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Tapta:
A user-driven translation system for patent documents based on domain-aware Statistical Machine Translation

EAMT 2011

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WIPO (World Intellectual Property Organization)

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- Training our SMT
  - English French parallel corpus
  - SMT training
  - Optimization
- Translating GUI
  - Server
  - TAPTA GUI
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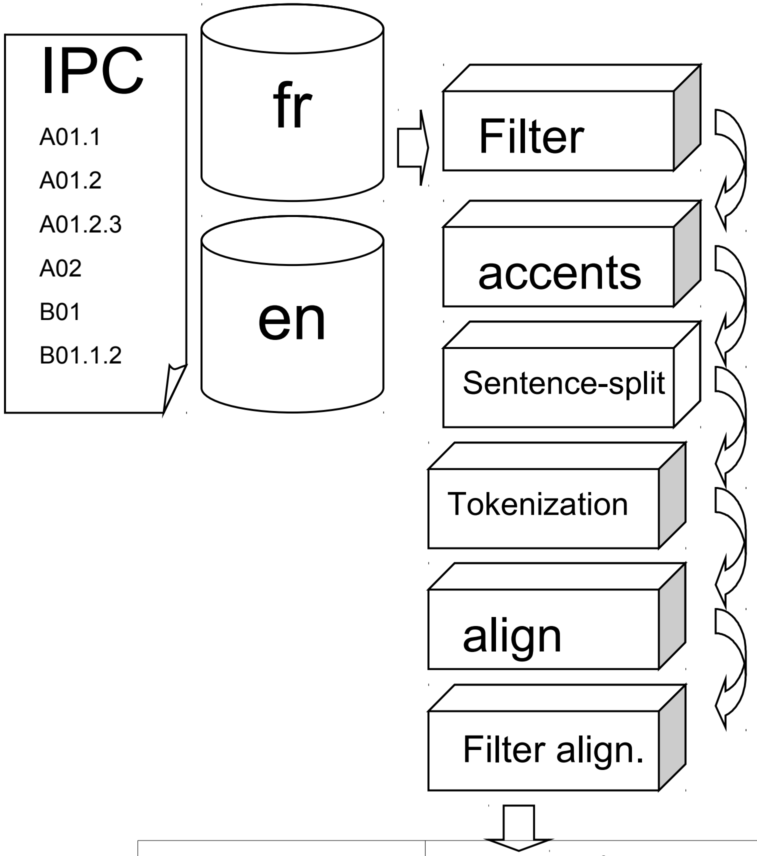
  - Human evaluation
- Conclusion

Introduction

- WIPO is a UN agency in charge of Intellectual Property
  - Patent Cooperation Treaty => facilitate patent protection in multiple countries
  - WIPO receives ~ 150,000 patent applications/year
  - Titles and abstracts must be available in English and French
- WIPO has a corpus of 1.8 M en-fr docs (> 8M segments)

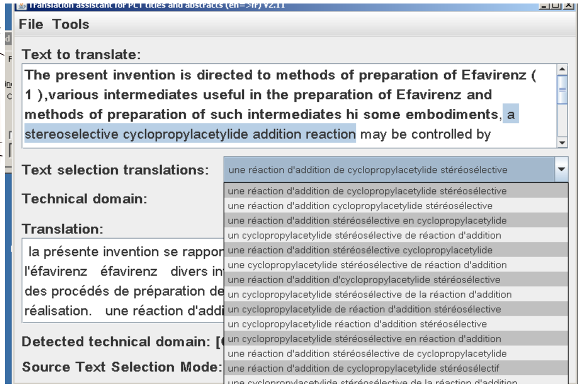
- Needs in CAT tools + huge parallel corpus => SMT
- **T**ranslation **A**ssistant for **P**atent **T**itles and **A**bstracts

Our SMT



en	fr	domain
antimicrobial coatings	enrobages antimicrobiens	CHEM
ternary mixed ethers	éthers mixtes ternaires	CHEM
submarine	sous – marin	MARI
automatic translation	traduction automatique	DATA
automatic translation	translation automatique	BLDG

Parallel segments


Translation assistant for PCT titles and abstracts (en=>fr) v2.11
File Tools

Text to translate:

The present invention is directed to methods of preparation of Efavirenz (1),various intermediates useful in the preparation of Efavirenz and methods of preparation of such intermediates hi some embodiments, a stereoselective cyclopropylacetylide addition reaction may be controlled by

Text selection translations: une réaction d'addition de cyclopropylacetylide stéréosélective

- une réaction d'addition de cyclopropylacetylide stéréosélective
- une réaction d'addition cyclopropylacetylide stéréosélective
- une réaction d'addition stéréosélective en cyclopropylacetylide
- un cyclopropylacetylide stéréosélective de réaction d'addition
- une réaction d'addition stéréosélective cyclopropylacetylide
- une cyclopropylacetylide stéréosélective de réaction d'addition
- une réaction d'addition d'cyclopropylacetylide stéréosélective
- un cyclopropylacetylide stéréosélective de la réaction d'addition
- un cyclopropylacetylide de réaction d'addition stéréosélective
- un cyclopropylacetylide réaction d'addition stéréosélective
- un cyclopropylacetylide stéréosélective en réaction d'addition
- une réaction d'addition stéréosélective de cyclopropylacetylide
- une réaction d'addition de cyclopropylacetylide stéréosélectif
- une cyclopropylacetylide stéréosélective de la réaction d'addition

Technical domain:

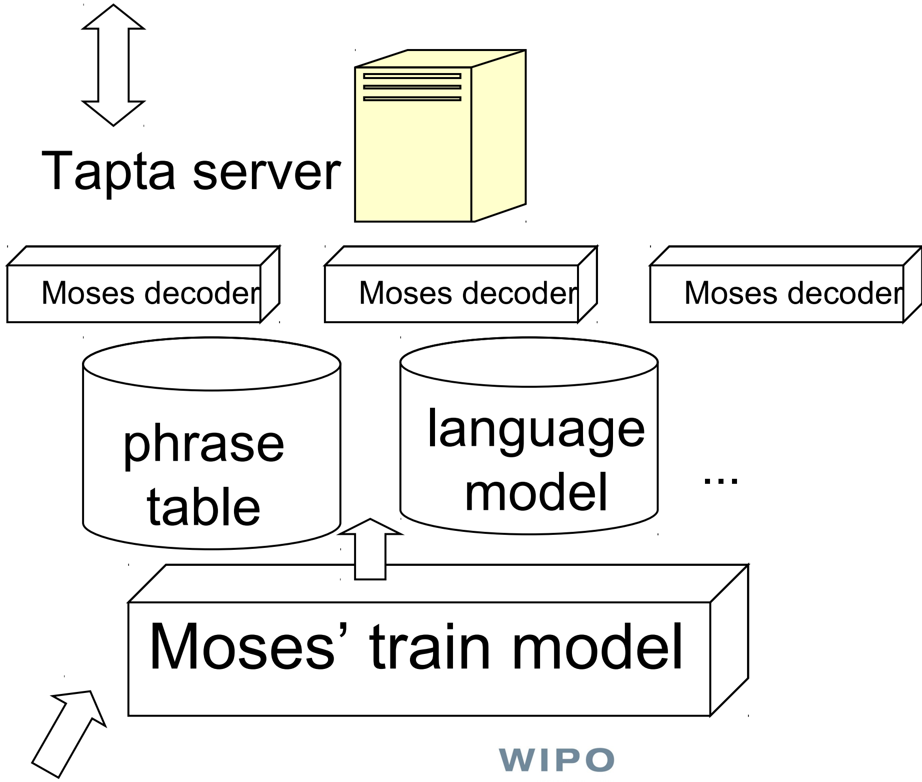
Translation:

la présente invention se rappor
l'éfavirenz éfavirenz divers in
des procédés de préparation de
réalisation. une réaction d'addi

Detected technical domain: [

Source Text Selection Mode:

Tapta client



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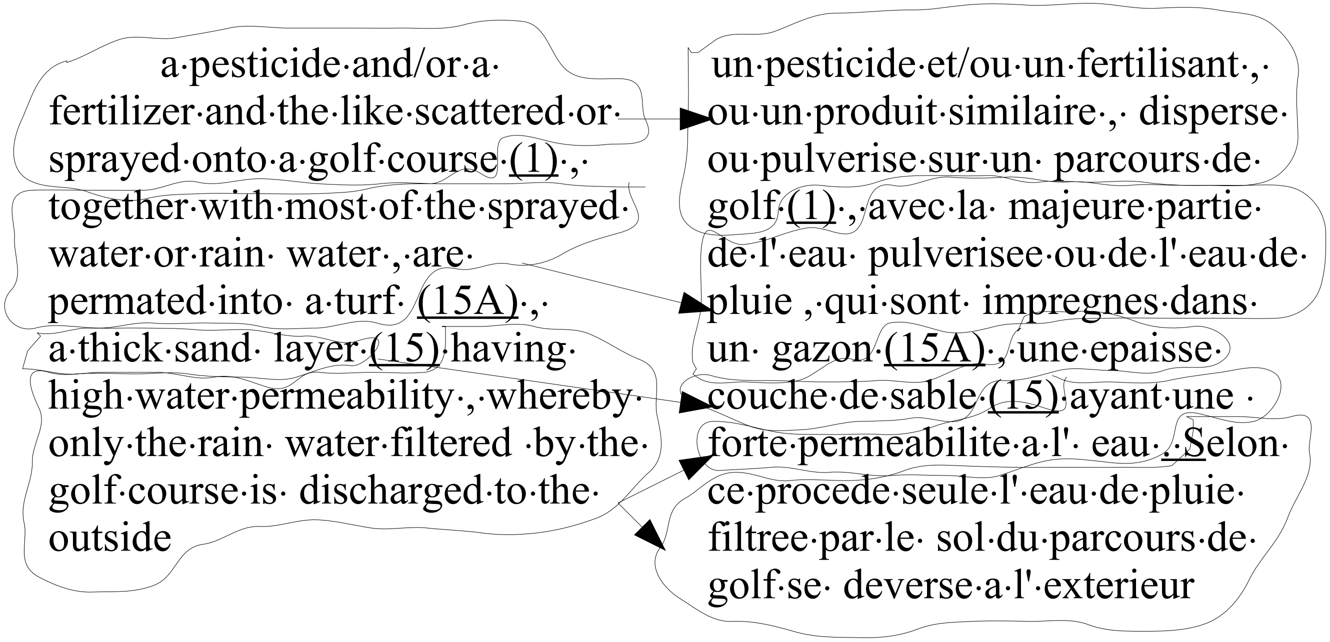
Training our SMT: corpus

- Previously translated patent applications (1,800,788 documents)
- Title+abstract
- Additional valuable information:
  - Classification (IPC)
  - Language of publication
  - Quality control passed
- **8’352’768** aligned pairs of segments (high quality)

Tokenization / sentence-splitting / Alignment



a·pesticide·and/or·a·
fertilizer·and·the·like·scattered·or·
sprayed·onto·a·golf·course·(1)·,·
together·with·most·of·the·sprayed·
water·or·rain· water·,·are·
permated·into· a·turf· (15A)·,·
a·thick·sand· layer·(15)·having·
high·water·permeability·,·whereby·
only·the·rain· water·filtered ·by·the·
golf·course·is· discharged·to·the·
outside

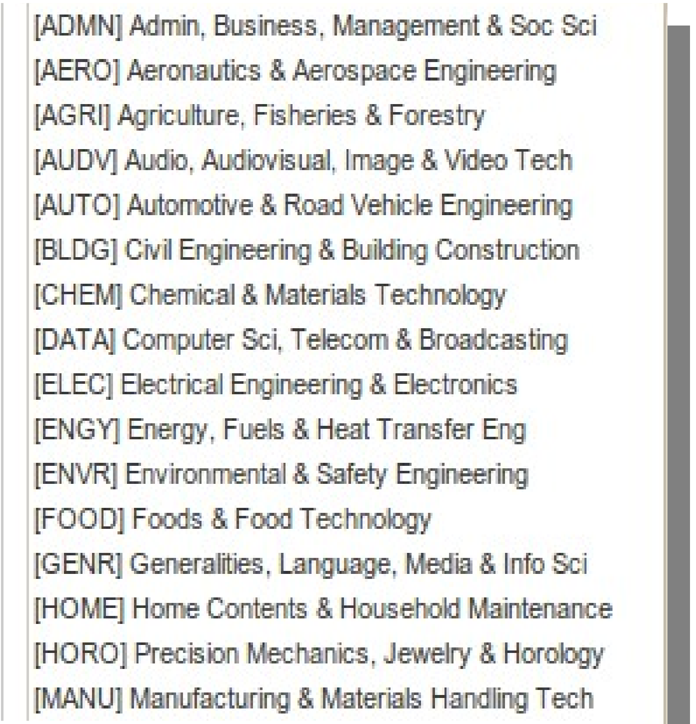
un·pesticide·et/ou·un·fertilisant·,·
ou·un·produit·similaire·,· disperse·
ou·pulverise·sur·un· parcours·de·
golf·(1)·,·avec·la· majeure·partie·
de·l'·eau· pulverisee·ou·de·l'·eau·de·
pluie ,·qui·sont· impregnes·dans·
un· gazon·(15A)·,·une·epaisse·
couche·de·sable·(15)·ayant·une ·
forte·permeabilite·a·l'· eau·.·Selon·
ce·procede·seule·l'·eau·de·pluie·
filtree·par·le· sol·du·parcours·de·
golf·se· deverse·a·l'·exterieur

SMT Training

- Using open-source Moses
- Training: > **8 Million segments**
- Small test set: 102 segments
- Big test set: newly published documents (9521 segments)

“domain-aware” SMT

- Text translated according to the technical domain
- Map IPC code to one of our 32 *domains*

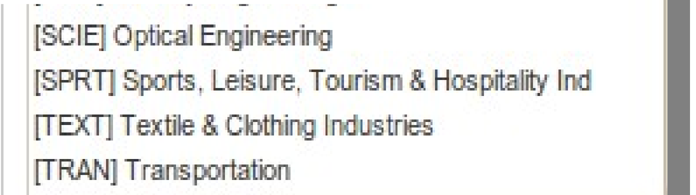


[ADMN] Admin, Business, Management & Soc Sci
[AERO] Aeronautics & Aerospace Engineering
[AGRI] Agriculture, Fisheries & Forestry
[AUDV] Audio, Audiovisual, Image & Video Tech
[AUTO] Automotive & Road Vehicle Engineering
[BLDG] Civil Engineering & Building Construction
[CHEM] Chemical & Materials Technology
[DATA] Computer Sci, Telecom & Broadcasting
[ELEC] Electrical Engineering & Electronics
[ENGY] Energy, Fuels & Heat Transfer Eng
[ENVR] Environmental & Safety Engineering
[FOOD] Foods & Food Technology
[GENR] Generalities, Language, Media & Info Sci
[HOME] Home Contents & Household Maintenance
[HORO] Precision Mechanics, Jewelry & Horology
[MANU] Manufacturing & Materials Handling Tech

Domain information as *factor, eg:*

in|U the|U robotic|1 prosthesis|1 alignment|1 device|U provides|U automatic|1 translation|1 in|U two|U axes|1

a|U chinese|2 to|U english|2 automatic|2 translation|2 method|U

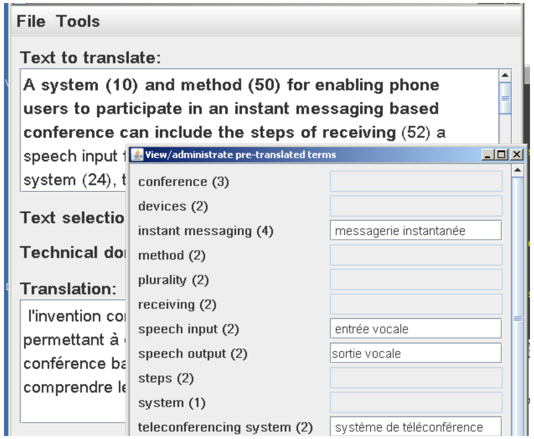


[SCIE] Optical Engineering
[SPRT] Sports, Leisure, Tourism & Hospitality Ind
[TEXT] Textile & Clothing Industries
[TRAN] Transportation

SMT… more…

- Language model: irstlm (5 grams), kenlm, binarization
- Pruning of the phrase table, binarized (102M entries x 2)
- Improve the quality:
    - Get only segments out of QC-passed documents
    - Add segments that were originally in French
    - Create a sub-model (phrase tables)
    - Merge this sub-model with original (75-25%)

Graphical User Interface



Text to translate:

A system (10) and method (50) for enabling phone users to participate in an instant messaging based conference can include the steps of receiving (52) a speech input t
system (24), t

Text selectio

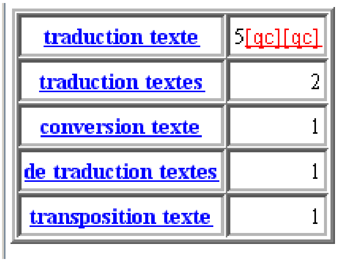
Technical do

Translation:

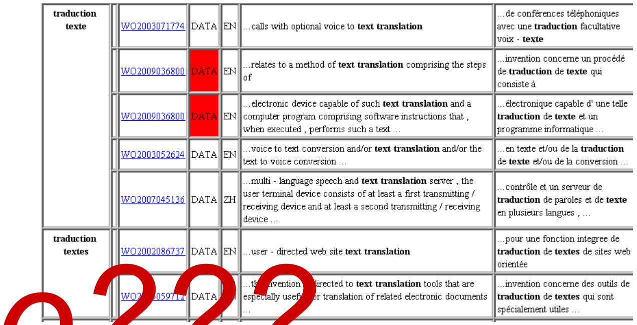
l'invention co
permettant à
conférence ba
comprendre le

View/administrate pre-translated terms

conference (3)	
devices (2)	
instant messaging (4)	messagerie instantanée
method (2)	
plurality (2)	
receiving (2)	
speech input (2)	entrée vocale
speech output (2)	sortie vocale
steps (2)	
system (1)	
teleconferencing system (2)	système de téléconférence

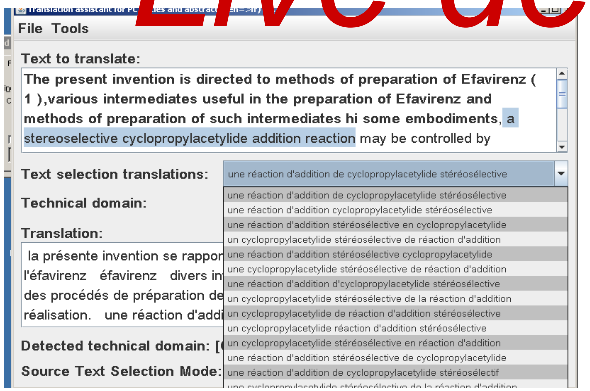


traduction texte	5[qc][qc]
traduction textes	2
conversion texte	1
de traduction textes	1
transposition texte	1



traduction texte	WO2003071774	DATA	EN	...calls with optional voice to **text translation**	...de conférences téléphoniques avec une **traduction** facultative voix - **texte**
	WO2009036800	🟥 DATA	EN	...relates to a method of **text translation** comprising the steps of	...invention concerne un procédé de **traduction** de **texte** qui consiste à
	WO2009036800	🟥 DATA	EN	...electronic device capable of such **text translation** and a computer program comprising software instructions that , when executed , performs such a text ...	...électronique capable d' une telle **traduction** de **texte** et un programme informatique ...
	WO2003052624	DATA	EN	...voice to text conversion and/or **text translation** and/or the text to voice conversion ...	...en texte et/ou de la **traduction** de **texte** et/ou de la conversion ...
	WO2007045136	DATA	ZH	...multi - language speech and **text translation** server , the user terminal device consists of at least a first transmitting / receiving device and at least a second transmitting / receiving device ...	...contrôle et un serveur de **traduction** de paroles et de **texte** en plusieurs langues , ...
traduction textes	WO2002086737	DATA	EN	...user - directed web site **text translation**	...pour une fonction integree de **traduction** de **textes** de sites web orientée
	WO2[illegible]059712	DATA	[illegible]	...th[illegible]nvention [illegible]directed to **text translation** tools that are especially usef[illegible]or translation of related electronic documents ...	...invention concerne des outils de **traduction** de **textes** qui sont spécialement utiles ...

Live demo???


Translation assistant for PC[illegible]les and abstrac[illegible]en=>fr)
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Detected technical domain: [(

Source Text Selection Mode:

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Evaluation: automatic

Experiment	**Speed Seconds (#docs)**	**BLEU score**
Baseline	542 (51)	**40.11**
Pruned	164 (51)	41.11
Pruned+d=0.15+s=10	22 (51)	43.30
Pruned+BigLm	196 (51)	**51.71**
Pruned+BigLm w/oDomain	173 (51)	50.91
Only Qc	N/a (51)	28.29
Google translate	N/a (51)	34.09
Bing translator	N/a (51)	27.17
Pruned+BigLm	27140 (1390)	45.06
Pruned+BigLm w/oDomain	6934 (1390)	44.99
Pruned+BigLm_Qc_d=0.15 s=10	6378 (1390)	**45.07**

Reasonable speed: 5 sec/doc (without parallelization)

Real test: translate latest published documents

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Evaluation: human

- 12 testers
  - Good French and English skills
  - Not translators
- Coached by 2 professional translator-revisers
- 516 translations produced during 13 days

	Translations produced	☺ Publishable		☹ Non Publishable	
With coaching (10 days)	403	243	**60.3%**	160	39.7%
Without coaching (3 days)	113	56	**49.6%**	57	50.4%

~ half of translation produced by non translators passed a high quality QC

Second evaluation: compare with outsourcing agencies

Translations	translations QCed	Tapta		Agency		Same quality	Tapta better	Agency better
		P	**NP**	P	**NP**			
With coaching	388	350	38	344	44	111	193	84
Without coaching	112	103	9	98	14	23	60	29
Total	500	453	47	442	58	134	**253**	**113**
%	**100**	**90.6**	**9.4**	**88.4**	**11.6**	**26.8**	**50.6**	**22.6**

Conclusion

- SMT with reasonable results
- User-driven translation was successful
- Tapta was not adopted by WIPO professional translators
- But:
  - Adding Tapta in the workflow is investigated
  - Was judged as very valuable for non-translators
  - Accelerated training aid

Future work

- Other language pairs : Chinese, Korean, Japanese …
- Triangulation
- Incremental training

- Web Tapta: http://www.wipo.int/patentscope/translate/