Text Generation for Abstractive Summarization
A New Approach for Guided Summarization

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Motivation

- **TAC 2010 Guided Summarization Track**
  - *The goal of guided summarization is to encourage a deeper linguistic (semantic) analysis of the source documents instead of relying only on document word frequencies to select important concepts.*

- **Our 2009 HexTac Experiment**
  - Showed an empirical limit to the performance of pure extraction
  - Our conclusion: stay away from extraction, i.e. try abstraction

- **Novelty!**
  - A lot has been tried with extraction
  - We feel that it is time to explore a new direction
Abstractive Summarization

1. Representation of source documents
   - Extract smallest coherent pieces of information found in sentences
   - We call them Information Items (InIts)
   - InIts can be a property, a statement, an action, etc.

2. Content Selection
   - Pick InIts that answer specific aspects
   - Rank the InIts according to salience

3. Summary Generation
   - Text Planning: order InIts in a logical way, join them together
   - Text Generation: generate sentences to realize the planned output
This year’s focus: Text Generation

- Main difference between abstraction and extraction
- Main reason for being considered less desirable
- And a great research area

Our approach

- Relies on parse trees to build InLts
- Uses a NLG Realizer (SimpleNLG)
- Does not require generation patterns
- Performs some text planning
2010 System

- **Abstract Representation**
  - Information Items defined as Subject-Verb-Object (SVO) triples
  - Extracted from each verb in the parse trees
  - InIts also have a date and a location

- **Sentence Generation**
  - Translates InIts into NLG format
  - Rule-based
  - Uses original context in parse tree
  - Includes some types of modifiers and complements
  - Results in short, to-the-point sentences
Information Item Example 1

Original Sentence (D1025E-A)
▶ At least 25 bears died in the greater Yellowstone area last year, including eight breeding-age females killed by people.

Information Items
1. bear – die – null (greater Yellowstone area, last year)
2. person – kill – female (greater Yellowstone area, last year)

Generated Sentences
1. 25 bears died.
2. Some people killed eight breeding-age females.
The Cypriot airliner that crashed in Greece may have suffered a sudden loss of cabin pressure at high altitude, causing temperatures and oxygen levels to plummet and leaving everyone aboard suffocating and freezing to death, experts said Monday.

Generated Sentence in the Summary

On August 15, 2005, a Cypriot airliner may have suffered a sudden loss of cabin pressure at high altitude in Greece.
Content Selection
- Ranking of the generated sentences
- Based only on average document frequency of unique lemmas
- Run1: From the generated sentences
- Run2: From the original sentences
- No use of categories and aspects for now

Summary Generation
- Order sentences by known or estimated date
- Categories 1 and 2: generate date and location modifiers
On July 12, 1998, the death toll could rise. An area was spotted with villages in Port Moresby. Earthquake struck the Admiralty Islands. Government station, catholic mission station and the Nimas village in the Sissano area west were destroyed in Aitape. PORT MORESBY was spotted with villages. Some people were confirmed dead. Jungle materials were built on beaches. Tsunami disaster climbed to 599 in CANBERRA. A 10 meter tsunami engulfed heavily populated villages. Queen Elizabeth II sent a message in Papua New Guinea. Prime Minister Tim Fischer described the events in PNG.
Pros and Cons

Pros

- Many short sentences: broad content coverage
- Lower global impact of low-information sentences

Cons

- Severe linguistic problems, sometimes unavoidable (bad parse)
- Possibility of unfocused summary

* General consideration: better content selection needed
Results (part A)

### Scores

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<th></th>
<th>Pyr.</th>
<th>Ling. Q.</th>
<th>Overall R.</th>
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<tbody>
<tr>
<td>Rali1</td>
<td>0.315</td>
<td>2.174</td>
<td>2.304</td>
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<tr>
<td>Rali2</td>
<td>0.282</td>
<td>2.239</td>
<td>2.326</td>
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<tr>
<td>Avg</td>
<td>0.309</td>
<td>2.820</td>
<td>2.576</td>
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<tr>
<td>Best</td>
<td>0.425</td>
<td>3.457</td>
<td>3.174</td>
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<tr>
<td>Models</td>
<td>0.785</td>
<td>4.910</td>
<td>4.760</td>
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</tbody>
</table>

### Ranks

<table>
<thead>
<tr>
<th></th>
<th>Pyr.</th>
<th>Ling. Q.</th>
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<tr>
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<tr>
<td>Rali2</td>
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<td>29</td>
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</tbody>
</table>
Results (part A)

\[ y = 0.9593x - 0.1285 \]

\[ R^2 = 0.7597 \]
Future Work

- **Better Information Item definition**
  - Move away from lemmas and towards semantic units
  - And closer to a predicate-logic semantic representation
  - Allow for deductions/inferences on InIts

- **Content Selection**
  - Rank InIts instead of already-made sentences
  - Attempt to answer aspects directly

- **Text Generation**
  - Improve on the current methodology
  - Combine InIts in the same generated sentence

- **Summary Generation/Text Planning**
  - Exploit the additional knowledge for planning
  - Order sentences from most generic to least, or by sub-topic
Thank you

Questions ? Comments ?