A question-answer distance measure to investigate QA system progress

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Introduction

Questions-answering (QA) systems

- Provide precise answers to the user questions
- Search the answer through a corpus of documents

Example

Question: *Besides France and Germany, where have we seen case of mad-cows disease ?*
Answer: *In Belgium*

Importance of evaluating the evolution of such systems

- Evaluation campaigns: TREC, QA@CLEF, QAst ...

Introduction

Evaluation campaigns on questions-answering systems

- Documents come from various origins: newspaper, meetings transcriptions ...
- Question corpus
  - Questions built by evaluators using the document corpus
- Measure the progress in QA domain

Issue addressed

Can we compare a QA system on successives evaluation campaigns?
$\longrightarrow$ Assessing the evolution of the evaluation criteria

Context of the work

- QAst: Questions-Answering on Speech Transcriptions

Introduction

The QAst evaluation campaign

- Evaluate systems on speech transcriptions
- Three different languages: French, English and Spanish
- QAst 2009: a new building procedure for the questions

Introduction

A new question corpus building procedure

- 2008: questions created from the documents
- 2009: more "spontaneous" questions provided by naive users:
  - Use of excerpts of document
    - Ask questions on information related to these excerpts

Example

Text fragment: *Jacques Chirac is the previous President of France.*
2008 question: *Who is the previous President of France ?*
2009 question: *What is the age of Jacques Chirac ?*

Question

- Does this questions building methodology changes the evaluating features of the QAst campaign ?
  - Observation of the impact on the results of the QA systems: comparison between 2008 and 2009 results

Observations on QAst 2008 and 2009 results

Results on LIMSI system

	French		English		Spanish	
	Acc(%)	Δ	Acc(%)	Δ	Acc(%)	Δ
QAst 2008	50	-22	52	-25	56	-20
QAst 2009	28		27		36	

Results for the other participants

System	English	
	Acc(%)	Δ
INAOE 2008	33%	-5
INAOE 2009	28%	
UPC 2008	34%	-13
UPC 2009	21%	

Observations on QAst 2008 and 2009 results

Observations

- Strong decrease between 2008 and 2009

Hypothesis for the loss

- Influence of the way the questions were built
  - Greater distance between the text fragment used to create the question and the answer

Example

Text fragment: *Jacques Chirac is the previous President of France.*
2008 question: *Who is the previous President of France ?*
2009 question: *What is the age of Jacques Chirac ?*

Idea

- Quantifying the influence of the new building procedure

A measure for the question corpus

Aim of the measure

- Evaluation of the distance between the elements of each question of a corpus and the corresponding answers
  - Question elements considered: named entities and multi-words expressions
- Gives two values: the average distance and the standard deviation

Computing of a global distance for each question

- Distance evaluated in words
- Average of distances between the elements of the question found in the document and the answer

A measure for the question corpus

Example

Q : Which Belgian organization has been declared criminal ?

A : Vlaams Block

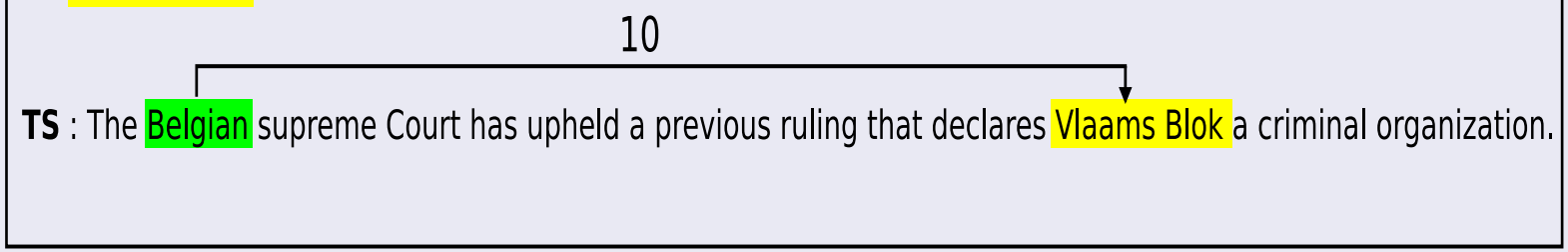
TS : The Belgian supreme Court has upheld a previous ruling that declares Vlaams Blok a criminal organization.

A measure for the question corpus

Example

Q : Which Belgian organization has been declared criminal ?

A : Vlaams Block



A measure for the question corpus

Example

Q : Which Belgian organization has been declared criminal ?

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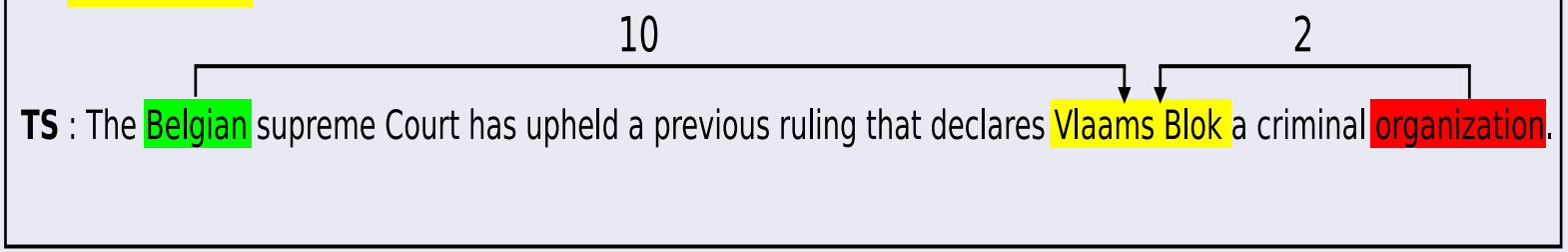
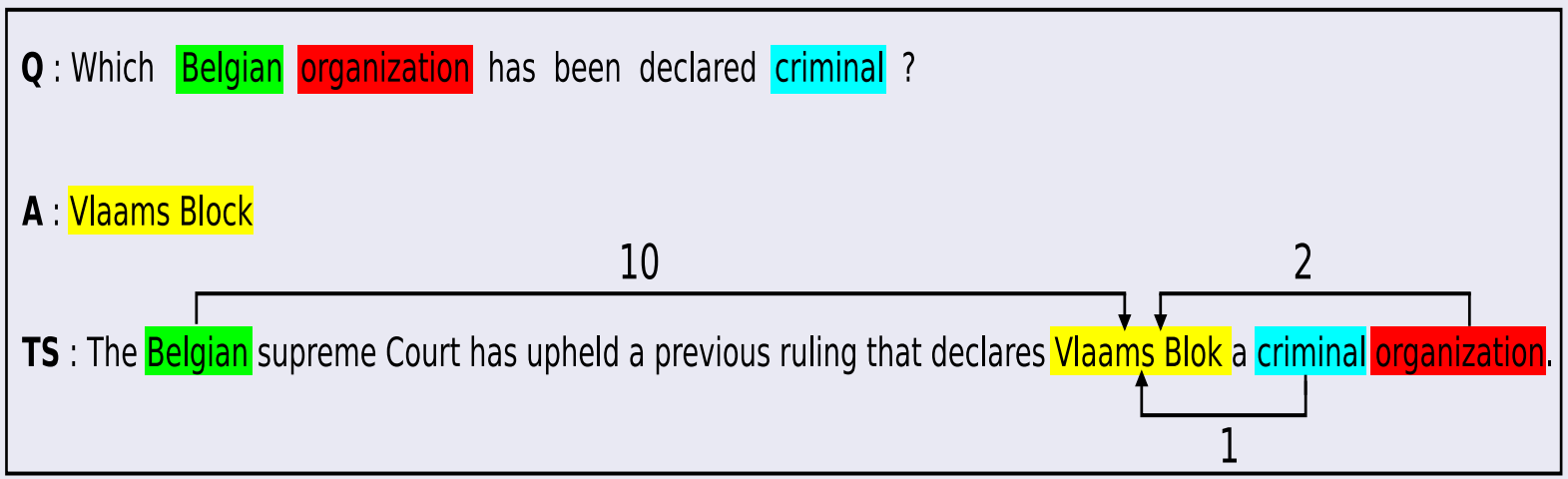


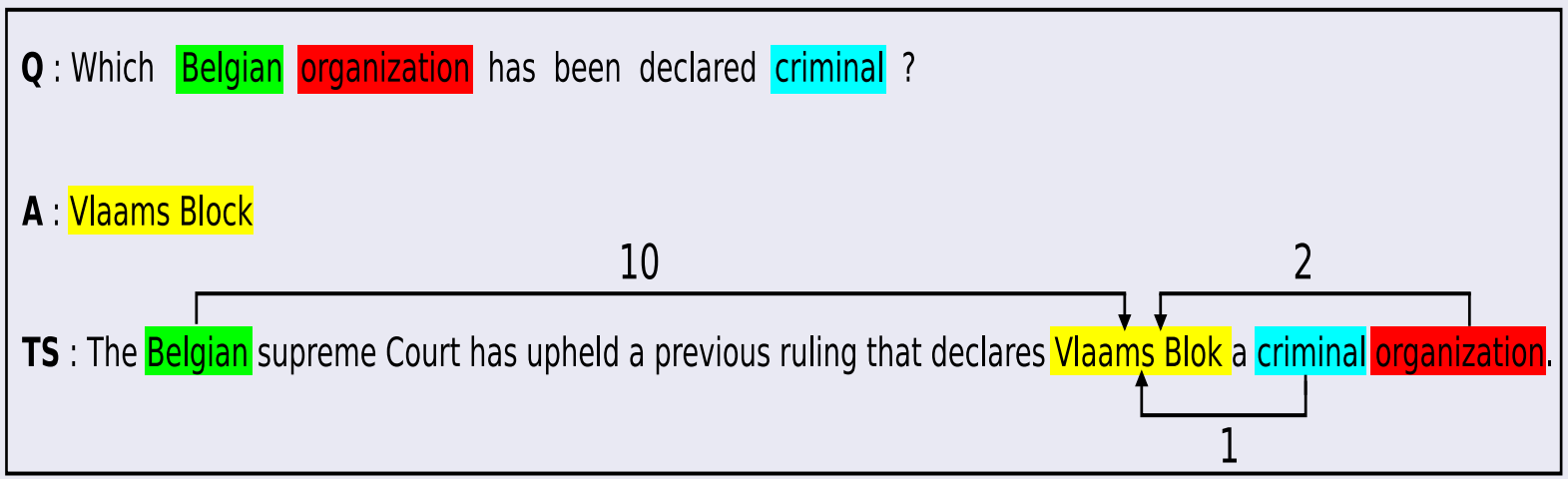
A measure for the question corpus

Example



A measure for the question corpus

Example



Global distance of the question: Average(10+2+1) = 4

Results: average distance and standard deviation

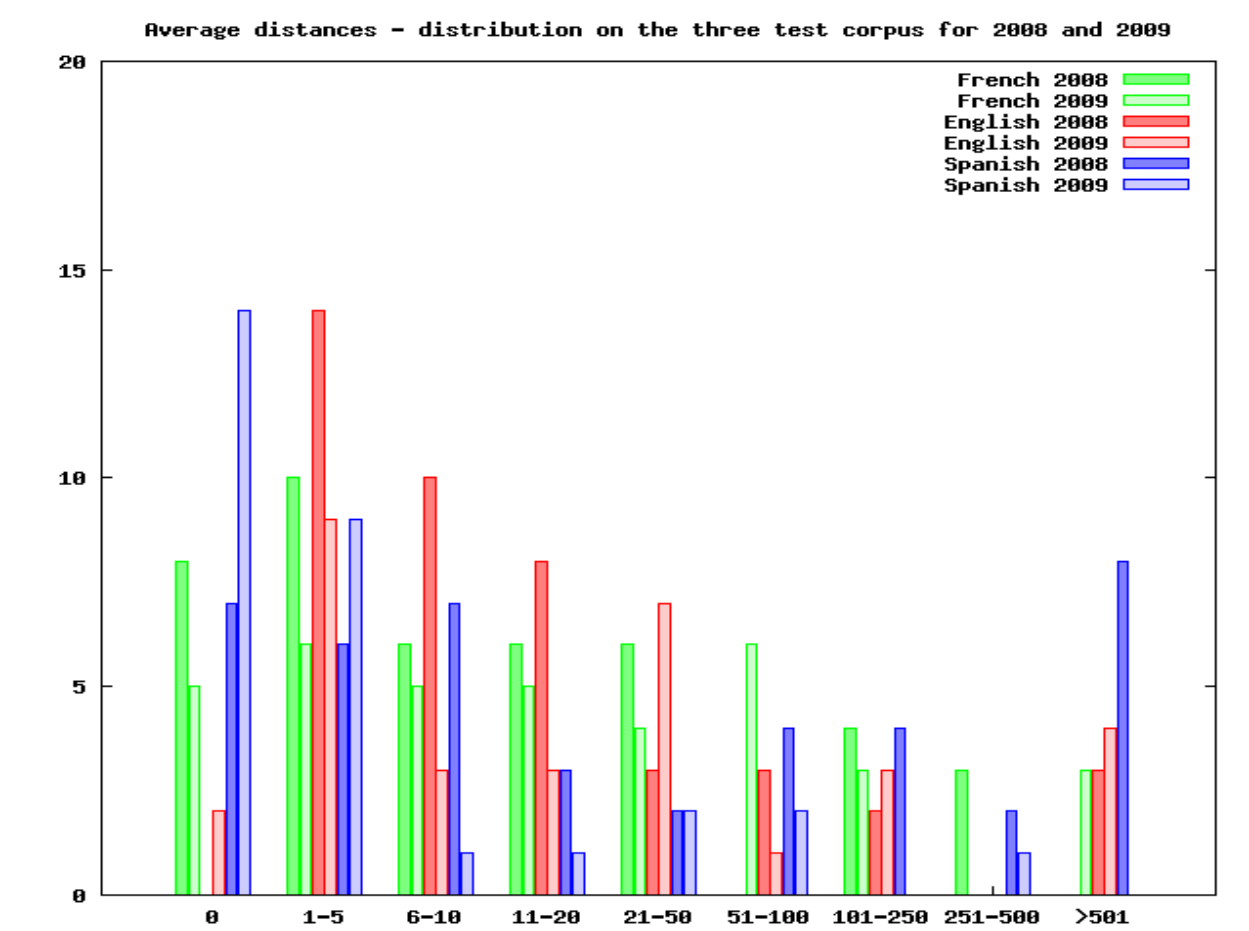
Evolution of the Average Distance and Standard Deviation

	French			English			Spanish		
	AD	SD	Δ	AD	SD	Δ	AD	SD	Δ
2008	45	100	+98	97	284	+39	381	851	-359
2009	143	431		136	310		22	73	

- Strong increase on French and English, but also a very strong decrease on Spanish
  - New building procedure does not always imply an increase of the distance
  - The corpora have not the same features for 2008 and 2009
- High Standard Deviation: strong distance variations in corpus

Focus on question distances

Average distance values - 2008 and 2009 test corpus



- X axis: distance classes (DC); Y axis: #questions in DC
- Evolution of the question corpus between 2008 and 2009
- Strong dispersion for the three languages

Discussion

Correlation with evaluation campaign results

- Segmentation of the documents by the QA systems
  - Use a window size fixed by tuning on the 2008 corpus
    - In 2009, the snippets are either too small (French, English) or too big (Spanish)

$\longrightarrow$ Potential explanation for the strong loss

Usability for futures evaluations

- Measure based on our representation of the elements of a question
  - Can be generalized on other systems using different representations (e.g. keywords)
- Measure can be used as a control parameter criterion for building question corpus
  - Allow to evaluate the features of a campaign

Conclusions and perspectives

Conclusions

- Huge performance loss between QAst 2008 and 2009 evaluations
  - New building procedure for the question corpus of 2009
- Application of a measure based on a distance between the elements of the question and the answer
  - Strong variations between the two instances of the QAst campaign
- The strong variations can potentially explain the bad results of the QA systems
- The measure can control for variations between two instances of a campaign

Perspectives

- Complementary measures
  - Referential expressions
  - Language-specific features

Questions

Thank you for listening ! Any questions ?