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NLG, Wrap up

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March 10, 2010

Today's lecture

1. Statistical NLG
2. Surface realizer
   - Linearization
3. SimpleNLG
   - Lexicon
4. Design ideas

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NLG research

Methods

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NLG research

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- **statistical**: corpus is used to construct a language model

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Methods

- **canned text**: predefined utterances are returned based on the string value
- **template-based**: hard-coded templates are filled in w missing constituents
- **statistical**: corpus is used to construct a language model
- **hybrid approach**: use templates, but select best candidate based on corpus.

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Goals of Statistical NLG

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- **fidelity**: that the output is as faithfully representative to human text as possible
- **fluency**: that the language generated is more easily processed and naturalistic

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Which is the text produced from Bigram?

, armed in their stings , Make boot upon the summer ' s velvet buds , Which pillage they with merry march bring home to the tent - royal of their emperor ; Who , busied in his majesty , surveys The singing masons building roofs of gold , The civil citizens kneading up the honey , The poor mechanic porters crowding in Their heavy burdens at his narrow gate , The sad - ey 'd justice , with his surly hum , Delivering o ' er to executors pale The lazy yawning drone .

retreat . By my hand into the clouds , as cold as any military man in divers functions , Setting endeavour in continual motion ; To - morrow is Saint Crispian . He trots the air , a subject for a sovereign ' s ambition ! He was thinking of civil wars when he speaks , The King hath heard that men of mould . Abate thy rage . Use lenity , sweet chuck . NYM . They know your worthiness . My liege , as you shall read that my Nell is dead i ' faith , my cousin Suffolk

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HENRY . We are in God 's peace ! I have an excellent armour ; but in loving me you should love the lovely bully . What mean have defeated the law ; Who when they were as cold as any ' s ambition ! He was thinking of civil wars when he was a merry message . KING HENRY . Thou doest thy office fairly . Turn head and stop pursuit ; for we hear Your greeting is from him , you men of mould . Abate thy rage , abate they manly rage ; Abate thy rage ,

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Shakespeare

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Trigram

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Fluency goals

Fluency

Achieved according to **macroscopic properties**, or those properties of text that describe non-content issues:

- sentence length
- vocabulary diversity
- use of certain syntactic structures (relatives, lists)
- surface stylistics (commas, punc., capitalization)

All things being equal, text *A* and text *B* could be produced with mostly different macroscopic properties, yet they would both represent the same information.

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Comparing macroscopic properties

Example

Man, that was a sweet deal you made. What was that guy thinking?

Example

Dude, you really scored with that deal. He was a real sucker.

Are these equal?

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But, a pure fully statistical NLG engine would be of minimal use. It would produce isolated utterances that sounded fine, but might be odd. Why?

- Domain, subject matter is highly specific.
- Context is completely lost.
- Turn doesn't match previous (in dialogue).

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Hybrid NLG

Hybrid techniques, on the other hand, provide the best of both worlds:

- template-based NLG to ensure relevance (fidelity)
- corpus-based NLG to produce natural sounding utterances (fluency). For example, content planning can still be accomplished using symbolic techniques. But condition upon the domain/genre:
    - choose lexical items (*heart* vs. *ticker*)
    - chose referring exp. syntax: *the large black dog*, *that big dog*, *the black one*
    - match dialogue act with tense

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Templates in Hybrid NLG

Given a text, extract potential templates:

- I'd like to leave **Houston at 5pm**.
- Can you recommend a good **wine** ?
- I wanna order **a sandwich** .

Now transform utterances into templates and fill with domain-specific items:

- I'd like to leave <CITY> at <TIME> .
- Can you recommend a good <PRONOUN> ?
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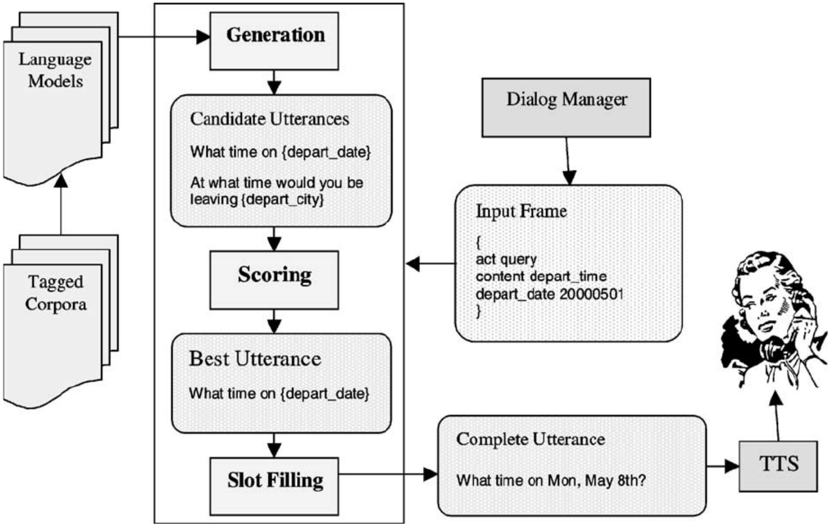
Components in statistical NLG



Today's lecture

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Surface realizer: Purpose

To generate natural language strings from a fully specified input (deterministic); the inverse of certain kinds of parsing processes.

- determines the surface form of the text;
- adds inflectional endings of words;
- orders constituents;
- misc. markup (e.g., lists, paragraphs, punctuation)

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Surface realizer: Inputs/Outputs

Input:

- phrase specifications
- Or for an entire text, a text specification

Output:

- linearized sentences, texts

Incremental NLG

A surface realizer adds more and more grammatical detail:

1. lexical items
2. morphosyntactic info
3. surface form with inflection
4. punctuation, capitalization (intonation if spoken)

Example

1. request itinerary
2. 2.SG POSS request INDEF.itinerary
3. you can request an itinerary
4. You can request an itinerary.

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Surface realizer

main functions:

- **linguistic realization**: uses rules of grammar (about morphology and syntax) to convert abstract representations of sentences into actual text.
- **structure realization**: converts abstract structures such as paragraphs and sentences into mark-up (punctuated text, HTML, etc.)

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Linearization

The microplanner identifies and specifies the order of constituents, but does not put the constituents in the final order.

It's left up to the surface realization component to carry out the instructions encoded in the phrase specification:

- English: adjectivals before nouns, e.g., *giant tortoise*
- Spanish: adjectivals after nouns, e.g., *tortuga gigante*

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3. SimpleNLG
   - Lexicon
4. Design ideas

Library contents

Key coomponents of SimpleNLG

- `simplenlg.features`: various morphosyntactic and discourse features
- `simplenlg.framework`: key NLG elements (documents, phrases, words)
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Process

Microplanning

```
PhraseElement myNP = phraseFactory.createNounPhrase(w);

DocumentElement sentence2 = documentFactory.createSentence();

sentence2.addComponent(myNP);
```

Realization

```
Realiser realiser = new Realiser();

realiser.setLexicon(lexicon);

NLGElement mydoc = realiser.realise(mydoc);

System.out.println(mydoc.getRealisation());
```

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Features and values available in SimpleNLG

Tense	Fut, Past, Pres
Person	First, Second, Third
Gender	Feminine, Masculine, Neuter
NumberAgr	Both, Plural, Singular
Pattern	Regular, Irregular, Regular_Double, ...
Interrogative	How, Where, Why, etc.
ClauseStatus	Matrix, Subordinate
DiscourseFuction	Cue_Phrase, Post_modifier, Complement, etc.

SimpleNLG lexicons

Available lexicons

- DefaultLexicon
- NIHLexicon

```
2010 Release:

432822 records
551454 baseForms
758153 forms
                  Item    BaseForms    Forms
                  ----    ---------   ------

noun            350050       430625   614737
adj              61999        93135    95089
verb             11001        14274    57412
adv               9416        13044    13108
prep               155          170      170
pron                87           88       88
conj                65           69       69
det                 38           38       38
modal                7            7       25
aux                  3            3       30
```

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Lexical entries

```
 WordElement: base=sell, category=VERB, {realisation=null,
      category=VERB, features={isDitransitive=true,
       presentParticiple=selling, present3s=sells,
       intransitive=true, transitive=true, pastParticiple=sold,
       past=sold}}

WordElement: base=Franklin, category=NOUN, {realisation=null,
   category=NOUN, features={proper=true, nonCount=false}}

WordElement: base=big, category=ADJECTIVE, {realisation=null,
    category=ADJECTIVE, features={isClassifyingAdj=false,
    comparative=bigger, predicative=true, superlative=biggest,
    isColourAdjective=false, isQualitativeAdjective=true}}
```

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Possible class hierarchies

You'll have 3 separate class hierarchies (with as much structure as you wish):

1. Messages, e.g., BirthMessage, DeathMessage
2. KB entities / things in the domain, e.g., Person, Location, etc.
3. SimpleNLG entities (phrases, whole docs, etc)

Methods

Create methods in the various message classes to output instances of `NLGElement`.