Integrating User and Story Context into Textual Affect Sensing

Hugo Liu
Software Agents Group
MIT Media Lab

12.4.2002 affective computing talk
Overview

- Toward Affective Story Understanding
- Textual Affect Sensing: Traditional Approaches
- A Real-World Knowledge Approach
- Tracking Story Context
- Bootstrapping User Affect Model Acquisition
- Integration
Believable software agents should be social and affective [Nass et al. 1994; Bates, 1994]

Text/speech input are important and pervasive modalities (access via phone, pda, web)

This work focuses on text / transcribed speech

effective textual affect processing approaches the full difficulty of AI “story understanding”
Toward Affective Story Understanding

Mary was invited to Jack’s Party. She wondered if he would like a kite (from Minsky, 2000)

• Full Story Understanding
  – Test: Should be able to answer questions about the text, including those requiring implicit knowledge
  – Should track the states of characters (including narrator) and events through the course of the story
  – Create and model expectations of forthcoming events (daemons) [Charniak, 1972]
  – The interpretation of story events are Bayesian conditioned on expectations and states of characters and history of events
Toward Affective Story Understanding

- Full story understanding is out-of-reach until:
  - We have a better theory of philosophy of mind
  - Have better parsers and semantic understanders

- Affective understanding is a projection of full story understanding onto the affective dimensions.
  - Unfortunately, we would still need to maintain a lot of state that is not directly related to affect

- Pragmatist: “Let’s start with textual affect sensing and slowly integrate state into it.”
Textual Affect Sensing: Traditional Approaches

- **Keyword Spotting** [Elliott, Batliner et al.]
  - I had a **really bad** day at work.
  - I got fired today.

- **Lexical Affinity**
  - Lexical valence: fired ➔ .80 BAD
  - That motivational talk today really fired me up.

- **Statistical NLP i.e. LSA** [Goertzel et al.]
  - Trained linguistic models are semantically weak
  - Requires large input for accuracy
  - Can typically only classify affect into 2 or 3 states

- **Cognitive/Symbolic Models** [Schank, Dyer, Ortony]
Textual Affect Sensing: Cognitive/Symbolic Models

- Ortony, Clore, Collins [1988]
  - Emotions have cognitive structure
- Schank and Dyer
  - Psychologically motivated modeling of character’s affective states
  - Symbolic functionalism aka Strong Symbol AI has not worked. Not flexible, robust, or extensible.
  - Semantic Externalism [Putnam, 1988]
    - Meaning is out there in the community + environment
- Affective meaning is out there in the community + environment???
A Real-World Knowledge Approach

- Textual Affect Sensing
- Evaluating the underlying affective meaning (c.f. keyword spotting) of text at the sentential level (c.f. statistical NLP)
- Affect bias: Commonsense POV
- Open Mind Commonsense is used
  - 400,000 pieces of knowledge about the everyday world, including affective knowledge (c.f. lexical affinity)
  - Generic commonsense is an External Semantic Resource (c.f. cognitive/symbolic models)

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A Real-World Knowledge Approach: OMCS

- (Non-affective)
  - *An activity* a doctor *can do* is examine the patient.
  - *You are likely to find* rollercoasters *in* an amusement park.
  - *The effect of* eating dinner *is* loss of appetite.

- (Affective)
  - *Some people find* ghosts *to be* scary.
  - *A person wants* popularity.
  - *A consequence of* riding a rollercoaster *may be* excitement.
A Small Society of Linguistic Models

- Subject-Verb-Object-Object Model (best accuracy)
  “Getting into a car accident can be scary” (OMCS)
  \[<\text{subj}>: \text{person\_class}, <\text{verb}>: \text{get\_into}, <\text{obj1}>: \text{‘car accident’}, <\text{obj2}>: \text{null}\]

- Concept-Level Unigram Model (fall-back 1)

- Concept-Level Valence “+/−” (fall-back 2)
  \text{narrator neg-verb pos-obj $\rightarrow$ neg-valence}
  I WRECKED MY CAR

- Modifier Unigrams (fall-back 3)
Model Trainer

Linguistic Processing Suite:
- Ontology-based Parsing
- POS tagging,
- phrase chunking,
- constituent parsing,
- SVOO identification,
- Semantic Class Generalizer

Emotional Commonsense Filter & Grounder

Propagation Trainer (run twice)

Emotion Ground Keywords

Models:
- SVOO
- Concept Unigram
- Concept Valence
- Modifier Unigram

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Text Analyser

raw story text
sentences
(independent clauses)

Segmenter

Linguistic Processing Suite:
- POS tagging,
- phrase chunking,
- constituent parsing,
- SVOO identification,
- Semantic Class Generalizer

Story Interpreter

Trained Models

Meta-emotion Patterns

Smoother

Expressor
(???)

re-annotated
sentences

re-annotated
sentences

parsed & processed
sentences

annotated sentences

parsed & processed
sentences

sentences

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Demonstration

- Click Here for Empathy Buddy
User Study

- 20 person study
- Performed 9/16-9/18
- Three interfaces given in random order
- 5 ? Questionnaire
- Implicit counting

Performance Measurement

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>Neutral face</th>
<th>Alternating, Randomized faces</th>
<th>EmpathyBuddy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program was entertaining</td>
<td>4.2</td>
<td>6.2</td>
<td>6.8</td>
</tr>
<tr>
<td>The program was interactive</td>
<td>4.6</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>The program behaved intelligently</td>
<td>4.3</td>
<td>3.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Overall I was pleased with the program and would use it to write email.</td>
<td>3.6</td>
<td>4.4</td>
<td>6.0</td>
</tr>
</tbody>
</table>

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Tracking Story Context

● OK, we can sense the user-independent (commonsense POV) affect of text at the *sentence level*.
● But, there’s no story-level coherence
● A few tricks:
  – Smoothing
    ● Decay, Interpolation, Global Mood, Meta-emotion
  – Topic-tracking
  – Character Affect-tracking
  – Plot Contour-tracking
Bootstrapping User Affect Model Acquisition

- The commonsense-POV might work with casual encounters with users, but not over longer term interactions
- Track user mood over interactions with different people, different topics
- Trap “personal affective commonsense”
  - *I hate crowded bars.*