THE UNIVERSITY OF TOKYO

A Cognitively Based Approach to Affect Sensing from Text

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1. Research Purpose

1) **Build Affective User Interface**
   Text-based Empathic Dialog System with Emotional Intelligence
2) **Emotional Intelligence**
   a) Represent an ability to validly reason with emotions and to use emotions to enhance thought
   b) Emotional Perception and Expression
   the ability to accurately identify and express feelings
3) **Emotion in Text or Linguistic Data**
   a) What emotions to recognise and How?
   b) En-tag the emotion for communication

2. Our Focus

- **Cognitive & Appraisal Structure of Emotion using OCC Model**
- **Classifying emotions into 22 types**
- **User Model based on LIWC and RDBMS**

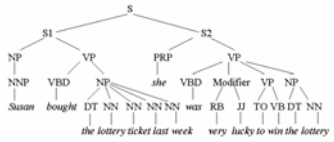
3. Methods

1) Chat Messages/Sentences Pre-Processing

a) Eliminate 'non-emotional' sentences
I. Questions
II. Clauses Phrases which begin with "when", "after", "before", "if"

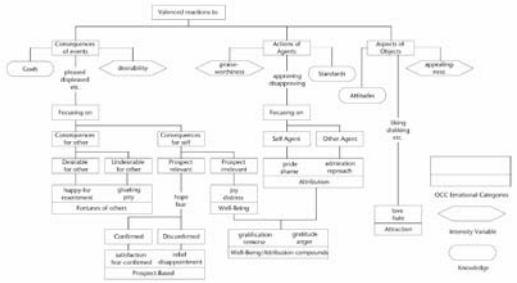
b) Sentence-level Processing. The following steps are performed:
I. Sentence Splitting
multiple-sentence text is spitted into single sentence
II. POS (part of speech) Tagging and Sentence Structure Recognition
III. Stemming words
Base form of verbs, adjectives etc

DT	: determiner
NNP	: proper noun
NN	: common noun
PRP	: personal pronoun
RB	: adverb
VBD	: verb, past tense
VB	: verb, base form
JJ	: adjective



e.g. Susan/*NNP* bought/*VBD* the/*DT* lottery/*NN* Ticket/*NN* last/*NN* week/*NN,* she/*PRP* was/*VBD* lucky/*JJ* to/*TO* win/*VB* the/*DT* lottery/*NN.*

2) Applying Cognitive and Appraisal Structure of Emotion based on OCC Model

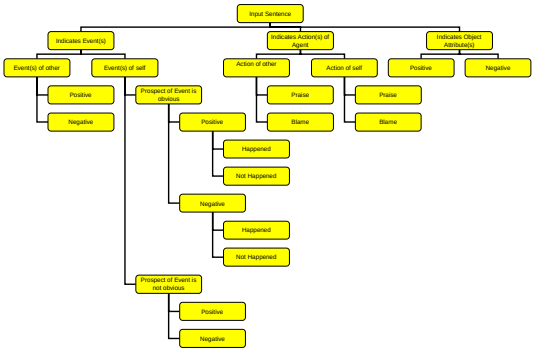


OCC Model specifies 22 emotion categories based on valenced reactions to situations constructed either as being goal relevant events, as acts of an accountable agent (including itself), or as attractive or unattractive objects.

Primarily we are considering six positive (joy, hope, relief, pride, gratitude and love) and six negative (distress, fear, disappointment, remorse, anger and hate) emotion categories.

3) Steps to fit linguistic information with the OCC Model

- **Classification:** Evaluates for an event, action or object, resulting what emotional categories are affected.
- **Quantification:** Calculates intensities of the affected emotional categories.
- **Interaction:** Evaluate a Interaction model based on Knowledge about user.
- **Mapping:** The OCC model distinguishes 22 emotional categories. The classification quantification and interaction define the emotional value of a certain event, action or object. This emotional value is mapped to a category.
- Expression: The emotional state can be expressed directly through scripted texts or automatically generated text using affective lexicons



Classification tree to Evaluate for an event, action or object based emotion

4. Emotion Reasoning (examples)

happy-for$(a, x, e, y, txt) \leftarrow [$ Valanced_Reaction$(txt) \wedge$Event_Consequence$(e\ txt) \wedge$ Positive_Polarity$(e) \wedge (x <> y$ in $txt) \wedge$ Desire_For $(e, y)]$

"Susan bought a lottery ticket last week, she was very lucky to win the lottery"
- Agent: Susan (x)
- Event/Verb: Bought [buy], Win (e)
- Adjective: lucky (*valence*)
- Adverb: very (*valence*)
- Object/Entity: lottery ticket, lottery (*polarity* or *desirability*)
- Conditionality: *Null*

hope $(a, x, e, txt) \leftarrow [$ Valanced_Reaction $(txt) \wedge$Event_Consequence $(e, txt) \wedge$ Desire_For $(e, x) \wedge$ Unconfirmed_Status $(e, txt) \wedge$ Belief (benefit $a\ e)]$

"I am wondering if I could buy a new car"
- Agent: I (x)
- Event/Verb: wonder, buy (e)
- Adjective: new (*valence*)
- Reaction(x, e, txt) = wondering // *what the agent does/did for e?*
- Adverb: *null*
- Object/Entity: new car (*polarity* or *desirability*)
- Conditionality: *true // "If I could"*

Fear$(a, x, e, txt) \leftarrow [$ Valanced_Reaction $(txt) \wedge$Event_Consequence $(e, txt) \wedge \neg$ Desire_For $(e, x) \wedge$ Unconfirmed_Status $(e, tx) \wedge \neg$ Belief(benefit $a\ e)]$

" The employee, suspecting he was no longer needed, he might be fired"
- Agent: The employee (x)
- Event/Verb: suspect, need , fire (e)
- Reaction(x, e, txt) = suspecting, no longer needed, fired
- Adverb: no longer (*valence*)
- Object/Entity: suspected to be fired (*polarity* or *desirability*)
- Conditionality: *true // "might be"*

Sample Conversation:

Conversation with ALICE Chatbot:
Human: *Ok, I am fine now but last night I had a bad dream*
Computer: *Glad to hear it, Human. Why now? Interesting. Really. Do you still have a bad dream?*
Human: *not really, last night I was falling from a mountain in the dream*
Computer: *Oh really? Really. Where were you falling from a mountain in the dream? I have been missing you*
Human: *that was not real but it was really scary though*
Computer: *Oh Give me an example of real but it was really scary.*

Expected affective conversation:
Human: *Cool!! But last night I had a bad dream.*
Computer: *Ahh! Was that scary?*
Human: *Not really*
Computer: *Then, why are you afraid of?*
Human: *I was in a kind of afraid of falling from a mountain!!*
Computer: *umm, Do you have such bad dream often?*
Human: *Not that often*

5. Summary

This paper presents an Emotion Recognition from textual interaction based on cognitive and appraisal structure of emotions

- Syntactical sentence-level processing to fit OCC model is proposed
- Our approach is based on the collection of lexicon and simple rules to deal with sentence-level processing and assessing the valanced reactions to events, agents or objects described in the texts.
- Affective state awareness and affective machine reply will improve the interaction and usability of any system.