

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

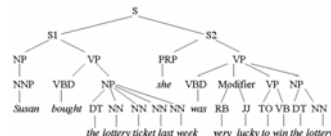
- **Cognitive & Appraisal Structure of Emotion using OCC Model**
- **Classifying emotions into 22 types**
- **User Model based on LIWC and RDBMS**

3. Methods

1) Chat Messages/Sentences Pre-Processing

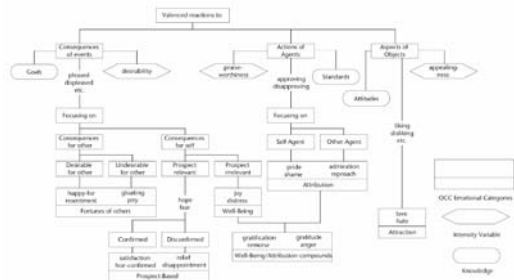
- a) **Eliminate 'non-emotional' sentences**
 - I. Questions
 - II. Clauses Phrases which begin with "when", "after", "before", "if"
- b) **Sentence-level Processing. The following steps are performed:**
 - I. Sentence Splitting
multiple-sentence text is spitted into single sentence
 - II. POS (part 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

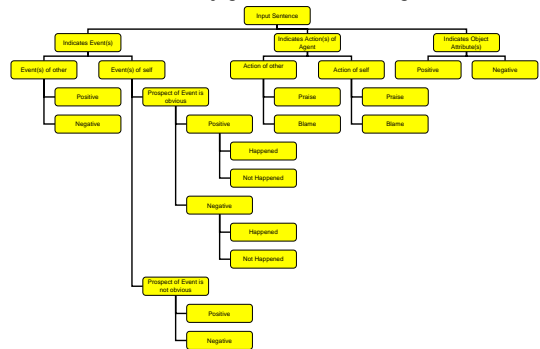


OCC Model specifies 22 emotion categories based on valenced reactions to situations constructed either as being goal relevant events, as acts of an accountable agent (including itself), or as attractive or unattractive objects.

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 [Valenced_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 [Valenced_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 (*a*)
- 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 [Valenced_Reaction(*txt*) \wedge Event_Consequence(*e, txt*) \wedge \neg Desire_For(*e, x*) \wedge Unconfirmed_Status(*e, txt*) \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 scary.

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 valenced 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.