Dialogue & Narrative Structures: Advanced Research Seminar in NLP and Narrative

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Motivation for Focus of the CMPS 245 S13

- Dialogue for interactive stories completely hand-written
- Leads to an “authoring bottleneck”
- Writing character dialogue is an art: it is not described at a level that supports computational models
  - Work on narrative (arts and humanities) does not suggest specific linguistic or behavioral reflexes or parameters
- Character Creator Project: Walker & Wardrip-Fruin
  - Use dialogue generation to increase creativity of authors of interactive stories.
  - Assume narrative structure already specified that can be used by natural language generator with proper interfaces
- Tie PERSONAGE generator to narrative structure
Plan-Based Narrative structure representations

Either no dialogue, or when there is dialogue these representations bottom out in hand-crafted dialogue.

Example: author goal for detective to *Investigate*

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**Good Cop**
Precondition: Cop [attitude = young, hopeful]
Dynamic Conversation Text: Detective: “I am sorry for the loss of your friend <victim name>. We are just checking up on all of our leads and need to ask you a few questions. This is standard procedure.”

**Bad Cop**
Precondition: Cop [attitude = arrogant, jaded]
Dynamic Conversation Text: Detective: “Alright, chief don’t bullshit me. We got a dead body on our hands, and we know you and <victim name> isn’t exactly best buds. Where were you.”

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**Good Cop**
Precondition: Cop [attitude = young, hopeful]
Dynamic Conversation Text: Detective: “Just to make sure you weren’t at <crime location> around <crime time> right? We’ll just need somebody to confirm this, but I’m sure it will be no problem.”
Suspect: “Yeah I wasn’t there I don’t know where you’re going with this.”

**Bad Cop**
Precondition: Cop [attitude = arrogant, jaded]
Dynamic Conversation Text: Detective: “Well it looks like you’ll be making a trip back real soon. Gimme the names and numbers of the people you met at the bar – or maybe you just want...”
ONCE UPON A TIME GEORGE ANT LIVED NEAR A PATCH OF GROUND. THERE WAS A NEST IN AN ASH TREE. WILMA BIRD LIVED IN THE NEST. THERE WAS SOME WATER IN A RIVER. WILMA KNEW THAT THE WATER WAS IN THE RIVER. GEORGE KNEW THAT THE WATER WAS IN THE RIVER. ONE DAY WILMA WAS VERY THIRSTY. WILMA WANTED TO GET NEAR SOME WATER. WILMA FLEW FROM HER NEST ACROSS A MEADOW THROUGH A VALLEY TO THE RIVER. WILMA DRANK THE WATER. WILMA WASN’T VERY THIRSTY ANY MORE.

Fig. 1. Prose generated by TALE-SPIN, 1977

Once upon a time a woodman and his wife lived in a pretty cottage on the borders of a great forest. They had one little daughter, a sweet child, who was a favorite with every one. She was the joy of her mother’s heart. To please her, the good woman made her a little scarlet cloak and hood. She looked so pretty in it that everybody called her Little Red Riding Hood.

Fig. 2. Prose generated by AUTHOR, 2001

Once upon a time there lived in a pretty cottage, on the borders of a great forest, a woodman and his wife who had one little daughter, a sweet child, and a favorite with every one. She was the joy of her mother’s heart, and to please her, the good woman made her a little scarlet cloak and hood, in which she looked so pretty, that everybody called her Little Red Riding-Hood.

Fig. 3. Prose from Little Red Riding Hood (Thomson 1884)
It happened that grandmother was in bed the day Little Red Riding Hood went to see her. When the wolf reached the cottage door, he tapped. "Who is there?" the old lady asked. "Little Red Riding Hood, granny," said the wolf, trying to speak like her. The old lady said, "Come in, my dear." She was a little deaf. "Pull the string. The latch will come up." The wolf did as grandmother told him and went in. You may think how frightened poor grandmother was when she saw him instead of Little Red Riding Hood.

Fig. 6. Some elements of written character-to-character dialogue
Dialogue Systems Architecture

Text-to-Speech Synthesis

Speech, Nonverbals

Dialog Management

Data, Rules

Speech, Nonverbals

Personality?

Spoken Language Generation

Speech, Nonverbals

Spoken Language Understanding

Speech, Nonverbals

ASR

SLG

TTS

SLU

Words

Goal

Meaning

Words

Data, Rules
Procedural Language Generation: A Key Technology

- Wide range of generation parameters
- Different methods for creating models that control the parameters
  - Dynamic Real-Time Adaptation
  - Trainable: Machine Learning Techniques
  - Individual Personalization
Language Generation Module

Content Planner
What to say

Sentence Planner
How to Say It

Surface Realizer

Prosody Assigner

Speech Synthesizer
What is Heard
Variation controlled by the Language Generator

- vary content and form easily depending on any factor (context, personality, social relationship)
PERSONAGE Architecture: 67 Parameters

**INPUT:** Dialog Act, Content Pool

- **VERBOSITY**
- **RESTATEMENTS**
- **CONTENT POLARITY**
- **SYNTACTIC COMPLEXITY**
- **SELF-REFERENCE**

**OUTPUT**

**Realization**

- **FREQUENCY OF USE**
- **WORD LENGTH**
- **VERB STRENGTH**

**CONTENT PLANNER**

- **Syntactic Template Selection**
  - **CONTRAST:** e.g. however, but
  - **JUSTIFY:** e.g. so, since
  - **PERIOD**

**Aggregation**

- **EXCLAMATION**

**Pragmatic Marker Insertion**

- **HEDGES:** e.g. kind of, rather, basically, you know
- **FILLED PAUSES:** e.g. err...
- **SWEAR WORDS:** e.g. damn
- **IN GROUP MARKERS:** e.g. pal
- **STUTTERING:** e.g. Ri-Ri-River
- **TAG QUESTIONS**

**Lexical Choice**
Character Creator

- Create parameter models by data mining utterance sets from lead characters in film dialogues?
- Discriminative features that map to generation parameters, getting 70 to 80% accuracy on classification
“Stop Cartmill Because Cartmill is Evil”

- Tortoise (long sentences, hedges)
  - Maybe you would be interested in knowing that Cartmill cannot be permitted to continue, unfortunately.
  - How can one man be so evil? Unfortunately, actually, you need to stop Cartmill.
  - The dreams of Cartmill are the stuff of nightmares. End the machinations of the doctor.

- Otter (mild swear words, disfluencies, verbosity)
  - How can really one man be so evil? You must thwart Cartmill pup.
  - Pull up the root of Cartmill's schemes. No one is darn worse than Cartmill!
  - Well, mmhm... no one is worse than Cartmill, so Cartmill cannot be permitted to continue.
  - Oh gosh ok, Cartmill cannot be permitted to continue, so Cartmill reeks of evil.
Motivation II

- CC work to date suggests that the interface between narrative structure and dialogue generation needs further theoretical and technical development.
- Narrative structure and plot representations in EIS tools (Wide-Ruled, Comme Il Faut, MisManor & Grail) do not have the right representations to support dialogue generation.

This class:

- Examine theories of narrative representations
- Examine work in NLP on inducing narrative structures and the types of representations that NLP assumes
- Examine tools for building interactive stories
- Use project work and class to advance our understanding of what is required of narrative structure to support high quality automatic dialogue generation
Dialogue & Narrative Structure: How does narrative structure and dialogue interact?
Advanced Seminar: Assume research interest

- Class is interdisciplinary.
- Assume you all have something to contribute to our understanding of this topic.
- Class is research focused.
- You may have to struggle with reading papers that you don’t have exactly the right background for. BUT
  - You still get a lot out of them
  - Confusions resolved in class discussion
  - You identify a project that is of great interest to you and make research progress.
  - At the end of the class you have a draft of a paper that could be submitted to a conference, such as FDG, IVA, INT, AIIDE, ICIDS, ACL
Sample research questions

- How does the writer of an interactive story or any kind of story for that matter, decide what aspects of the plot structure should be revealed in dialogue vs. in third person narrative or other means?
- What kinds of representations of narrative structure are needed to support automatic generation of character dialogue?
- Is it possible to develop some computational analysis of the interaction between dialogue and scene description in film screen plays to determine how they work together to move the story along, to convey character emotion, or other key aspects of the story?
Sample Research Questions. II

- What are the computational representations of dialogue currently used in interactive stories and what are their weaknesses? How can we make them better?
- In web log stories, how is reported dialogue used and when is it used?
- Can we use weblog stories to construct models of narrative structure for different types of events?
Sample Research Questions

- How does Pride and Prejudice character Elizabeth's language in dialogue differ when she is talking to her sisters vs. talking to Darcy? Can we use NLP tools such as LIWC lexical tagging or other ways of measuring language to quantify whether there is a difference and what it is?

- Is it possible to use tools like Perceptual Markup Language with an interactive agent to program appropriate dialogue behaviors?
Sample Research Questions

- Can we use the NLDS Personage expressive natural language generator to generate good dialogue for interactive stories that could increase author creativity? What extensions to the Personage engine would be useful or needed?

- How do people learn from interactive story systems? How can we make it easier to construct such systems? What kinds of models from natural language processing are useful?
Expressive Language in Conversation

- Expresses Speaker’s Personality & Identity
  - culture, style, origin, class
- Dynamically Adapts to Conversational Partner
  - Convergent: Matching, e.g. two friends (extraverts) talking
  - Divergent: Tailoring, e.g. parent to baby
- Controlled by *generation* parameters
  - Content: Who is interested in what, who knows what
  - Linguistic: Lexical and Syntactic Choice
  - Pragmatic: Personality & Social Relationship
  - Acoustic: Speaking Rate, Amplitude, Prosody
What will we do?
Examine interaction of dialogue with narrative structure in some traditional media
Corpora Pages for Class. Still adding.

- https://courses.soe.ucsc.edu/courses/cmpts245/Spring13/01/pages/data
Scene from Annie Hall: Lobby of Sports Club

**ALVY**: Uh ... you-you wanna lift?

**ANNIE**: Turning and aiming her thumb over her shoulder

Oh, why-uh ... y-y-you gotta car?

**ALVY**: No, um ... I was gonna take a cab.

**ANNIE**: Laughing  Oh, no, I have a car.

**ALVY**: You have a car?

Annie smiles, hands folded in front of her

So ... Clears his throat. I don’t understand why ... if you have a car, so then-then wh-why did you say “Do you have a car?” ... like you wanted a lift?
Scene from *The Terminator*: Cigar biker

**TERMINATOR:** I need your clothes, your boots, and your motorcycle.
**CIGAR BIKER:** You forgot to say please.

*Terminator hurls Cigar, all 230 pounds of him, clear over the bar, through the serving window into the kitchen, where he lands on the big flat grill. We hear a SOUND like SIZZLING BACON as Cigar screams, flopping jerking. He rolls off in a smoking heap.*
What can we learn from a corpus?

- **Reveal Subtext**: The way a character says something is one way to reveal subtext and character emotion
  - Short vs. Long turns/sentences => friendliness, formality
  - Word choice => level of education,
  - Disfluencies, Stuttering => anxiety, hesitation
  - Direct forms vs. indirect forms => extraversion, aggression

- **Character Voice**: Learning to model specific characters or sets of characters should produce individual character voices
Find 3 examples of scenes in a film from the IMSDB corpus that include both scene descriptions and dialogue, that are cases where you think that the interaction between dialogue and scene are interesting. For example, the 'interesting interactions' would arise from trying to model the character's emotions, or because they induce some kind of inference about character or plot, or cases where it seems that the plot depends on contextual and emotional interactions that are captured only by the relationship between the scene descriptions and what is said the dialogue. Write up your three selected scenes in a format that can be used to support discussion in class next Tuesday when the homework is due, (i.e. you could use it to present to the class using the projector). Describe why you think the scenes are interesting from the perspective of trying to computationally model what is going on in them. Write two paragraphs describing how it might be possible to computationally model this interaction in such a way as to support an interactive story, i.e. one of the participants in the dialogue would be a computational agent and one of the participants would be a human. Turn this in on Ecommons.
Processing Scene Descriptions

Automatic Script Generation

Building Blocks

Script Generation

- Event Structure Induction
- Object Relation Database

Coreference Resolution

Event Clustering

Total Ordering

Douglas Quaid and his wife Kristen, are asleep in bed.
Gradually the room lights brighten.
The clock chimes and begins speaking in a soft, feminine voice.
They don’t budge.
Shortly, the clock chimes again.
Quaid’s wife stirs.
Maddeningly, the clock chimes a third time.
Quaid reaches out and shuts the clock off.
Then he sits up in bed.
He swings his legs out from under the covers and sits on the edge of the bed.
He puts on his glasses and sits, lost in thought.
He is a good-looking but conventional man in his early thirties.
He seems rather in awe of his wife, who is...
Tick, tock --

Quail reaches out and shuts the clock off. Then he sits up in bed.

He swings his legs out from under the covers and sits on the edge of the bed. He puts on his glasses and sits, lost in thought.

He is a good-looking but conventional man in his early thirties. He seems rather in awe of his wife, who is attractive and rather off-hand towards him.

Kirsten pulls on her robe, lights a cigarette, sits fishing for her slippers.

**QUAIL**

I dreamed about Mars again... it was bizarre, yet is was so real...

**KIRSTEN**

(casual)

It's your time of the month again.

Quail looks at her quizzically.

**KIRSTEN**

(continuing; world-weary air)

At least once a month. Douglas Quail's obsession. For twelve years you've been talking about Mars.

**QUAIL**

People do go to Mars, you know.

**KIRSTEN**


Quail looks crestfallen.

**KIRSTEN**
Read and discuss research papers on dialogue or on narrative structure, and papers in the intersection.
Recent Novel Approaches

- ACL/NAACL/EMNLP conferences. Lots of recent work in NLP on inducing narrative structures from text
- IVA. Lots of work in intelligent virtual agents (IVAs) on interactive story systems for various applications
- ACII, IVA, AIIDE, AAMAS. New architectures for building agents, PML, BML.
- ICIDS. International Conference on Interactive Story Systems
- AIIDE: Artificial Intelligence in Digital Entertainment
- FDG: Foundations of Digital Games
- INT: Intelligent Narrative Technologies series of workshops
Syllabus & Course Structure

- [http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models](http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models)
- Can you see this class in your Ecommons?
- Also probably good idea to set up Piazza for discussion of homeworks etc.
Scherezade Story Graph: Elson & McKeown

Provides one way of linking story structure to natural language representation by annotating stories
Dialogue Systems Architecture

- Speech, Nonverbals
- Text-to-Speech Synthesis
- Words
- Spoken Language Generation
- Personality?
- Data, Rules
- Goal
- Meaning
- Dialogue Management
- TTS
- ASR
- SLU
- SLG
Expressivity?: Which parameters and models?

- Theories and Corpus Studies of Human Dialogue Behavior
- Psychology: Big Five Theory of Personality
- Sociolinguistics: Politeness Theory
- Learn from Film Character Dialogue
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Character Creator: Author creativity

- Learn models of character voice (linguistic style) from film screenplays
- Use the learned models to control the parameters of PERSONAGE
- Apply the learned models to character dialogue in the SpyFeet story domain
  - A Different!! Domain

- Test human perceptions of the resulting generated utterances
Example: Model Learned for Annie

Map character model to PERSONAGE parameters: weighted average of features. Parameters either binary, or scalar range 0…1.

<table>
<thead>
<tr>
<th>PERSONAGE parameter</th>
<th>Description</th>
<th>Sample mapped features (from character model)</th>
<th>Annie</th>
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<tbody>
<tr>
<td>Verbosity</td>
<td>Control # of propositions in the utterances</td>
<td>Number of sentences per turn, words per sentence</td>
<td>0.78</td>
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<tr>
<td>Content polarity</td>
<td>Control polarity of propositions expressed</td>
<td>Polarity-overall, LIWC-Posemo, LIWC-Negemo, LIWC-Negate</td>
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<td>Polarization</td>
<td>Control expressed polarity as neutral or extreme</td>
<td>1 if polarity-overall is strong negative or positive</td>
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<td>Positive content first</td>
<td>Determine whether positive propositions – including the claim – are uttered first</td>
<td>Accept-ratio, Accept-first-ratio</td>
<td>1.00</td>
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</table>

... etc.
Original and Generated Utterances

Annie (Annie Hall) original dialogue sample

• H’m?
That’s, uh ... that’s pretty serious stuff there.
Yeah? Yeah?
M’hm? M’hm.
Yeah.
U-huh.
• Hi. Hi, hi.
Well, bye.
Oh, yeah? So do you.
Oh, God, whatta- whatta dumb thing to say, right?
I mean, you say it, “You play well,” and right away ... I have to say well. Oh, oh ... God, Annie. Well ... oh, well ... la-de-da, la-de-da, la-la

Annie’s Learned Z-Score Model for our ENLG engine

Verbosity=0.78
Content polarity =0.77
Polarization =0.72
Repetition polarity=0.79
Concessions =0.83
Concessions Polarity=0.26
Positive content first=1.00
First Person in Claim=0.6
Claim Polarity=0.57
... etc.

Generated dialogue (SpyFeet story domain)

• Come on, I don’t know, do you? People say Cartmill is strange while I don’t rush to um.. judgment.
• I don’t know. I think that you brought me cabbage, so I will tell something to you, alright?
• Yea, I’m not sure, would you be? Wolf wears a hard shell but he is really gentle.
• I see. I am not sure. Obviously, I respect Wolf. However, he isn’t my close friend, is he?
Syllabus & Course Structure

- [http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models](http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models)

- Can you see this class in your Ecommons?

- Also probably good idea to set up Piazza for discussion of homeworks etc.
Do a project on something that you discover that interests you (or if you have a related project expand that using insights/material from class)
Project requirements and deadlines

- [http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models](http://courses.soe.ucsc.edu/courses/cmps245/Spring13/01/pages/computational-models)

- Project is 40% of your grade. Proposal due in the middle of term