Chinese Text Segmentation

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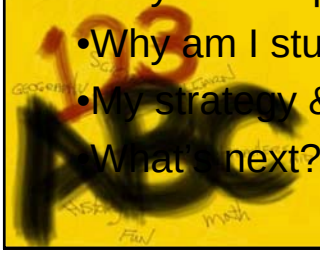
Chinese Segmenter (lee55@indiana.edu)

Introduction

- What is a segmenter?
- Why are segmenters important?
- General research questions about segmenters
- Why do computers hate Chinese?
- Why am I studying segmenters?
- My strategy & results so far …
- What's next?



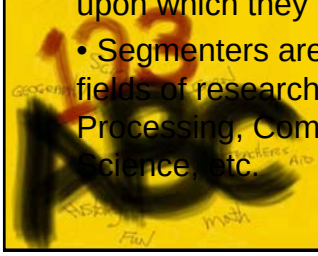
What is a segmenter?

• A segmenter is a type of tokenizer or something which creates tokens or atomic pieces of data separated by a distinct delimiter.

• They are a tool which allows researchers to do other things with the data.

• A common distinction for segmenters is the language upon which they are applied.

• Segmenters are used widely in computing. Significant fields of research on segmenters are Natural Language Processing, Computational Linguistics, Computer Science, etc.



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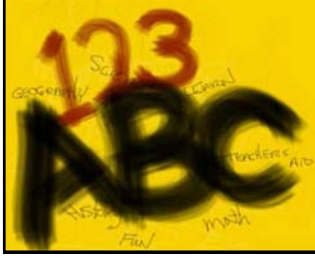
Why are segmenters important?

• **Content / data analysis**: Especially in East-Asian languages, there is no spaces between words. Punctuations sometimes exist, sometimes not.

• **Wide variety of usages**: Computational linguistics, spam, etc.

General research questions

- How can we identify words? Punctuation? Places where we can put a space to segment the data
- The representation methods which make sense to a computer and to existing software.
- The efficiency and accuracy of the segmenter



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Why do computers hate Chinese characters?

- The definition of the token is vague
  - What are the words? Tokens? Where is the punctuation?
  - Without tokens, we can't do things at the **word-level**, we can only do things at the phrase or sentence level. This sucks if you are a word processor or spam filter or the like, i.e. YOU'R DUMB AND YOU REALLY LOVE SPAM.
- It takes 2 bytes for a meaningful character

美国总统表示中国经济发展速度很快

(American president indicated that the economical growth in China is very fast)

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Why do computers hate Chinese characters?

- The encoding is different
  - Chinese language belongs to ideographical word system, which usually employs special ways of encoding to represent characters, e.g. gbk, Big5, unicode
- So what do we do?

We think about strategies for parsing the sentence, breaking it up into smaller chunks.

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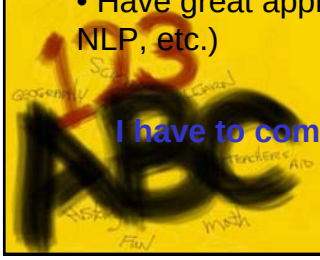
Why am I studying segmenters?

- TREC: Spam track in TREC published Chinese corpus in 2006, which gives new challenges to participants
- Want to try some different strategies
  - Most of the strategies are the same: POS taggers, lexical analyzers, sliding-window …
  - Only a few do extremely well (+95% or higher accuracy).
- Have great applications for other uses (e.g. spam filters, NLP, etc.)



I have to complete my independent studies with Kiduk :-)

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My strategy & results so far …

• Working with Gavin, we've devised a strategy based on a left-to-right maximum matching approach using a lookup table based on a robust, but not too lengthy dictionary of common Chinese words.

• The variant of maximum matching

• Testing corpus: Chinese emails from spam track

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My strategy & results so far …

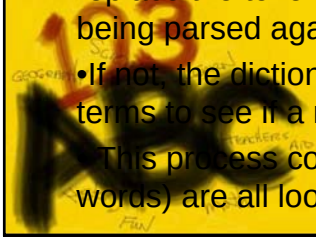
[Segmentation Process]

•This sentence is passed through an algorithm which looks at a window of the first ***n*** number of characters and tries to find a match in the dictionary, where n equals the longest term in the dictionary

•If a match is found, it saves the token(s) to an array and replace the token(s) with double spaces to avoid them being parsed again

•If not, the dictionary is then consulted again for shorter terms to see if a match can be found.

•This process continues until all the shortest terms (2 words) are all looked up in the dictionary



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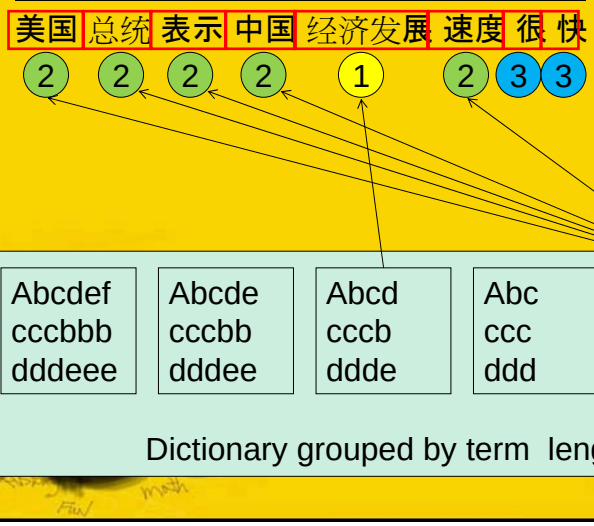
My strategy & results so far …



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My strategy & results so far …

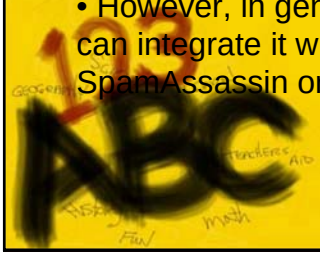
[Integrate with spam filter]

- After the segmentation, all the tokens are recorded as a unique index number
- A new document (email) is then generated with all the index numbers separated by the space for spam detection purpose
- Integrate the segmenter with the spam filter

My strategy & results so far …

[Result evaluation]

- Compared with segmenter
  - While our segmenter does better at **the accuracy**, the Mandarin segmenter does better at **the efficiency.**
- It's hard to compare the results since both do a good job at from different perspectives.
- However, in general it does a great job such that we can integrate it with common Spam filters such as SpamAssassin or Bspam.



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What's next …

- Improve the dictionary. The dictionary is the most important component of this strategy. Too big of a dictionary and the tokenization will be too fine-grained, too small of the dictionary and the tokenization will just be poor.
- Improve the lookup efficiency which means refactoring the code to use advantages of the programming language syntax as well as memory optimizations.