Understanding Consumer Experience with ACT-R

Alessandro Oltramari[1,2]

(work done in collaboration with Francesco Patt[2] and Paolo Panizza[2])

[1]Carnegie Mellon University, CyLab (CS Department)

[2]B-Sm@rk Ltd (Dublin, Ireland)

b·sm@rk

Founders

Nicola Farronato
Marketer, CEO

Paolo Panizza
Engineer, CTO

Developers

Fabio Alessandrelli

Giacomo Persichini

2010
Born in Dublin from Italian founders

2011
Winner of Top Irish Start-up competition @NDRC

2012
Global Hot 100 @Boston

2013
Top 10 Semantic Tech Start-up @ San Francisco

Communication

Constantina Tyrogalas

R&D

Alessandro Oltramari

Francesco Patt

2014

€**1m** funds from italian-irish investors

2 patents pending

ENTERPRISE IRELAND NDRC

- **MySmark©: tech and theory**

- **Gauging emotions with cognitive models**

- **Example/Results**

❖ ***Sentiment analysis*** leverages on machine learning to dig out emotions hidden in blogs, tweets, status updates, check-ins,...

❖ But what about "openly disclosed sentiments"?

  ❖ Popular rating systems such as the "+1" or "Like" (respectively, about 3 and 6 billions per day) assess the willingness of sharing basic emotions related to specific contents, <u>but capture just tiny bits of user's experience</u>.

➡ **MySmark**© platform aims at exposing user's emotional experience, analyzing it and recommending products/ services/events on the basis of <u>user experience models</u>.

MySmark© platform is:

Based on

- Five-factor model (Big 5 personality traits)
  - O, C, E, A, N
    - Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism
- Plutchik's "wheels of emotion"
- Russell-Mehrabian's PAD model
  - Pleasure, Arousal, Dominance
- Ortony, Clore and Collins cognitive theory of emotions

Used for

- Emotional mapping
- Real-time surveys
- Personality assessment
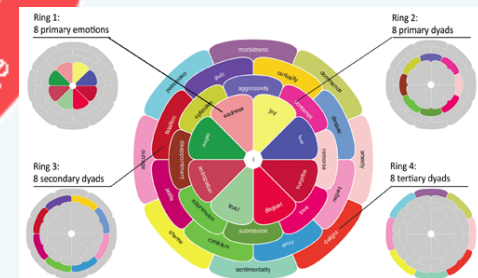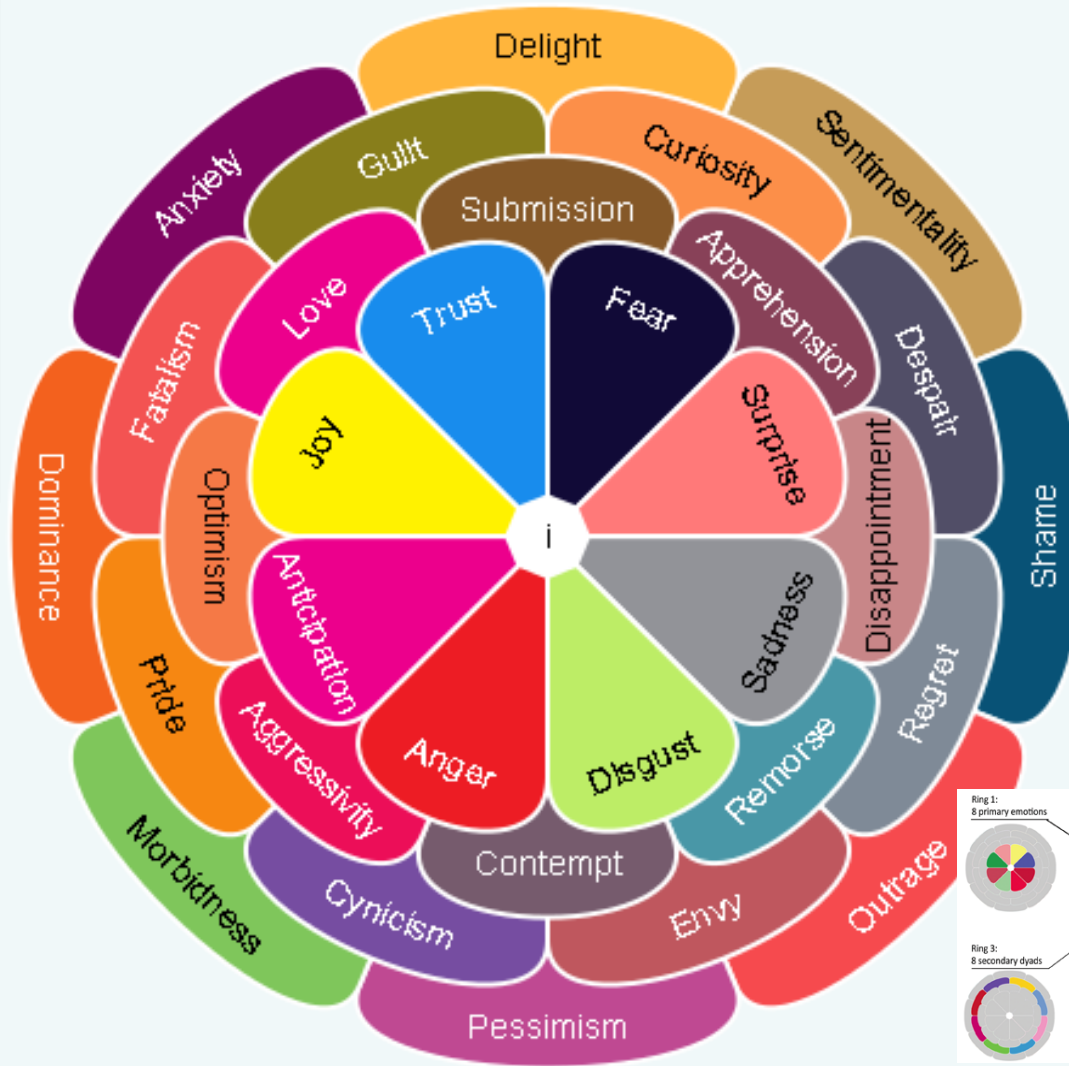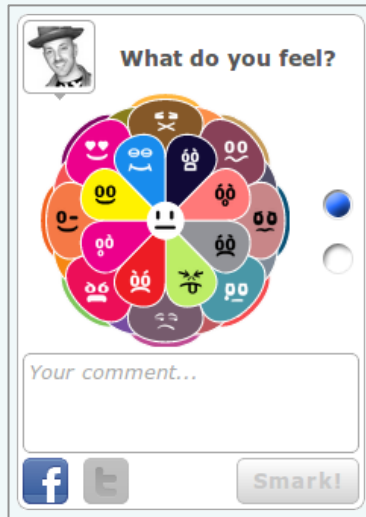
Developed as a *customizable interactive widget*

Plutchik's Emotion Circumplex model:

- 2D

  o Primary emotions: 8 basic bipolar emotions: *joy* vs. *sadness, anger* vs. *fear*, *acceptance* vs. *disgust*, *surprise* vs. *expectancy*

  o Secondary and tertiary are the result for composition

- 3D (*Intensity* of emotions as 3rd Dimension)
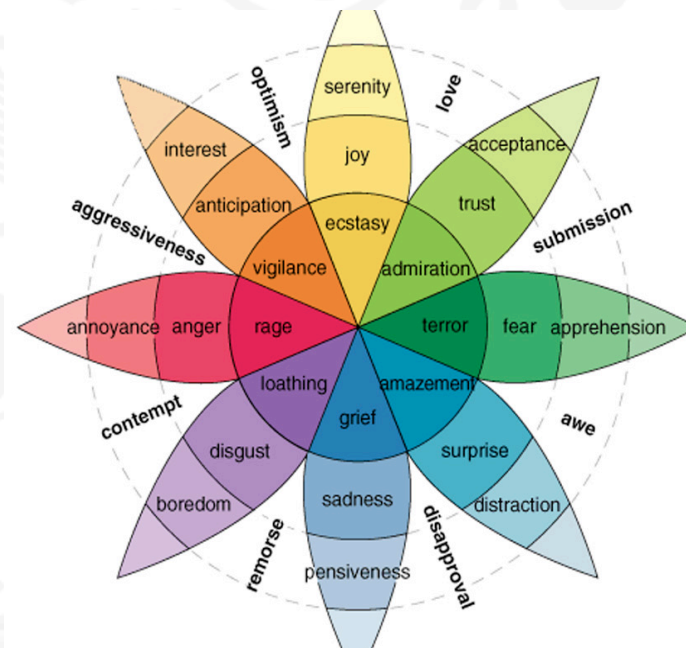
The Plutchik Emotion Circumplex
2D (left) and 3D (above) developed in 1980
by Robert Plutchik.

The Rose of Emotions offers an overview of all emotions that you use to tag your content and describes how emotions are related. You can personalise it to your liking. Simply click on a petal of the Rose and change label, colour, emoticon and aphorism.

What do you feel?

Your comment...

Smark!

Delight · Curiosity · Sentimentality · Anxiety · Gullt · Submission · Apprehension · Despair · Love · Trust · Fear · Fatalism · Joy · Surprise · Disappointment · Shame · Dominance · Optimism · Anticipation · Sadness · Disgust · Remorse · Regret · Pride · Aggressivity · Anger · Contempt · Envy · Outrage · Morbidness · Cynicism · Pessimism

Ring 1:
8 primary emotions

Ring 2:
8 primary dyads

Ring 3:
8 secondary dyads

Ring 4:
8 tertiary dyads

Ortony, Clore, Collins. *The Cognitive Structure of Emotions*. Cambridge University Press, 1988.*

- **OCC theory**: emotions as "valenced reactions to events, agents, or objects" depending on suitable eliciting conditions.

  - **Resignation** is a particular kind of cognitive state, namely a **belief state** that has as **its object the inevitability of some undesirable event**. Thus, the mental state of a 'feeling of hopelessness" refers primarily to a belief that some situation has this characteristic (*p. 131).

- On this basis an emotional reaction can vary respectively according to

  1. **being pleased/displeased** of some events: if consequences are desirable then the event is pleased, otherwise it is unpleased

     e.g., "The manager was pleased by the President agreeing to his working plan"

  2. **approving/disapproving** another agents' action as praiseworthy or blameworthy

     e.g., "The audience approved with a long applause Annan's discourse"

  3. **liking/disliking** an object (including persons, things, ideas, experiences) as appealing or unappealing with respect to one's attitudes

     e.g. "Mary didn't like that movie because it was too much crude"

- **MySmark© OCC Reasoning:**

  - Belief and goal confirmation: ontology reasoning triggered by free-text comments combined with temporal stamps of smarks per user

    - State of the art: to the best of our knowledge, limited to the the "Affective Reasoner" (Clark Elliot, 1992)

LEAVE YOUR EMOTIONAL PORTRAIT WITH

IPAD LOCATION

What do you feel?

Your comment…

Smark!

Click on the painting,
over the spot you like most.

Select from the "Rose of Emotions" the
sentiment you're feeling.
If you like, you can leave a comment too.

Check where the detail you chose
is located today, 270 after.

SATELLITE IMAGE

THE PAINTING

Places on paint visitors smarked on.

REAL TIME DATA AND STATISTICS

www.canalettovenezia.it/emozioni/
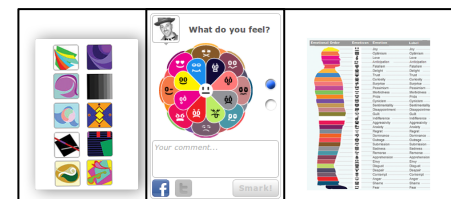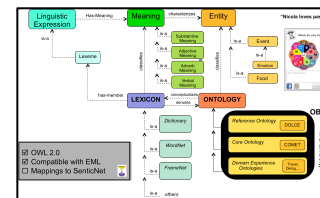
Making sense of affect

ENVIRONMENT

Choice
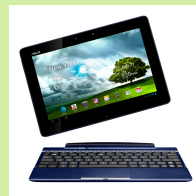
Semantic Analysis
- Web contents
- Free-text feedbacks (when available)

Consumer Experience
- Personality test
- Smarks
- Other tools

INPUT

OUTPUT

ACT-R

$$A_i = \ln \sum_j t_j^{-d} + \sum_k W_k S_{ki} + \sum_l MP_i Sim_{li} + N(0, \sigma)$$

$$V = \min \sum_i P_i \cdot \left(1 - Sim(V, V_i)\right)^2$$

KNOWLEDGE

Declarative Module

Affective patterns
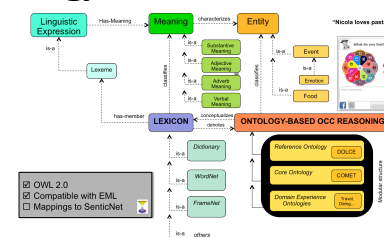- OCC structures
- Smark bundles

Semantic similarities
Consumer personality

Procedural Module

Affective reasoning
- Goal-directedness
- Blending on *affective patterns*

Ontology-based OCC reasoning

ASSESSMENT/ RECOMMENDATION

Best match: *Love*
Probability Distribution:
Surprise 35%, Anticipation 14 %, ...

Recommendation:

"Why don't you try Monet's exhibition in Paris"

MySmark

We override some of the ACT-R standard cognitive machinery

- ## PARTIAL-MATCHING-HOOK

  - o For each selected emotion label (=Smark), a function computes **semantic similarity*** with the remaining 32 available smarks

    *For now limited to WordNet based gloss-vector measure.

- ## BL-HOOK

  - o The base-level activation of affective patterns is computed on the basis of an equation designed to reflect the personality of the consumer, gauged by OCEAN/PAD.

- ## SPREADING HOOK

  - o Inhibitory effect: given a low self-esteem as part of the input regarding a user's personality, spreading of activation is set negative for positive patterns

MySmark

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Not everyone wants cheering up, new study suggests

Tuesday, June 24, 2014

You may want to rethink cheering up your friends who have low self-esteem because chances are they don't want to hear it.

People with low self-esteem have overly negative views of themselves, and often interpret critical feedback, romantic rejections, or unsuccessful job applications as evidence of their general unworthiness. A new study from researchers at the University of Waterloo and Wilfrid Laurier University found that they likely don't want you to try to boost their spirits.

"People with low self-esteem want their loved ones to see them as they see themselves. As such, they are often resistant to their friends' reminders of how positively they see them and reject what we call positive reframing—expressions of optimism and encouragement for bettering their situation," said Professor Denise Marigold, from Renison University College at Waterloo, and lead author of the study.
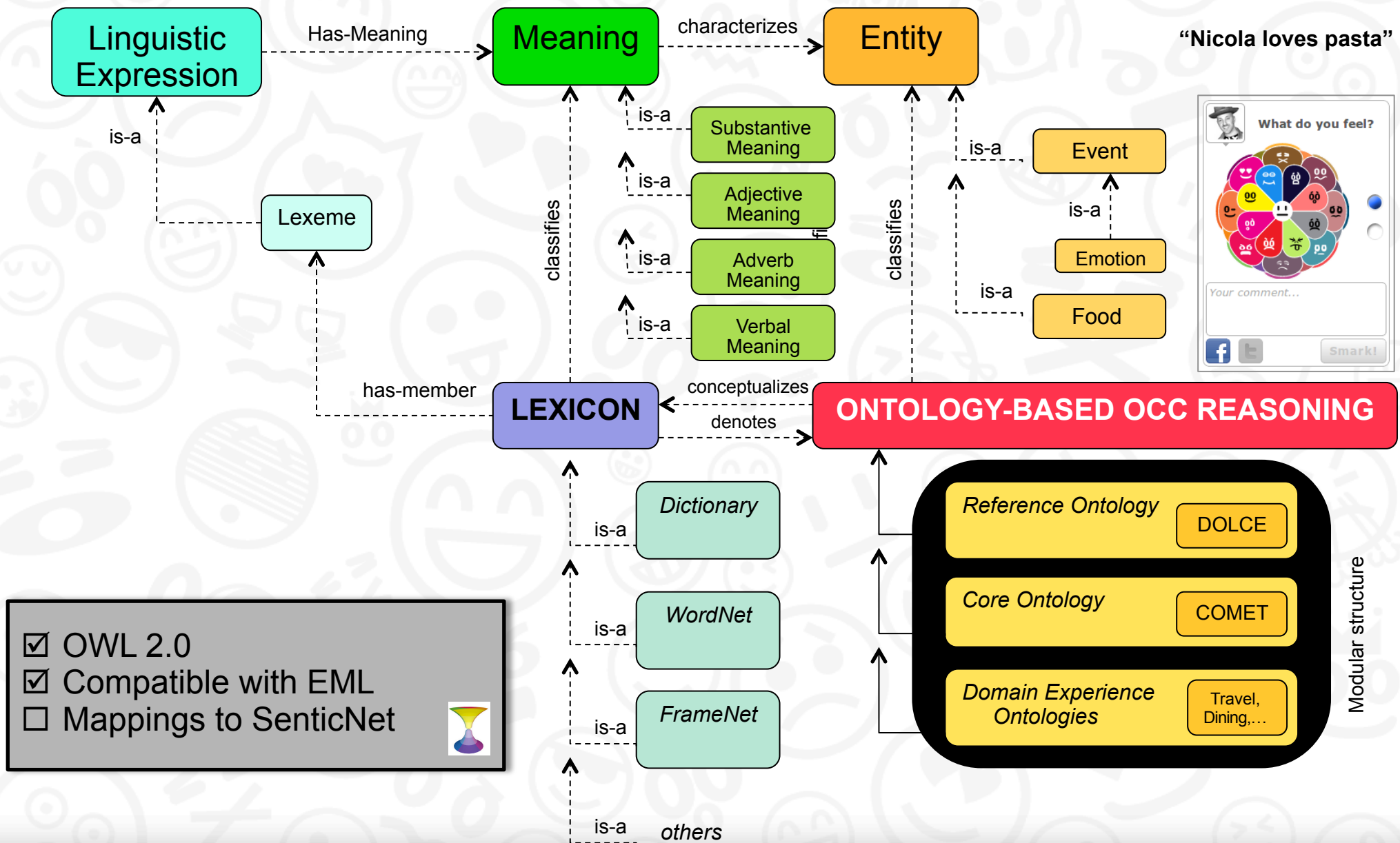
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OB-1©: the "Hybrid" Semantic Model underlying **MySmark**©

MySmark

Linguistic Expression — Has-Meaning → Meaning — characterizes → Entity

is-a → Lexeme

Meaning:
- is-a → Substantive Meaning
- is-a → Adjective Meaning
- is-a → Adverb Meaning
- is-a → Verbal Meaning

Entity:
- is-a → Event
  - is-a → Emotion
- is-a → Food

"Nicola loves pasta"

What do you feel?

Your comment...

Smark!

classifies

Lexeme — has-member → LEXICON

LEXICON ← conceptualizes — ONTOLOGY-BASED OCC REASONING
LEXICON — denotes → ONTOLOGY-BASED OCC REASONING

LEXICON:
- is-a → *Dictionary*
- is-a → *WordNet*
- is-a → *FrameNet*
- is-a → *others*

- ☑ OWL 2.0
- ☑ Compatible with EML
- ☐ Mappings to SenticNet

Reference Ontology — DOLCE

Core Ontology — COMET

Domain Experience Ontologies — Travel, Dining,...

Modular structure

www.mysmark.com

50 participants (crowd workers), 12 Smarks available, 7 videos

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FilmStim

Assessing the effectiveness of a large database of emotion-eliciting films: A new tool for emotion researchers.

Cognition and Emotion **24**(7): 1153-1172.

Schaefer, A.; Nils, F.; Sanchez, X. & Philippot, P. 2010

This website links to a database of brief video clips intended to elicit emotional states in experimental psychology experiments. By clicking on any of the links below, you accept that you will not use this material for commercial purposes. You also accept that any material obtained from this website will be used solely for the purpose of non-profit scientific research approved by an independent ethical committee. In addition, you also accept that you will not reproduce or broadcast this material in any way that might violate copyright laws.

Cognitive Agent Experiment

Fill the fields with your personal data

Age

Gender

No selection ⬍

Select an Image
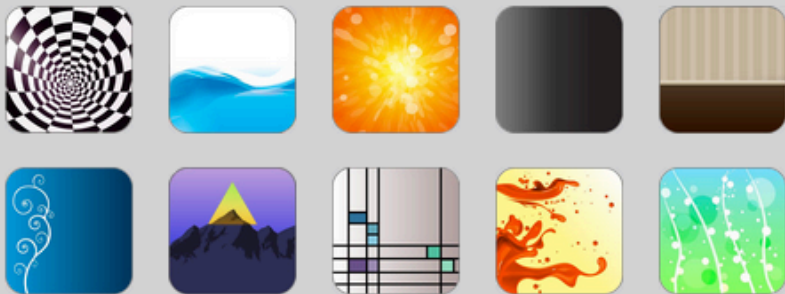
Instructions

Before starting the experiment, try to find a quiet room without any possible interruption or noise and put yourself in a relaxed mood.

You will see a flow of emotional videos cut in video snippets.

At the end of every video snippet, automatically will be shown a form to collect your response

Then select an emotion that better represents the feelings elicited by the video snippet.

Give also a brief and synthetic description (max 200 chars) of what you see focusing on the actions and subjects involved (e.g. a man is walking in the street), without reporting too specific details.

Thank you for your participation.

Start Experiment

```
user_id,age,gender,O,C,E,A,N,video_index,P,A,D,smark_index,Ann
142,33,M,3,4,2,4,4,Fe1-1,0.31,0.4,-0.02,3,"child rides a tricycle in a corridor"
142,33,M,3,4,2,4,4,Fe1-2,-0.3,0.26,-0.29,10,"suddenly two twins girls appear"
142,33,M,3,4,2,4,4,Fe1-3,-0.3,0.26,-0.29,10,"twins speak to the child"
142,33,M,3,4,2,4,4,Fe1-4,-0.5,0.48,-0.43,2,"image of twins murdered"
142,33,M,3,4,2,4,4,Fe1-5,-0.5,0.48,-0.43,2,"child get scared"
142,33,M,3,4,2,4,4,Fe1-6,0.31,0.4,-0.02,3,"twins disappear"
142,33,M,3,4,2,4,4,Fe1-7,-0.3,0.26,-0.29,10,"child speaks with himself"
```
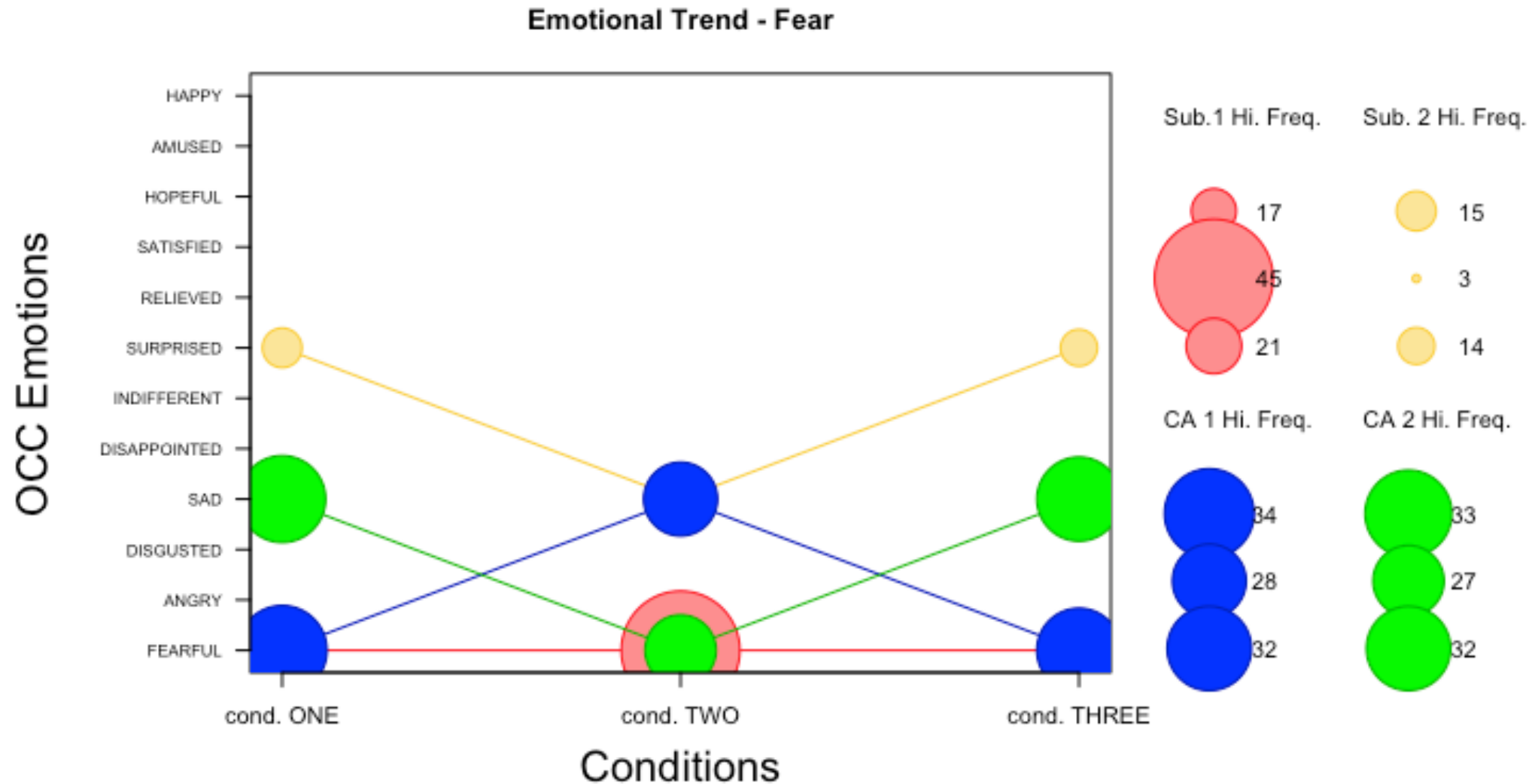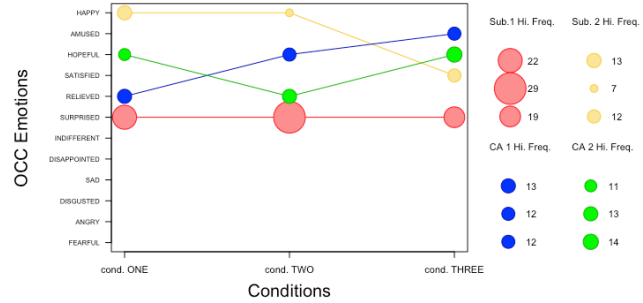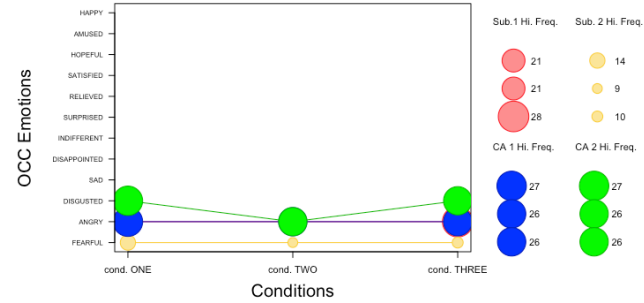
1

2

3
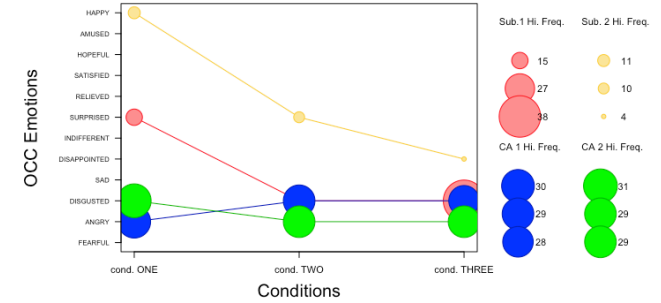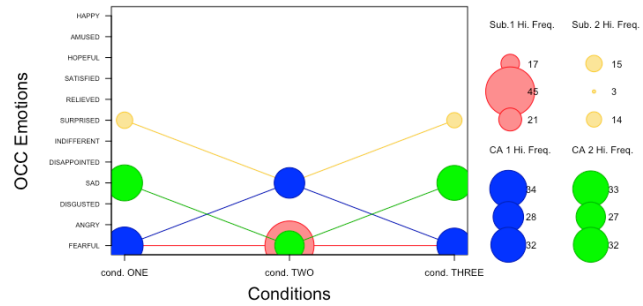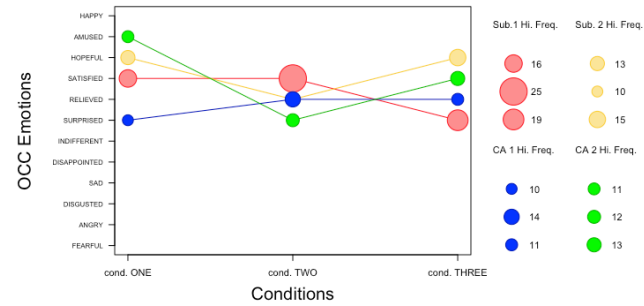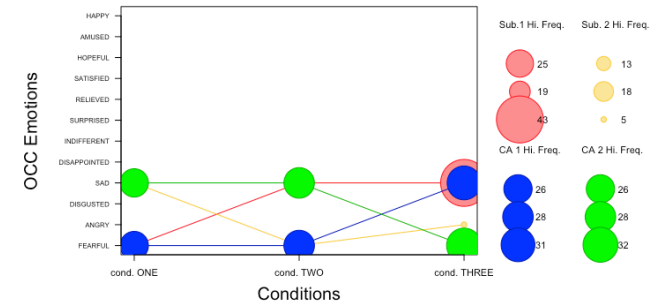
Emotional Trend - Fear
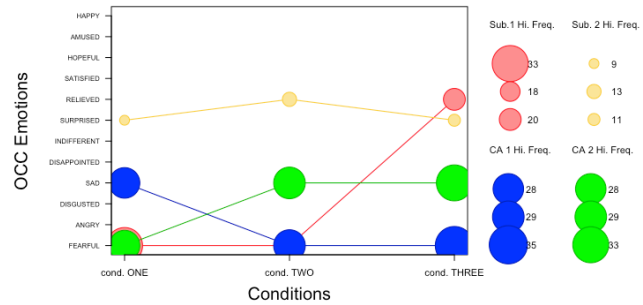
- **Scalability** can become an issue down the road, especially if multiple domain experience ontologies are loaded and used for reasoning.

- The current (<u>unoptimized</u>) ACT-R model takes ~15 sec. to process ~1K smarks and related information (as in the CSV file).

- **Targeted Knowledge** might be a better shot than "Big Data" for SBE's typical business scale, scope and resources.

If you have a small gun and few bullets, take good aim!