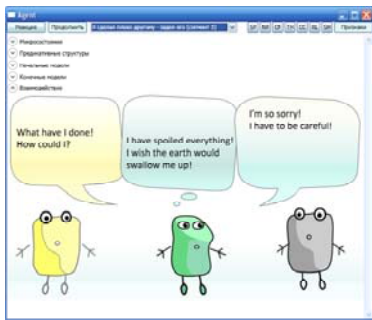


# Accounting for Irony and Emotional Oscillation in Computer Architectures

Artemy Kotov (kotov@harpia.ru)

Institute of Linguistics, Russian State University for the Humanities (www.rsu.ru)

www.harpia.ru/english.html



We want to create a computer agent, which understands incoming text, acts in a multiagent environment and provides rich emotional speech reactions in a number of situations. Through the interaction between emotional processing and operations with semantics the agent simulates several emotional phenomena: top-down emotional processing [Clore, Ortony 2000], hypocrisy, emotional oscillation, sarcasm and irony.



Construction and usage of jokes/wit replies [Kotov 2008]

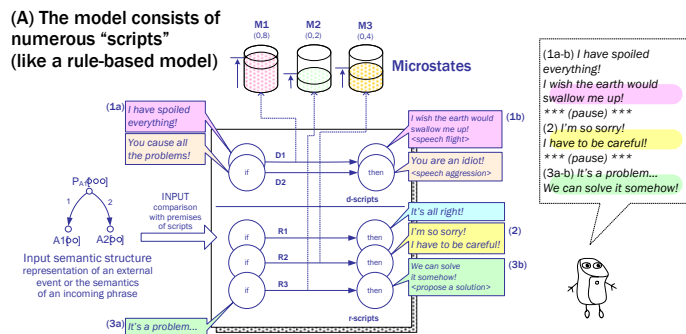


Construction of speech turns around jokes [Budiankaya, Kotov 2007]

## 1. Architecture of the model

The model combines features of (a) rule-based models and (b) connectionist models

(A) The model consists of numerous "scripts" (like a rule-based model)

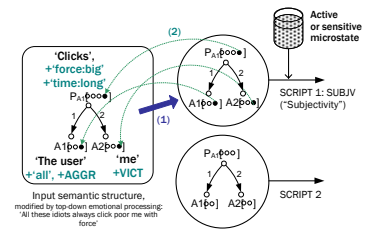


The agent receives semantic trees on its input and for the output (a) constructs semantic trees and (b) replies with ready phrases from a database. Input semantic structure forces activation of scripts and subsequent speech reactions: *d*-scripts (n=45) simulate emotional speech reactions and *r*-scripts (number varies) are responsible for "rational" speech reactions: problem solving, etiquette replies, conciliation with addressee.

In the case of a single-sentence answer the winning script forms the speech output of the model.

Groups of scripts are linked to microstates (M1-M3). In case of an emotional monologue (emotional oscillation) microstates consecutively discharge, resulting in speech output from the connected scripts (here indicated as 1-2-3). This simulates **Emotional Oscillation** of the computer agent.

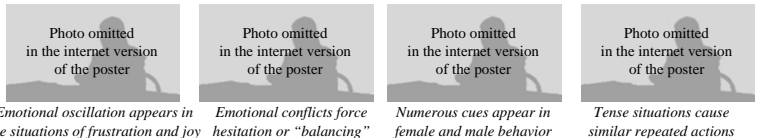
(B) The model operates on semantic trees and semantic markers (like a connectionist model)



Incoming semantic tree 'the user clicks me' (1) activates scripts (bottom-up processing) and (2) is enriched with key markers of the winning script: 'all these bad users click poor me with force' (top-down processing). During comparison the agent prefers scripts with active microstates (interprets situations depending on its' mood'). Appended markers allow to handle deictic references during the usage of phrases in multiagent environment.

### Corpus

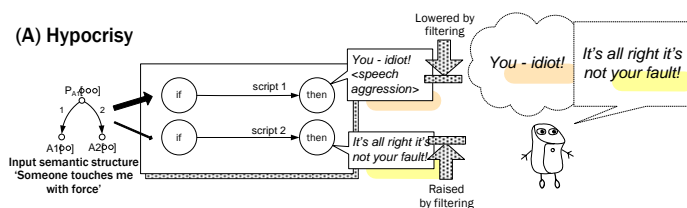
We rely on a multimodal corpus of oral exams to observe the usage of emotional expressive cues in situations of strong conflict between internal motivation and external social limitations.



## 2. Blueprint for the Cases of Irony and Emotional Oscillation

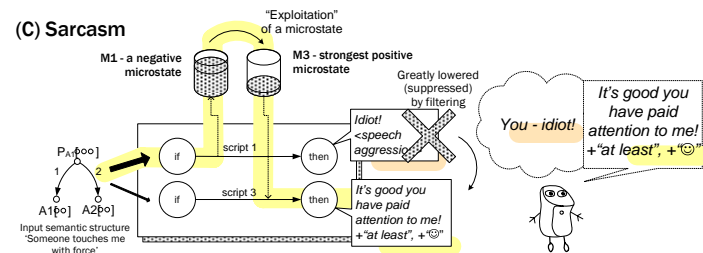
Some types of *hypocrisy, emotional oscillation and sarcasm* may be simulated as the interaction between the activation of scripts, changes in microstates and filtering

### (A) Hypocrisy



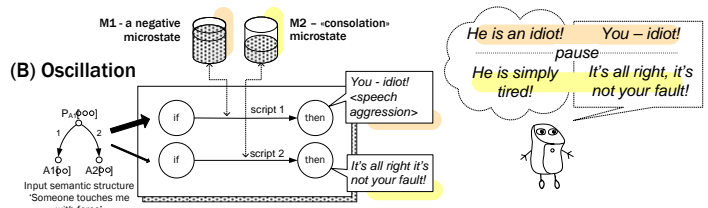
(A) In the case of *hypocrisy*, filtering suppresses inappropriate scripts (pushes their output to "thoughts" of the agent) and rises "polite" scripts, which creates the contradiction between "words" and "thoughts" of the agent.

### (C) Sarcasm



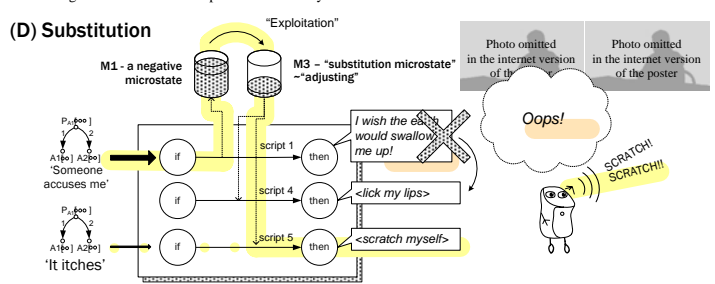
(C) In the case of *sarcasm*, the negative script/microstate pair is completely suppressed by filtering and the system "exploits" the best positive microstate in order to express the suppressed activation – output may be modified by the ironical cues.

### (B) Oscillation



(B) In the case of *emotional oscillation*, the order of scripts is controlled by microstates: scripts appear one after another, simulating changes in moods or emotions – both in "words" and "thoughts". The order of scripts is controlled by the activation of microstates.

### (D) Substitution



(D) In the situations of strong emotional arousal people scratch themselves, lick the lips, adjust clothes – thus replacing processing of the main stimulus with processing of a minor stimulus. Here script\_1 exploits script\_5, responsible for another (minor) stimulus. The architecture allows to simulate Maxim of Relevance (Grice) in speech processing.

## 3. Cases of "script exploitation" in Russian Emotional Corpus (REC) – studies and future design of the computer agent

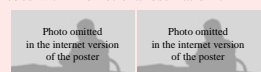
Within the Russian Emotional Corpus (REC) we collect video records of natural emotional interactions:

(a) university exams: 235 records, 4 faculties, 4 courses, (b) children vs. staff in summer linguistic school: 39 records (c) clients of a municipal center for public utilities (current project)

The address of the corpus is www.harpia.ru/rec/ (video is not available for download)

### (A) Numerous actions/irony

Irony serves as one of the speech strategies and may be surrounded by other expressive cues within "emotional oscillation".



Irony, combined with other cues

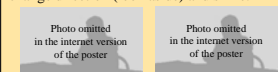
At the same time, irony usually comes at the end of an expressive sequence – after interjections, substitutive gestures and minor utterances.

#### Agent design

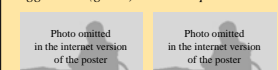
1. Ironical expression doesn't suppress other microstates, except for the "exploited" microstate.
2. Substitutive gestures are "more simple" than irony – is it due to deliberate nature of irony?

### (B) "Overimitation"

Informants imitate "high" degree of emotion in moderate/concealed situations. They change direction (look aside) and smile.



Aggression (growl)      Reproach

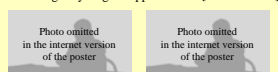


Caprice      Pain

Low degree of script activation may "exploit" a high degree of expression: (a) to denote internal emotion or (b) as uncontrolled shift to usual patterns of emotional expression (statistical evaluation of scripts)

### (C) Me-goal -> You-goal

Cues typical to express "internal" emotions may be modified to influence the speaker, see me-goal/you-goal opposition in [Schank 2000]



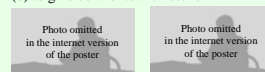
Mimicry: biting lips      Gestures: counting

Prosody: rising tone  
Speech answer combined with prosody influence

Influence (rational you-goal) may "exploit" expressive emotional scripts (originally corresponding to me-goals). We may organize inheritance of scripts: you-goal scripts will develop from basic expressive scripts.

### (D) Transferring locus of control

Contradictory strategies force informants (a) to take control in communication and (b) to give control to the listener.



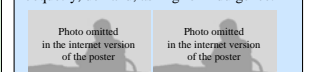
Control-competence      Capture of control

Etiquette rules force to give control to the listener while rational goal 'show competence'/'pass the exam' may force to capture locus of control in communication.

1. Managers of scripts may belong to speaker/listener.
2. Emotional script may force transfer of control (manager).
3. Managers may get in conflict with each other.

### (E) Coquetry, influence strategies

In case of failure (wrong answer) informants may turn to another influence strategy, like coquetry, demand, asking for indulgence.



"Coquetry" appears on the peak of tension, not during a relaxation!

In a nervous situation informants may change the strategy every 3 seconds

1. Frustration in achieving rational goals may exploit emotional strategies with different emotional roles.
2. Tension may cause poor coordination of the strategies and their frequent change.