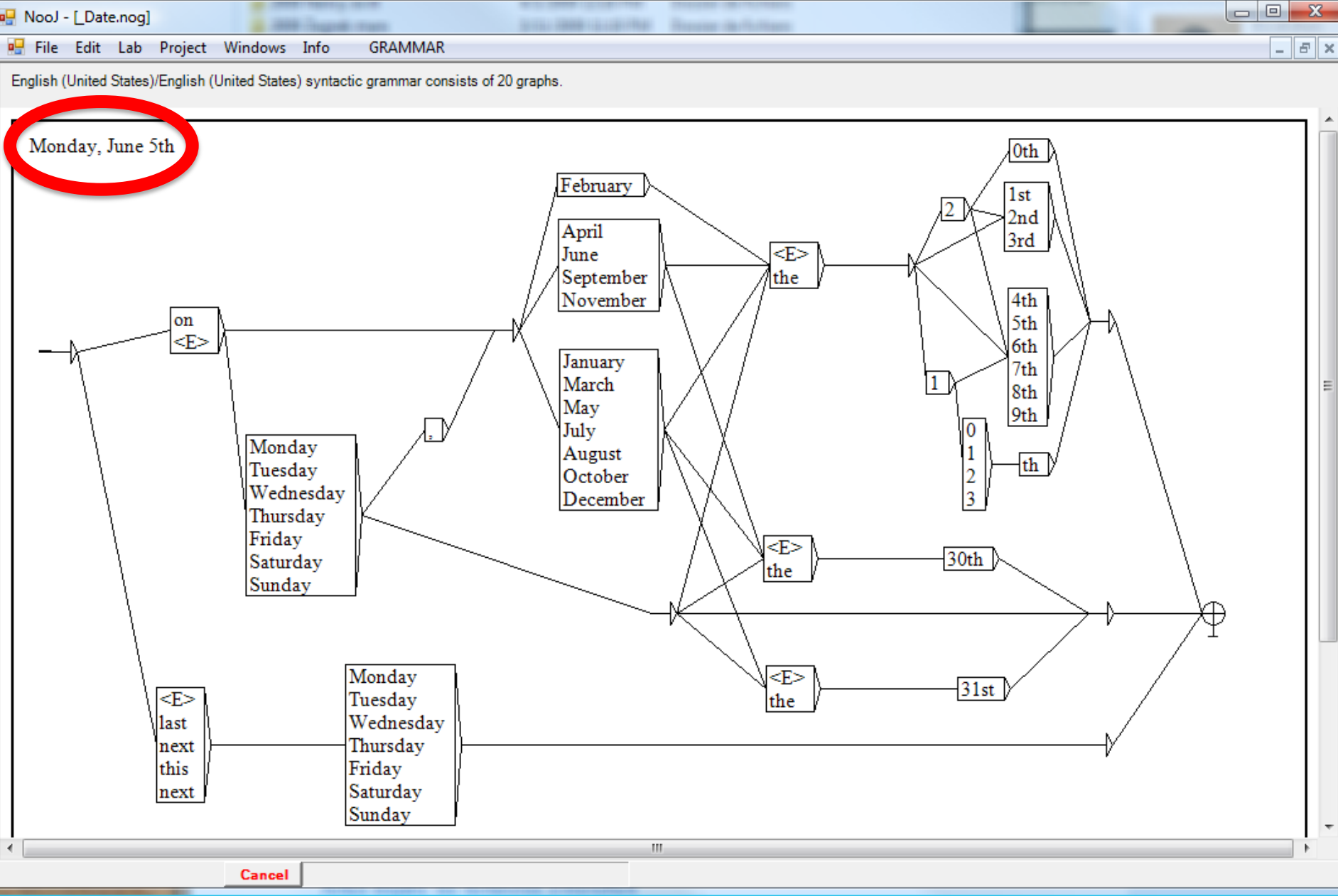
Regular and Context-Free grammars

- A graphical grammar that contains only one graph is equivalent to a regular grammar
- A graphical grammar that contains multiple graphs is equivalent to a context-free grammar
- The main graph is named **Main**
- To create a new graph: GRAMMAR > New Graph
- To delete current graph: GRAMMAR > Delete Graph
- To display the structure of a grammar: GRAMMAR > Show Structure
- To refer to an embedded graph, add prefix “:” in front of its name in a node, e.g., **:NP**

Enhanced Context-Free Grammars

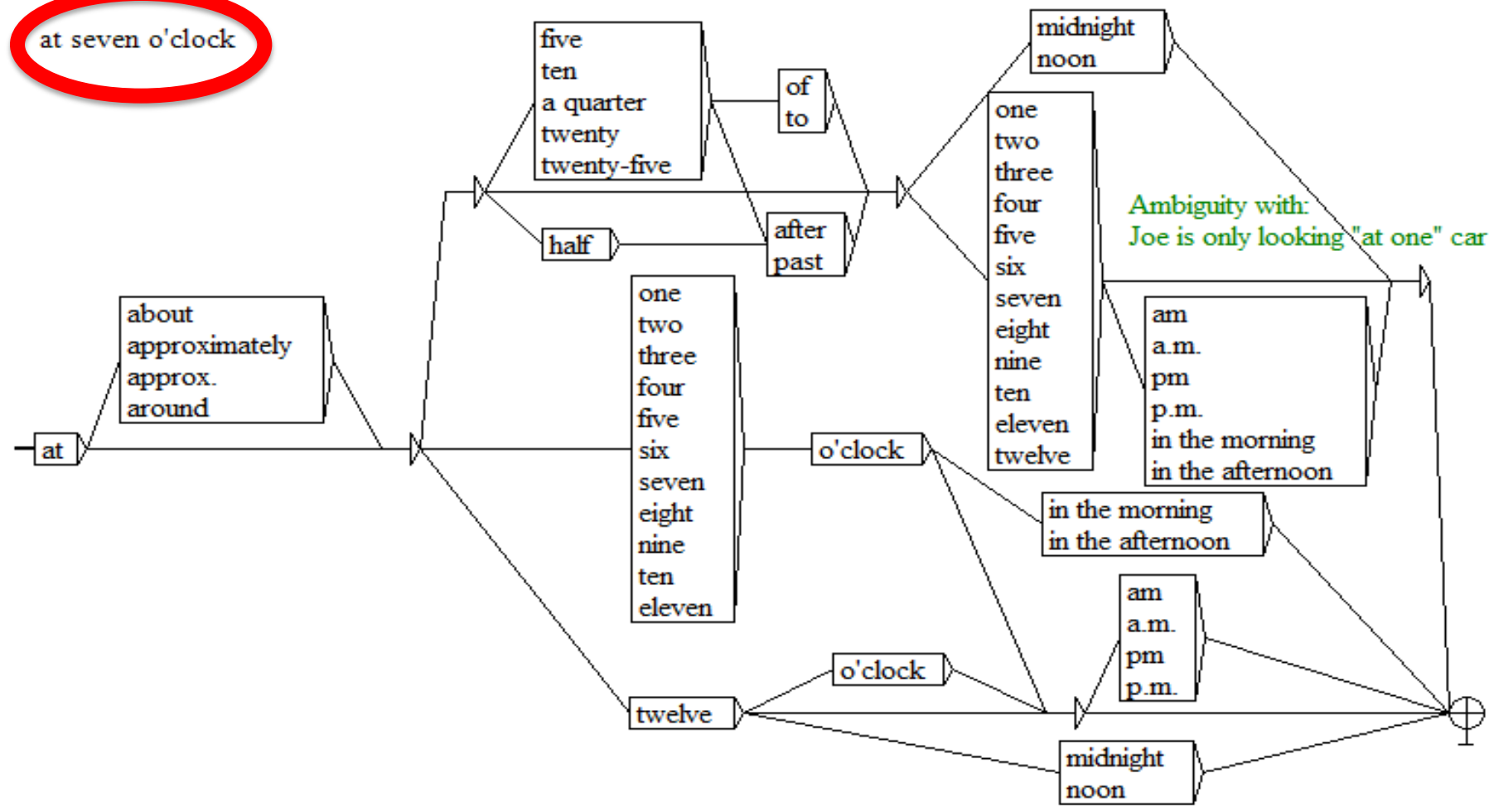






English /English syntactic grammar consists of 20 graphs.

at seven o'clock

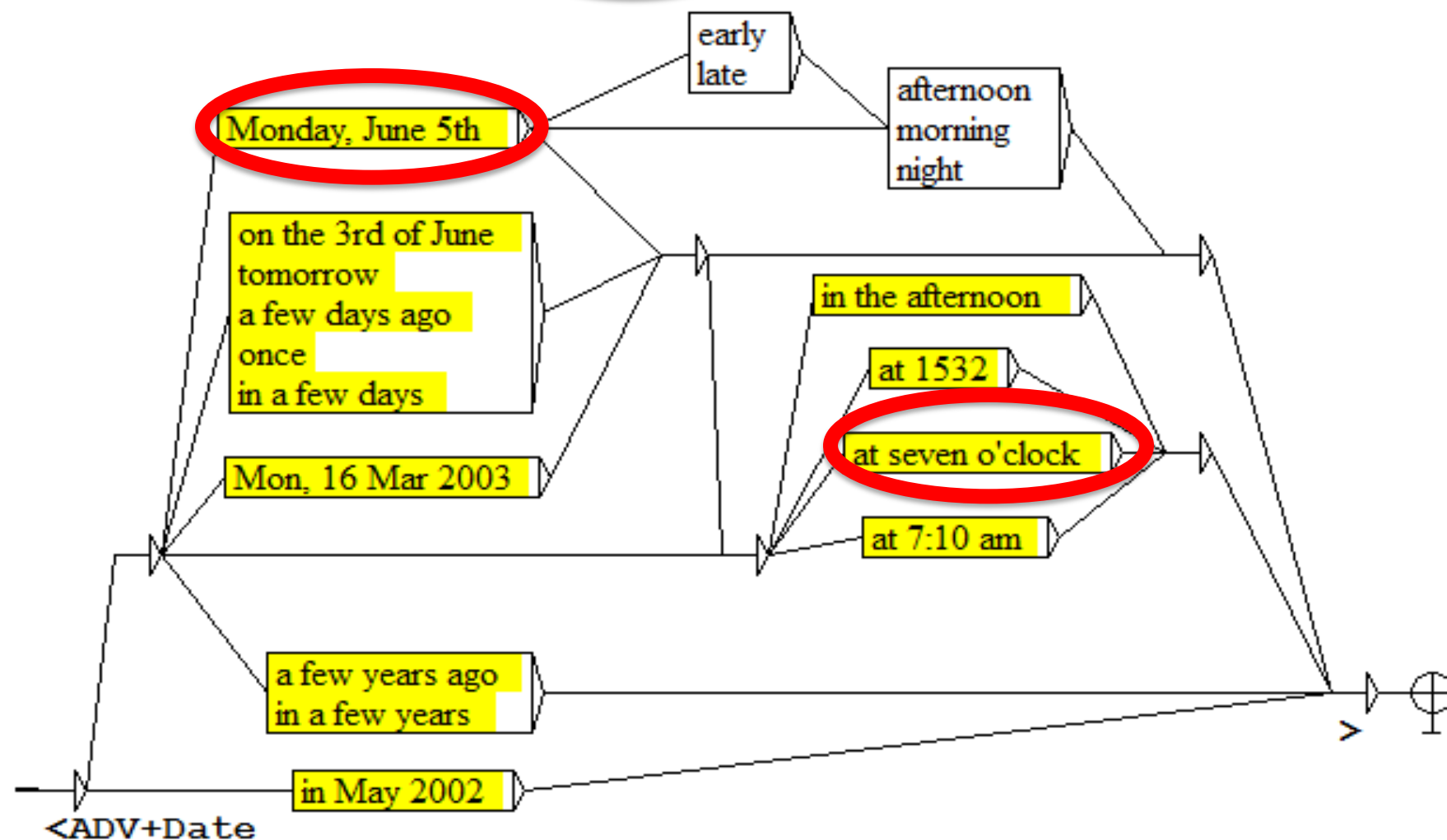


Ambiguity with:
Joe is only looking "at one" car

Cancel

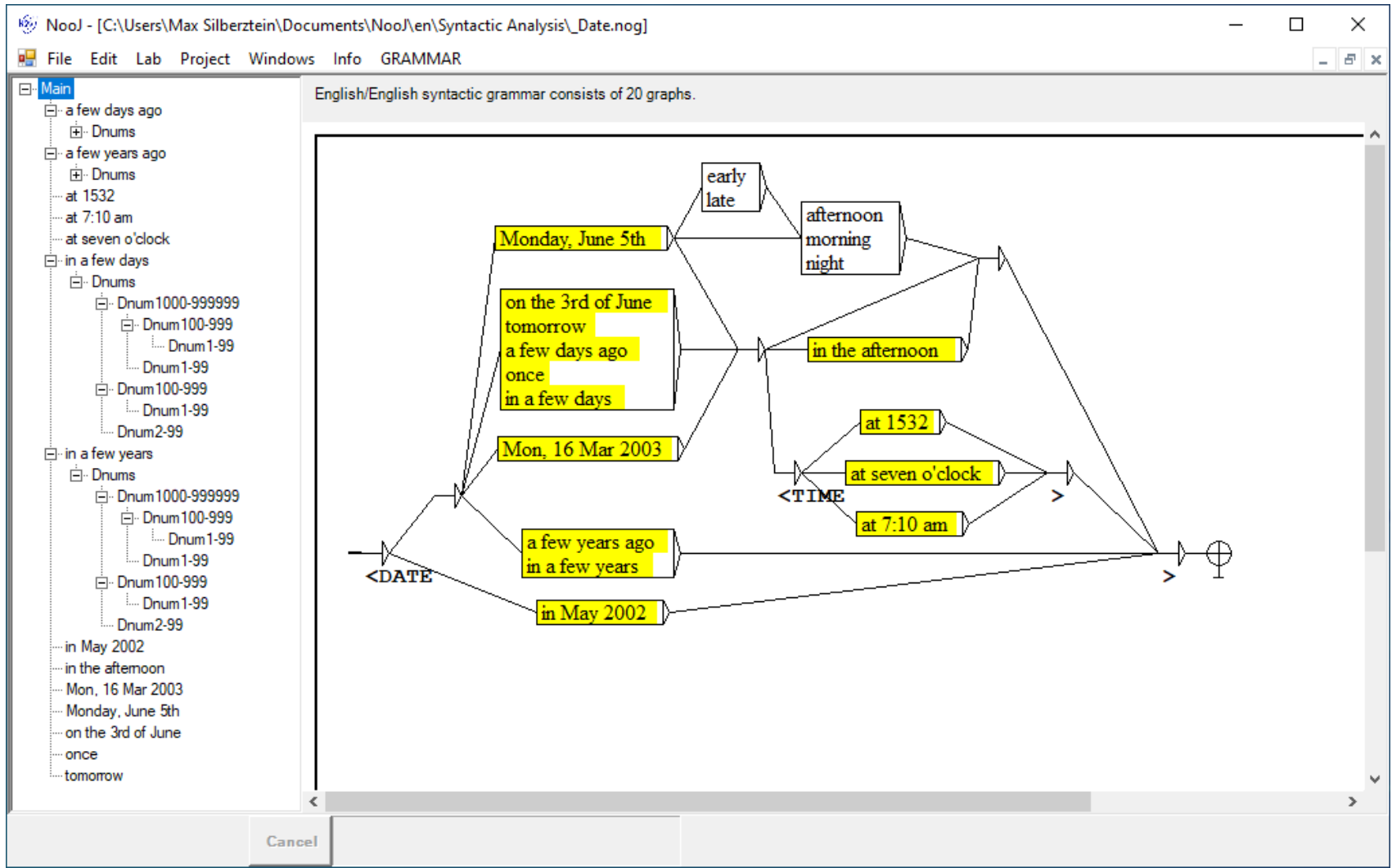


English /English syntactic grammar consists of 20 graphs.



Context-Free Grammars

- A **Main** graph, plus any number of embedded graphs
- Recursion is allowed



Debug a grammar: green, blue, or red results

NooJ Community Edition - [C:\Users\Max\Documents\NooJ\en\Syntactic Analysis_Date.nog]

File Edit Lab Project Windows Info GRAMMAR

English/English syntactic grammar consists of 20 graphs.

at seven o'clock

five
ten
a quarter
twenty
twenty-five

of
to

midnight
noon

one
two
three
four
five
six
seven
eight
nine
ten
eleven
twelve

about
approximately
approx.
around

half

after
past

am
a.m.
pm
p.m.
in the morning
in the afternoon

at

one

in the morning

problem:
John looks <at one> TV

Enter expression: at five to ten in the morning

1 analysis. Click a solution below to display the corresponding path:

Perfect Match Partial Match Failure

Paths

("Main" ("at seven o'clock" at five to ten in the morning))	<ADV+Date>
---	------------

6.7 sec

Cancel

Associate a grammar with a contract: green, or red results

NooJ Community Edition - [C:\Users\Max\Documents\NooJ\en\Syntactic Analysis_Date.nog]

File Edit Lab Project Windows Info GRAMMAR

English/English syntactic grammar consists of 20 graphs.

at seven o'clock

problem: John looks <at one> TV

at

about
approximately
approx.
around

five
ten
a quarter
twenty
twenty-five

of
to

half

after
past

midnight
noon

one
two
three
four
five
six
seven
eight
nine
ten
eleven
twelve

am
a.m.
pm
p.m.
in the morning
in the afternoon

one
two

in the morning
in the afternoon

Contract

Check

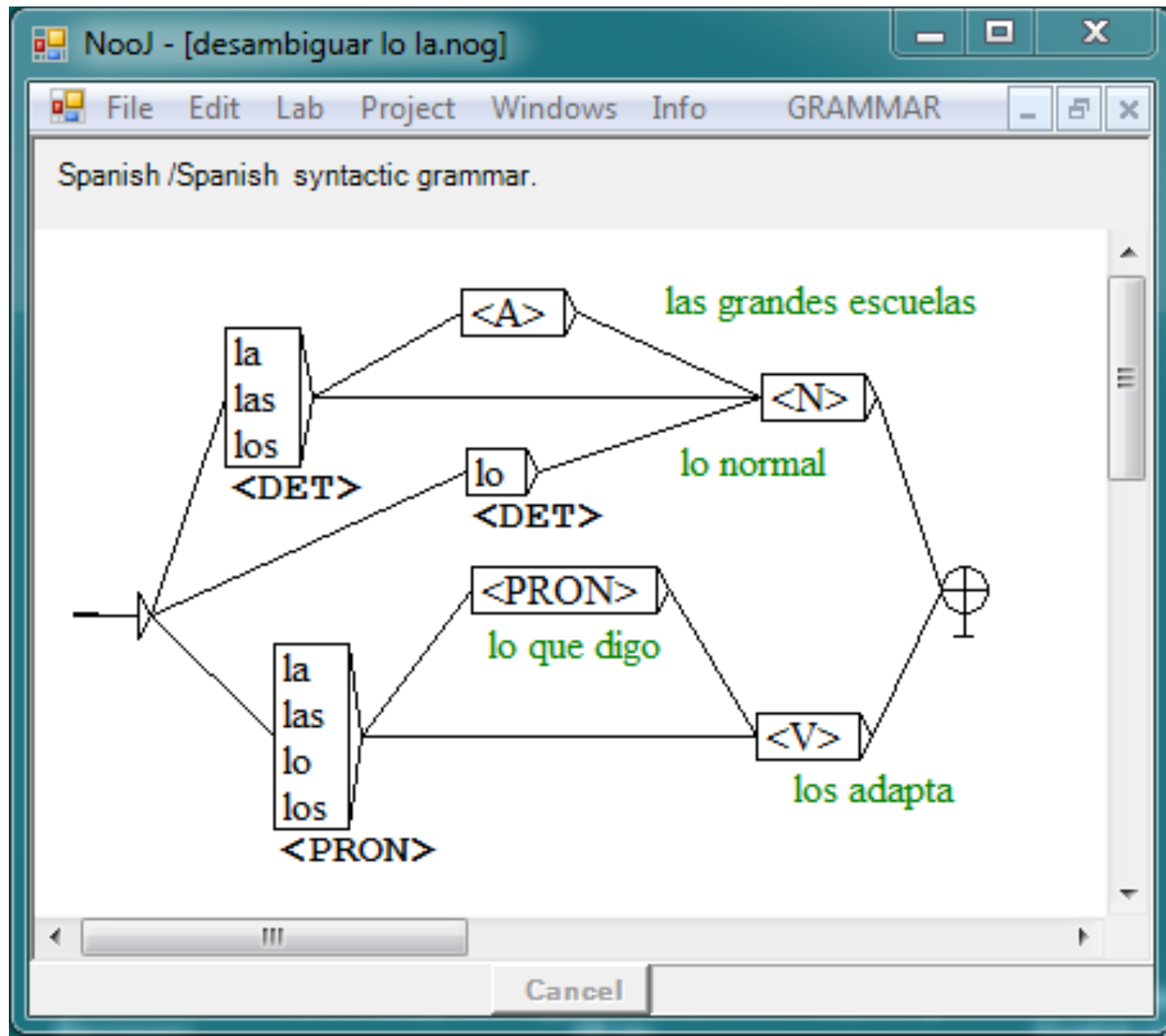
March 23rd
*Tuesday, February the 30st
on Monday 14th
on the 22nd of May, 2002
a long time ago
a couple of years ago
two years ago
two months ago

6.7 sec Cancel

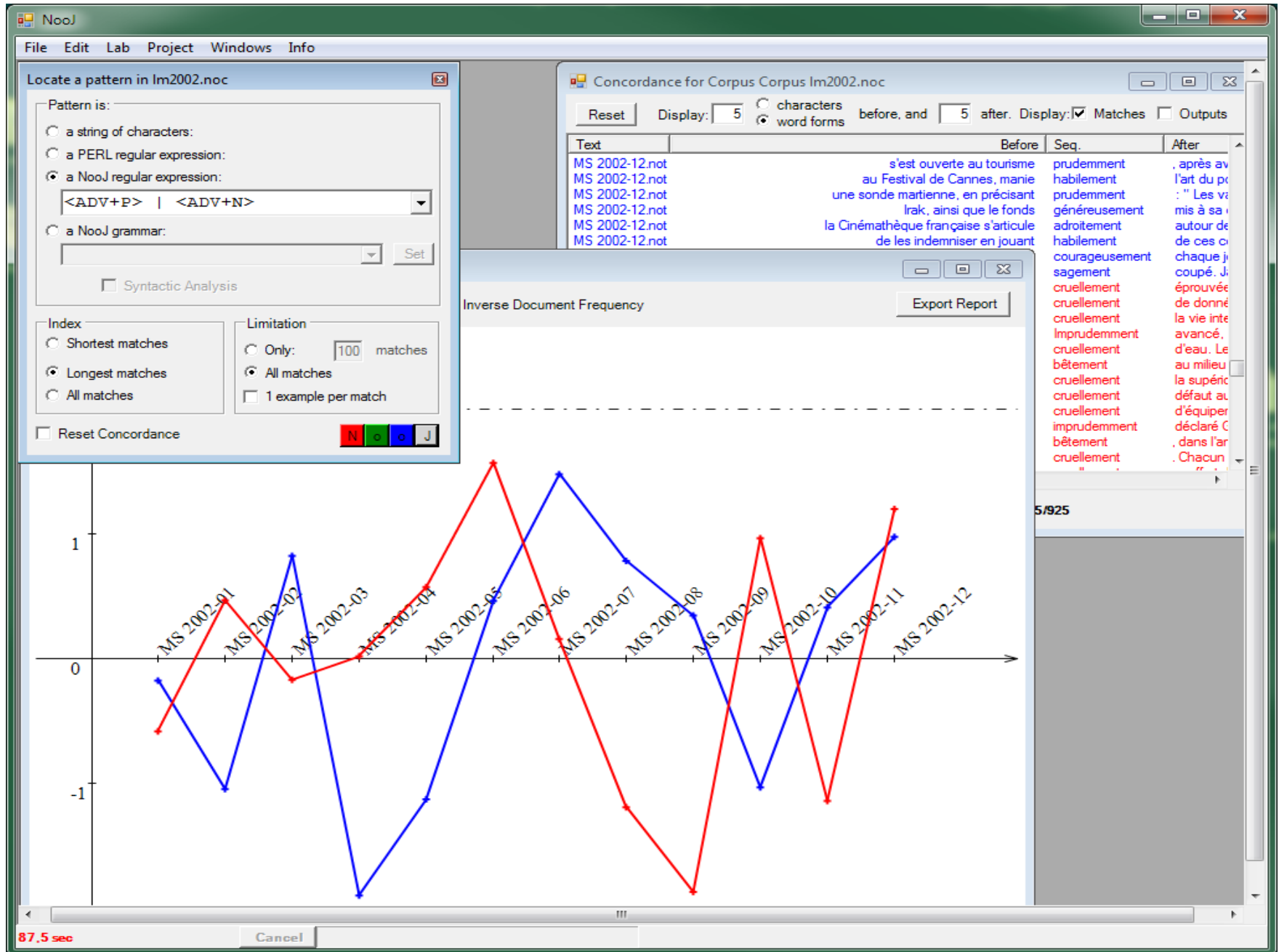
Grammars that recognize named entities for institutions, dates, durations, addresses, professions, organizations, etc.
Organizations, Hela Fehri, Univ. of Sfax

Concordance for Corpus corpusorg.noc									
Reset	Display:	5	<input type="radio"/> characters	before, and	5	after.	Display:	<input checked="" type="checkbox"/> Matches	<input type="checkbox"/> Outputs
<input checked="" type="radio"/> word forms									
Text			After					Seq.	
text1.not	-----	مدينة الزقازيق " محافظة الشرقية " 8- جامعة						جامعة الزقازيق	
text1.not	-----	أسسيوط "الصعيد" 10- جامعة المنيا						جامعة أسسيوط	
text1.not	-----	المنصورة " محافظة الدقهلية " 13- جامعة قناة						جامعة المنصورة	
text1.not	-----	طريق الاسماعيليه " الدراسة باللغة الانجليزية						جامعة مصر الدولية	
text1.not	-----	مدينة 6 اكتوبر أولا : التخصصات العلمية						جامعة 6 اكتوبر	
text2.not		- أكDAL ص.ب. 554 شاله أكDAL						جامعة محمد الخامس	
text2.not		ص.ب. 19-9167 زنقة طارق بن						جامعة الحسن الثاني	
text2.not		ص.ب. 524 وجدة - المركب الجامعي						جامعة محمد الأول	
text2.not		للبنزول والمعادن ص.ب 31261 الظهران						جامعة الملك فهد	
text2.not	21671-562700/567322 فاكس	92 شارع 9 أفريل 1938- تونس- 1007 تلفون:						جامعة تونس	
text2.not		بقرطاج 4. (جامعة الحقوق الاقتصادية و						جامعة 7 نوفمبر	
text2.not		(الجنوب) طريق المطار كم 8.5 صفاقس						جامعة صفاقس	
text2.not		دمشق، البرامكة- الجمهورية العربية السورية						جامعة دمشق	
text2.not		حلب، الجمهورية العربية السورية تلفون						جامعة حلب	
text2.not		ص.ب (50) الخوض 123- سلطنة عمان						جامعة السلطان قابوس	
text2.not		بيروت، ص.ب 115020 بيروت تلفون						جامعة بيروت العربية	
text2.not		ص.ب-21- محافظة النجف - الكوفة						جامعة الكوفة	
text2.not		جامعة الموصل- العراق تلفون: 96460-810733 فاكس						جامعة الموصل	
text2.not		الجادرية - بغداد - العراق تلفون : 9641-7760735 فاكس						جامعة بغداد	
text2.not		ص ب 321 - الرمز البريدي 11115 تلفون						جامعة الخرطوم	
text2.not		تلفون : 0811)3-227986 (جوبا فاكس : 00249-11-222142) ص.ب						جامعة جوبا	

Dozens of disambiguation grammars



Opinion Mining, *Le Monde* 2002



Automatic detection of grammatical errors and production of correction suggestions

The screenshot displays the Noo Community Edition interface with three overlapping windows. The background window shows a document titled "Demo Document.not" with the text: "Remember when you were a careless eight year old kid riding a bike with your friends, racing each other around the neighborhood? Remember that feeling of absolute freedom as you felt the wind in your my fr comm I was lapto". The word "eight year old" is highlighted in red. A status bar at the bottom left shows "0 sec".

The middle window, titled "Concordance for Text C:\Users\Max\Documents\Noo\en\Projects\Demo Doc...", displays a concordance table for the phrase "eight year old".

Text	Before	Seq.	After
Remember when you were a careless	eight year old/Add dashes		kid riding a bik

The bottom window, titled "C:\Users\Max\Documents\Noo\en\Syntactic Analysis\G Dnum N old.nog", displays a syntactic grammar diagram for the phrase "eight year old".

English/English syntactic grammar.

Diagram illustrating the syntactic structure of the phrase "eight year old" (labeled "Add dashes"):

```
graph LR; A[Add dashes] --> B["<DET+Dnum><NB>"]; B --> C["<N+s>"]; C --> D["high<br>large<br>long<br>tall<br>old"]; D --> E(( ));
```

Automatic detection of grammatical errors

Nool Community Edition

File Edit Lab Project Windows Info GRAMMAR

C:\Users\Max\Documents\Nool\en\Projects\Demo Docume...

- 3 + / 8 TUs

Characters
Tokens
Digrams

Lang
Text
Text
729
cen

☒ Show Text Annotation Structure

That is when I **decided getting** on the bike. I haven't regretted my decision so far. One of the best things about cycling is that the bike is perfect for exercising. Just cycling to and from work or to the shop.

8 13 15

when,ADV I,PRO+Pers=1+Nb=s decide,V+Te

Concordance for Text C:\Users\Max\Documents\Nool\en\Projects\De

Reset Display: 5 characters before, and 5 after. Display word forms

Text	Before	Seq.	After
meetings. That is when I	decided getting/to get	on th	
mountain bike trails so I	could spent/spend	the d	
all of that if I	hadn't decide/decided	to try	

Query 3/3

0.2 sec

22.8 sec

Cancel

Nool - [C:\Users\Max\Documents\Nool\en\Syntactic Analysis\2 G could Vpp.nog]

File Edit Lab Project Windows Info Max TEXT GRAMMAR

English/English syntactic grammar.

could
should
would

<V+PP>
\$THIS_

<ADV>

<have>

no
very
+EXCLUDE

<V-PP>
\$THIS_V+PP

<V+G>
+EXCLUDE

<V+PP>
+EXCLUDE

<V-PP>
\$THIS_V+PP

<V+INF>
+EXCLUDE

<V+G>
to \$THIS_

<decide>
<hope>
<want>

to

to

All I have is here

You have notice
You have noticed

I was also scare
I was also home

- Lexical problems: (unknown words) Syntactic problems (auxiliary verbs + compound adjectives) Punctuation problems (missing space + extra space)

NooJ Community Edition

File Edit Lab Project Windows Info CONCORDANCE

C:\Users\Max\Documents\NooJ\en\Projects\Demo Document.not

- 3 + / 8 TUs

Characters
Tokens
Digrams

☐ Show Text Annotation Structure

Language is "English(en)".
Text Delimiter is: \n (NEWLINE)
Text contains 8 Text Units (TUs).
729 tokens including:
550 word forms

That is when I decided getting on the bike. I haven't regretted my decision so far. One of the best things about cycling is that the bike is perfect for exercising. Just cycling to and from work or to the shops every day is enough to keep you healthy and happy. Besides, its incredibly liberating to be able to get anywhere without loosing time in traffic jams. Also don't forget about the pollution while reducing also traffic congestion and the At some point, I realized that I started to use the bike with friends and to head out for coffee on weekends. I appreciate what you are seeing around you. You can see the distance. That daily distance I rode to work was no longer decent mountain bike trails so I could spent the day going up and down. Because I enjoyed it. "I wish I could bike all the way round the world" I said. OK, I knew I couldn't ride across the oceans. I came from continents, from coast to coast. The more I thought about it, If I will do this, I will have to thoroughly prepare, I thought over towering mountains and across burning deserts? What language? After a few months of training, I set off. This was hard. People cheered me on when they heard about my journey.

Concordance for Text C:\Users\Max\Documents\NooJ\en\Projects\Demo Doc...

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

☐ word forms

Before	Seq.	After
and yet you can cover	alot/+Unknown word	of distance. That daily distance
cheered me on when they	hearded/+Unknown word	about my journey. The news
month later, I found myself	petaling/+Unknown word	back toward the place where
meetings. That is when I	decided getting/to get	on the bike. I haven
mountain bike trails so I	could spent/spend	the day going up and
all of that if I	hadn't decide/decided	to try biking instead of
when you were a careless	eight year old/Add dashes	kid riding a bike with
I could continue on my	way ./Delete space	I never gave up on
a bike with your friends	,racing/Add a space	each other around the neigh
way as a grown up	,until/Add a space	my friends presented me a
brand-new bike. At first	,I/Add a space	was a bit skeptical about
a couple of days later	,I/Add a space	changed completely my mind

GRAM = G Lexical Mistakes 31/31



CONGRATULATIONS



You know how to develop complex grammars
with the graph editor to develop various NLP
applications

