Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

SMT error analysis and mapping to syntactic, semantic and structural fixes

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Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for SMT

- Does error analysis make sense for SMT?

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for SMT

- Does error analysis make sense for SMT?
- Which aspects should it cover?

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

1. Introduction

2. Error classification schemes

3. Our approach

4. The SMT systems

5. Error analysis results

6. Fixing possibilities with SSS

7. Conclusions

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Dynamic Quality Framework - TAUS

Typology Errors:
Count and categorize errors per segment

| 0 ⌄ Country standards | 0 ⌄ Style | 0 ⌄ Terminology | 0 ⌄ Language | 0 ⌄ Accuracy |

- Dimensions: attributes, grammatical and localization issues

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Dynamic Quality Framework - TAUS

Typology Errors:
Count and categorize errors per segment

| 0 ↕ Country standards | 0 ↕ Style | 0 ↕ Terminology | 0 ↕ Language | 0 ↕ Accuracy |

- Dimensions: attributes, grammatical and localization issues

Disadvantages

- High-level annotation only
- Mixed dimensions
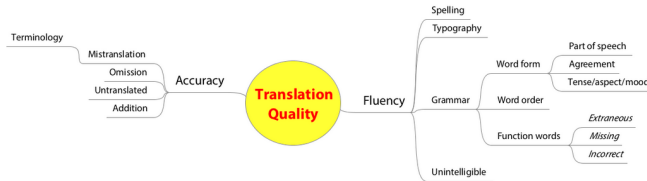
Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Multidimensional Quality Metric - QTLaunchPad

- MQM Core: a hierarchy of 22 issues
- Dimensions: quality attributes, grammar/linguistic and edit-types
  - Top level dichotomy: accuracy vs fluency
  - Lower-levels: grammatical/linguistic and edit-type errors

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Multidimensional Quality Metric - QTLaunchPad
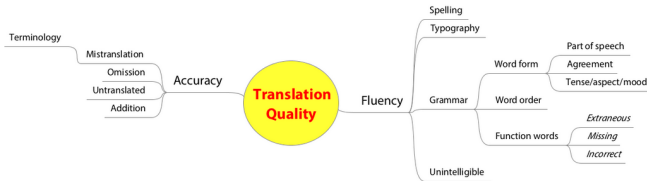
- MQM Core: a hierarchy of 22 issues
- Dimensions: quality attributes, grammar/linguistic and edit-types
  - Top level dichotomy: accuracy vs fluency
  - Lower-levels: grammatical/linguistic and edit-type errors

Disadvantages

- Mixed dimensions
- Issues often too broad to identify SSS solutions
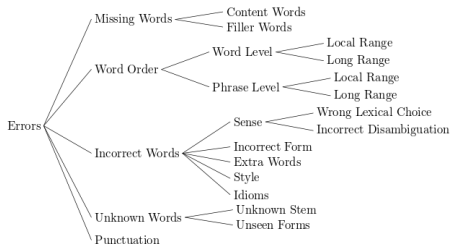
Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

SMT-oriented classification - Vilar et al. 2006

- Dimensions: edit-types and linguistic issues
  - Top level: edit-types
  - Lower-levels: edit-types, spans and grammatical issues

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

SMT-oriented classification - Vilar et al. 2006
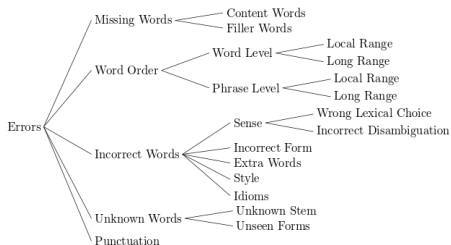
- Dimensions: edit-types and linguistic issues
  - Top level: edit-types
  - Lower-levels: edit-types, spans and grammatical issues

Disadvantages

- Not informative enough linguistically for SSS solutions

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Proposed bidimensional error scheme

dynamic, extensible bidimensional scheme

Top-level category	Subclasses	Incorrect	Missing	Additional
Lexis				
Morphosyntax				
Verbs				
Order				
Punctuation				
Untranslated				

- Complementary dimensions: linguistic issues and edit-types
  - Six top linguistic categories
    - Dynamic extensible hierarchy
  - Three edit-type categories

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Proposed bidimensional error scheme

dynamic, extensible bidimensional scheme

Top-level category	Subclasses	Incorrect	Missing	Additional
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Punctuation				
Untranslated				

- Complementary dimensions: linguistic issues and edit-types
  - Six top linguistic categories
    - Dynamic extensible hierarchy
  - Three edit-type categories

To be considered

- Further dimensions (e.g. severity)

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Description of the SMT systems

English-Spanish SMT

- Standard phrase-based Moses system

- Training data:
  - Bilingual: europarl, UN corpus, News Commentary and Common Crawl (~335M words)
  - Monolingual: Spanish part of europarl, News Commentary and Common Crawl (~60M words)

- In-domain tuning data: 1,000 QA interactions

- BLEU score (in-domain): 45.86

English-Basque SMT

- Phrase-based Moses system

- Alignment at lemma-level

- Training data:
  - Bilingual: academic booksk, software manuals and UI strings, web-crawled data (~13.5M words)
  - Monolingual: Basque part of the above + administrative text (~21M words)

- In-domain tuning data: 1,000 QA interactions

- BLEU score: 20.24

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

1. Introduction

2. Error classification schemes

3. Our approach

4. The SMT systems

5. Error analysis results

6. Fixing possibilities with SSS

7. Conclusions

Error analysis for the English–Spanish pair

137 sentences evaluated with a total of 169 errors.

- Lexis: 31% of the total errors

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example of a lexical error

Click run where it says vulnerabilities.
Pulse correr donde dice vulnerabilidades.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English–Spanish pair

137 sentences evaluated with a total of 169 errors.

- Lexis: 31% of the total errors
- Morphosyntax: 29%

---

example of a morphosyntactic error

Yes, you can share files and folders with one or more users on MEO Cloud.
Sí, puede compartir archivos y carpetas con uno o más usuarios sobre MEO Cloud.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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- Morphosyntax: 29%
- Verbs: 18%

example of a verb error

Connect your computer to the ZON HUB via Ethernet cable.
Conectar su ordenador a la HUB af a través de cable Ethernet. (infinitive to connect)

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Spanish pair

137 sentences evaluated with a total of 169 errors.

- Lexis: 31% of the total errors
- Morphosyntax: 29%
- Verbs: 18%
- Order: 11%

example of an ordering error

> Tap Import to copy your Android Browser Favourites.
> Toca Importar para copiar su navegador de Android favoritos.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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137 sentences evaluated with a total of 169 errors.

- Lexis: 31% of the total errors
- Morphosyntax: 29%
- Verbs: 18%
- Order: 11%
- Punctuation: 6%

---

example of a punctuation error

If I buy a computer abroad, will it work in Portugal
Si compro un ordenador en el extranjero, funcionará en Portugal? (missing ').

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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- Verbs: 18%
- Order: 11%
- Punctuation: 6%
- Untranslated: 5%

example of an unstranslated unit

Then click on the yellow disc with a green tick.
Then haga clic en el disco de color amarillo con una marca verde.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Basque pair

140 sentences evaluated with a total of 393 errors.

- Lexis: 23% of the total errors

example of a lexical error

> Go to WhatsApp > 'Menu Button' > 'Status'.
> Joan menu botoia WhatsApp > " " > " egoera ".

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Basque pair

140 sentences evaluated with a total of 393 errors.

- Lexis: 23% of the total errors
- Morphosyntax: 39%

---

example of a morphosyntactic error

simply by dragging the profile of the person concerned to the various circles.
besterik gabe, arrastatu pertsonaren profila hainbat nahia zirkulu.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Basque pair

140 sentences evaluated with a total of 393 errors.

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- Morphosyntax: 39%
- Verbs: 18%

---

example of a verb error

> Choose a standard status or personalize one.
> Egoera estandar bat edo pertsonalizatu bat.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Basque pair

140 sentences evaluated with a total of 393 errors.

- Lexis: 23% of the total errors
- Morphosyntax: 39%
- Verbs: 18%
- Order: 14%

example of an ordering error

You can use the app iPP Podcast Player you find on Google Play.
Aplikazioa erabil dezakezu IPP podcast Player aurkitu duzu Google erreproduzitu.

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Error analysis for the English-Basque pair

140 sentences evaluated with a total of 393 errors.

- Lexis: 23% of the total errors
- Morphosyntax: 39%
- Verbs: 18%
- Order: 14%
- Punctuation: 4%

example of a punctuation error

> How can I change the language to of Mega to Portuguese?
> Nola aldatu hizkuntza of Mega, portugesa?

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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- Verbs: 18%
- Order: 14%
- Punctuation: 4%
- Untranslated: 1%

---

example of an unstranslated unit

> How much space do I have for free on Mega?
> Zenbat leku ditut doan on Mega?

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

1. Introduction

2. Error classification schemes

3. Our approach

4. The SMT systems

5. Error analysis results

6. Fixing possibilities with SSS

7. Conclusions

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

Main sources for errors

- use-scenario-specific features
  - Q&A chat scenario in the information technology domain
- language pair-specific features

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified   (CR)NER

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified	(CR)NER
UIs not identified	NER

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified	(CR)NER
UIs not identified	NER
domain-specific terminology	WSD

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified	(CR)NER
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domain-specific terminology	WSD
Basque postpositions	predicate-argument structures and semantic roles

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified	(CR)NER
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domain-specific terminology	WSD
Basque postpositions	predicate-argument structures and semantic roles
incorrectly ordered phrases	predicate-argument structures and semantic roles

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

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IT names not identified	(CR)NER
UIs not identified	NER
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Basque postpositions	predicate-argument structures and semantic roles
incorrectly ordered phrases	predicate-argument structures and semantic roles
split phrases	syntax

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

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domain-specific terminology	WSD
Basque postpositions	predicate-argument structures and semantic roles
incorrectly ordered phrases	predicate-argument structures and semantic roles
split phrases	syntax
incorrect phrase-internal order	syntax

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Fixing possibilities with syntax, semantics and structure

IT names not identified	(CR)NER
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domain-specific terminology	WSD
Basque postpositions	predicate-argument structures and semantic roles
incorrectly ordered phrases	predicate-argument structures and semantic roles
split phrases	syntax
incorrect phrase-internal order	syntax
incorrectly generated verb phrases	

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Index

1. Introduction

2. Error classification schemes

3. Our approach

4. The SMT systems

5. Error analysis results

6. Fixing possibilities with SSS

7. **Conclusions**

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Conclusions

- proposed a bidimensional error classification
  - dynamic, extensible linguistically-informed dimension
  - edit-types
- evaluated English-Spanish and English-Basque SMT systems
  - domain-related issues:
    - terminology and UI strings
  - language-pair-specific issues:
    - English prepositions and subordinate markers for Basque
    - verb phrase generation
    - ordering at different levels
- revealed potential of SSS to solve errors

Introduction
Error classification schemes
Our approach
The SMT systems
Error analysis results
Fixing possibilities with SSS
Conclusions

Thanks!
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eman ta zabal zazu

Universidad   Euskal Herriko
del País Vasco   Unibertsitatea

qtleap