Workpackage 3
Interactive Editing

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No.	Task	month	PM	Status
3.1	Sentence-level Estimation of Post-Editing Effort	1–24	7	on track
3.2	Word-level Confidence Measures	1–24	6	on track
3.3	Rules from Translation Memory	1–12	4	DONE
3.4	Visualisation of Word Alignment	1–12	4	DONE
3.5	Display Multiple Translation Options	1–36	5	planned
3.6	Authoring Assistance	19–36	5	planned
3.7	Automatic Reviewing	25–36	10	planned

Overview

- Task 3.1: Sentence-level estimation of post-editing effort (UPVLC)
- Task 3.2: Word-level confidence measures (UPVLC)
- Task 3.3: Rules from Translation Memory (UEDIN)
- Task 3.4: Visualization of word alignments (UEDIN)

Task 3.1

Sentence-Level Confidence Measures

Current Work

- Aid post-editing machine translation
- If machine translation output is too bad
  $\rightarrow$ do not show it
- Main approach: supervised learning problem with many features
  - research focused on dimensionality reduction methods
  - future work: train on CASMACAT field trial data
- Two publications
  - "PRHLT Submission to the WMT12 Quality Estimation Task", Jesús González-Rubio and Alberto Sanchis and Francisco Casacuberta, WMT 2012
  - "Black Box Features for the WMT 2012 Quality Estimation Shared Task", Christian Buck, WMT 2012

Task 3.2

Word-Level Confidence Measures

Approach

- Goal: Estimate the correctness of machine translated words

- Prior work on word-level confidence measures within interactive MT [González-Rubio et al., 2010]

- Implemented: confidence measure based on IBM Model 1
  - advantage: very fast to compute
  - other approaches: posterior methods, additional features

- Given source sentence $\mathbf{x} = x_0 \ldots x_j \ldots x_J$, confidence $\text{conf}(y_i)$ of words in translation $\mathbf{y} = y_1 \ldots y_i \ldots y_I$ computed from Model 1 probabilities $p(y_i|x_j)$

$$\text{conf}(y_i) = \max_{0 \leq j \leq J} p(y_i|x_j) \ ,$$

- Positive empirical results in simulated setting

Integration into Workbench

- Highlight words with low confidence
- Integration in UPVLC prototype
- Currently working on integration into CASMACAT Prototype

Planned Work

- Sequence models such as conditional random fields
- More features
  - linguistic information
  - lexical choice models
  - structural properties of the search graph
- Work on sub-word level (inflections)
- Exploitation of data generated by CASMACAT field trial

Task 3.3

Rules from Translation Memory

Main Idea

- Input

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory

The second paragraph of Article 5 is deleted .

⇒ **Part of the translation from TM fuzzy match**

Part of the translation with SMT

The second paragraph of Article	21	is deleted .

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

The second paragraph of Article 5 is deleted .
=
À l' article 5 , le texte du deuxiéme alinéa est supprimé .

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

The second paragraph of Article 5 is deleted .

=

À l' article 5 , le texte du deuxiéme alinéa est supprimé .

- Detect mismatch (string edit distance)

Example

- Input sentence:

  The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

  The second paragraph of Article 5 is deleted .
  =
  À l' article 5 , le texte du deuxiéme alinéa est supprimé .

- Detect mismatch (string edit distance)

- Align mismatch (using word alignment from GIZA++)

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

The second paragraph of Article 5 is deleted .

=

À l' article 5 , le texte du deuxiéme alinéa est supprimé .

Output word(s) taken from the target TM

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

The second paragraph of Article 5 is deleted .

=

À l' article 5 , le texte du deuxiéme alinéa est supprimé .

Output word(s) taken from the target TM

Input word(s) that still need to be translated by SMT

Example

- Input sentence:

The second paragraph of Article 21 is deleted .

- Fuzzy match in translation memory:

The second paragraph of Article 5 is deleted .

=

À l' article 5 , le texte du deuxiéme alinéa est supprimé .

- Very Large Hierarchical Rule

À l' article X , le texte du deuxiéme alinéa est supprimé .
$\rightarrow$ The second paragraph of Article X is deleted .

Steps

- Fuzzy matching
  - based on string edit distance on words

$$\text{FMS} = 1 - \frac{\text{edit-distance}(\text{source}, \text{tm-source})}{\max(|\text{source}|, |\text{tm-source}|)}$$

  - string edit distance on letters as tie breaker
  - details see [Koehn and Senellart, AMTA 2010] straight-forward
- Word alignment of TM source and target standard method
- Construction of very large rule
  = linking mismatch(input, TM source) to TM target can be tricky

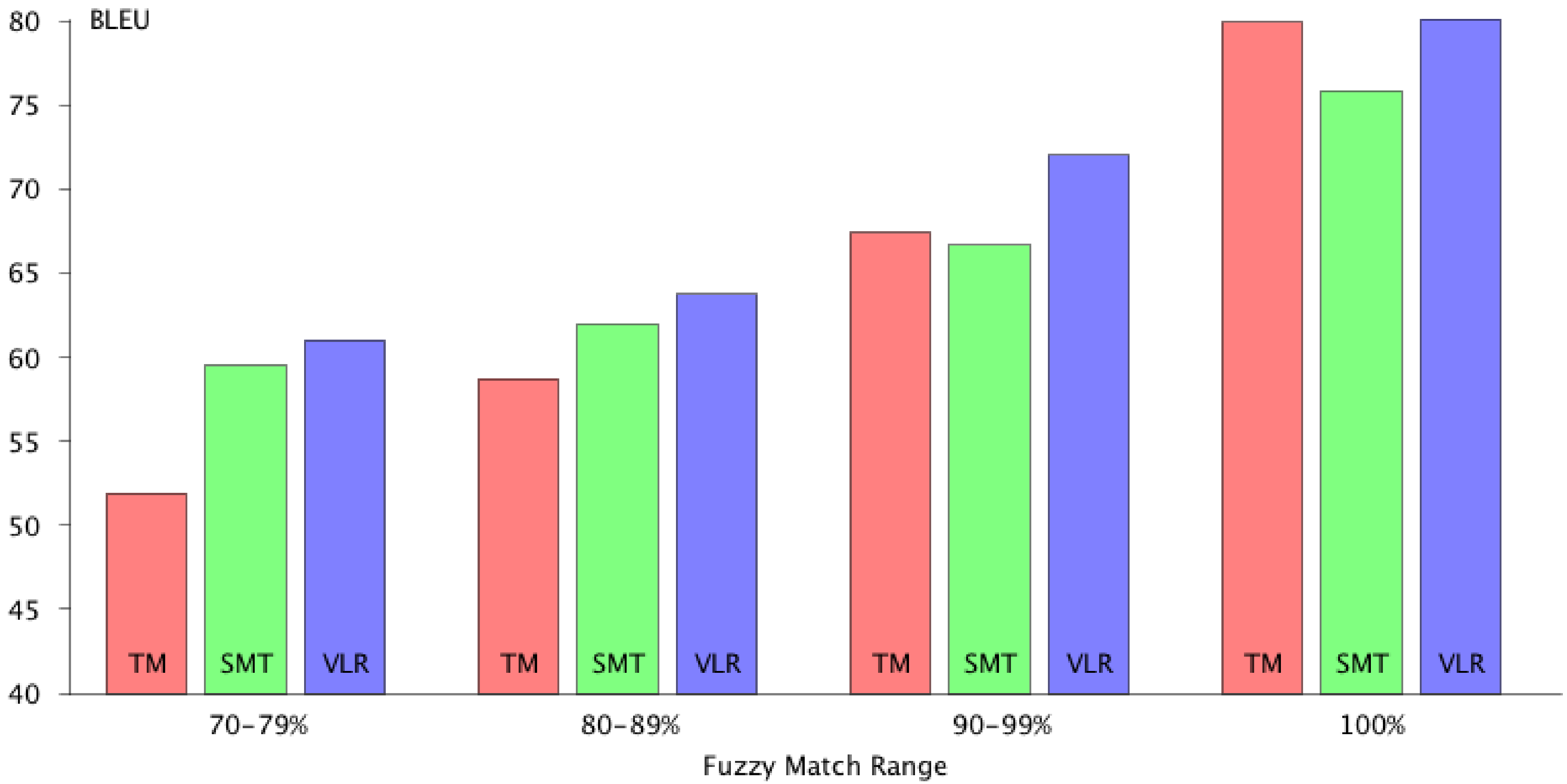
Multiple Choices

- Multiple fuzzy matches in TM with same score
  $\Rightarrow$ consider all with optimal match score

- Same TM source with multiple translations
  $\Rightarrow$ consider all with conditional probability score

- Fuzzy match choices integrated into decoder search

Quality Evaluation



Encoding TM fuzzy match
as very large hierarchical grammar rules (VLR)
outperforms baseline methods (Acquis task English-French)

Integration into Moses

- Proof-of-concept implementation before project [Koehn and Senellart, 2010]

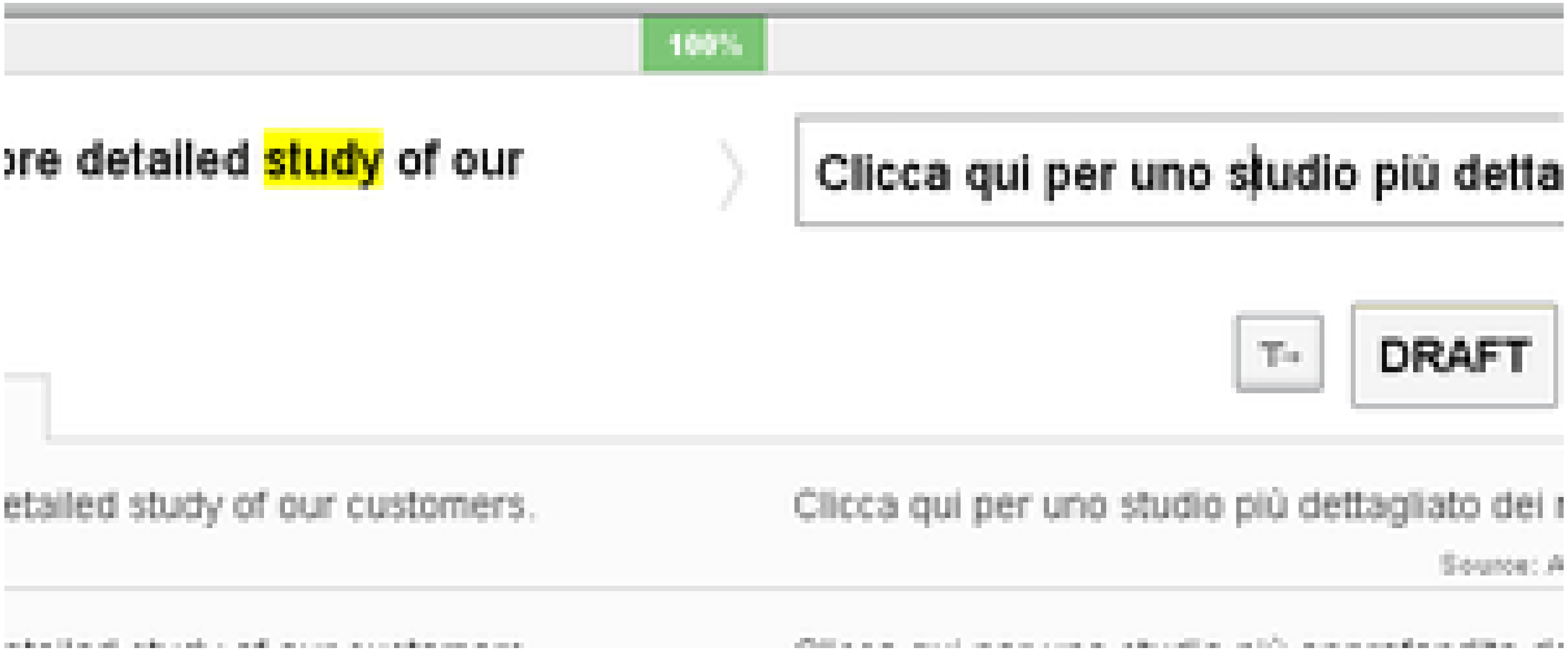
- Integration into Moses
  - reimplementation of rule generation in C++
  - translation memory another rule table format
  - extremely easy to configure: just provide word-aligned parallel corpus

- Integration into CASMACAT Workbench
  - pass meta information about fuzzy match rule to GUI
  - highlight mismatched part with special color
  - not yet completed
  - will be tested in next field trial

Task 3.4

Visualization of Word Alignments

Idea



- Highlight source word(s) when cursor is positioned on target word
- Live updating of alignments when user changes translation

Computation of Alignment

- Training of alignment models
  - choice: HMM alignment model, since powerful and fast
  - train model with GIZA++ toolkit on parallel corpus

- Transmission of partial model to GUI
  - only word translation probabilities of source words in input needed
  - partial model compact enough to cause little overhead

- Computation of alignments
  - implementation of HMM inference and symmetrization in Javascript
  - dynamic programming allows computation of exact solution
  - requires tokenization of source (given) and target (various options)
  - special consideration for unknown words

- Demo

questions?