

*Third International Conference on Cognitive Science  
Moscow, 25<sup>th</sup> June 2008*

**Simulating speech dynamics  
and communicative switching  
for virtual agents**

**Artemy Kotov**

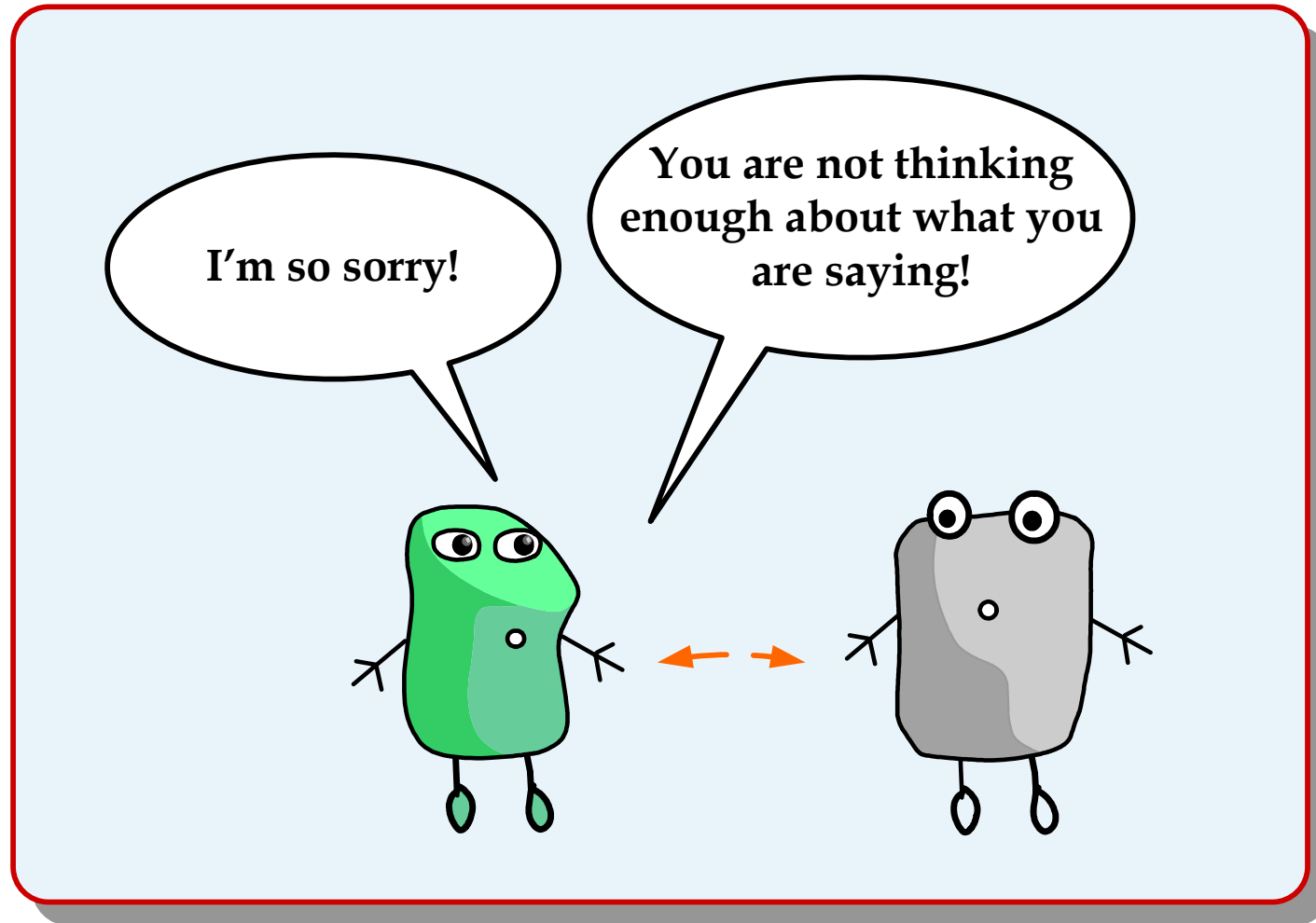
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# GOAL: To study and test the strategies of speech interaction and semantics of emotional texts



To create “minimalist” agents – who look vivid, but have no gender, positive or negative characteristics

## Method

Studies of emotional texts, mass media and propaganda since 1999  
Inventory of emotional meanings and text patterns (d-scripts):

**13 d-scripts for negative contexts**

**INADEQ:** *You are not thinking enough about what you are saying!*

**MANIP** ("Manipulation"): *TV programs control our consciousness!*

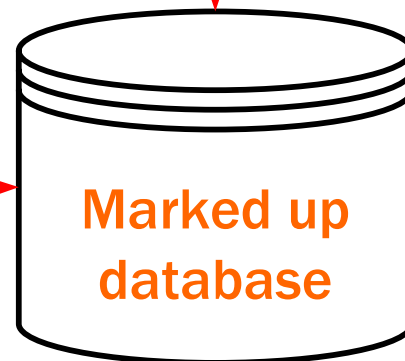
**22 d-scripts for positive contexts** (**CARE:** *This iron cares about you!*)

## Object of studies

Study of ~600 people with modified  
Rosenzweig Picture Frustration Test (PFT)

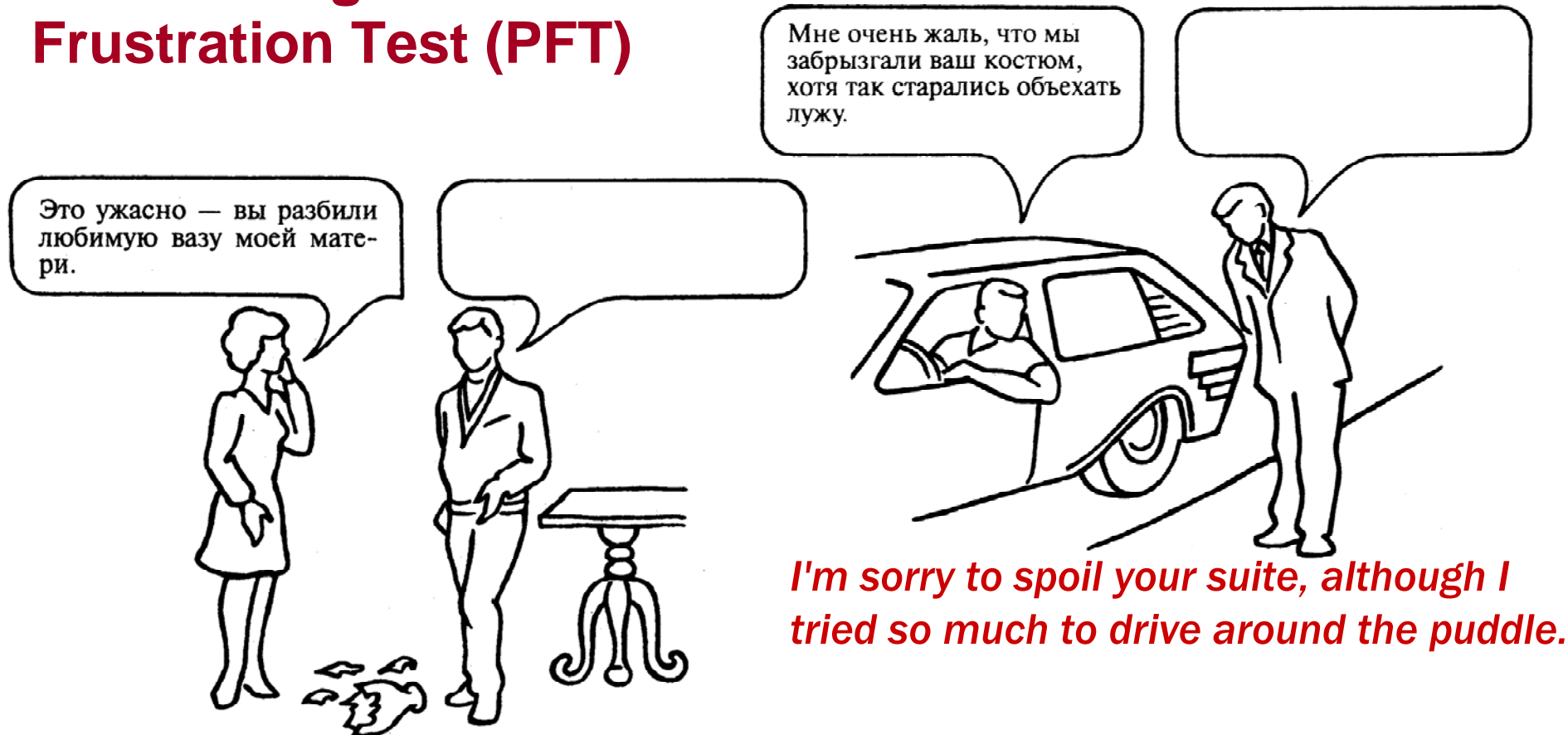


[Кравченко, 2005]



Additional PSY. tests  
Relations between  
utterances of PSY  
characteristics  
[Kotov, 2005]

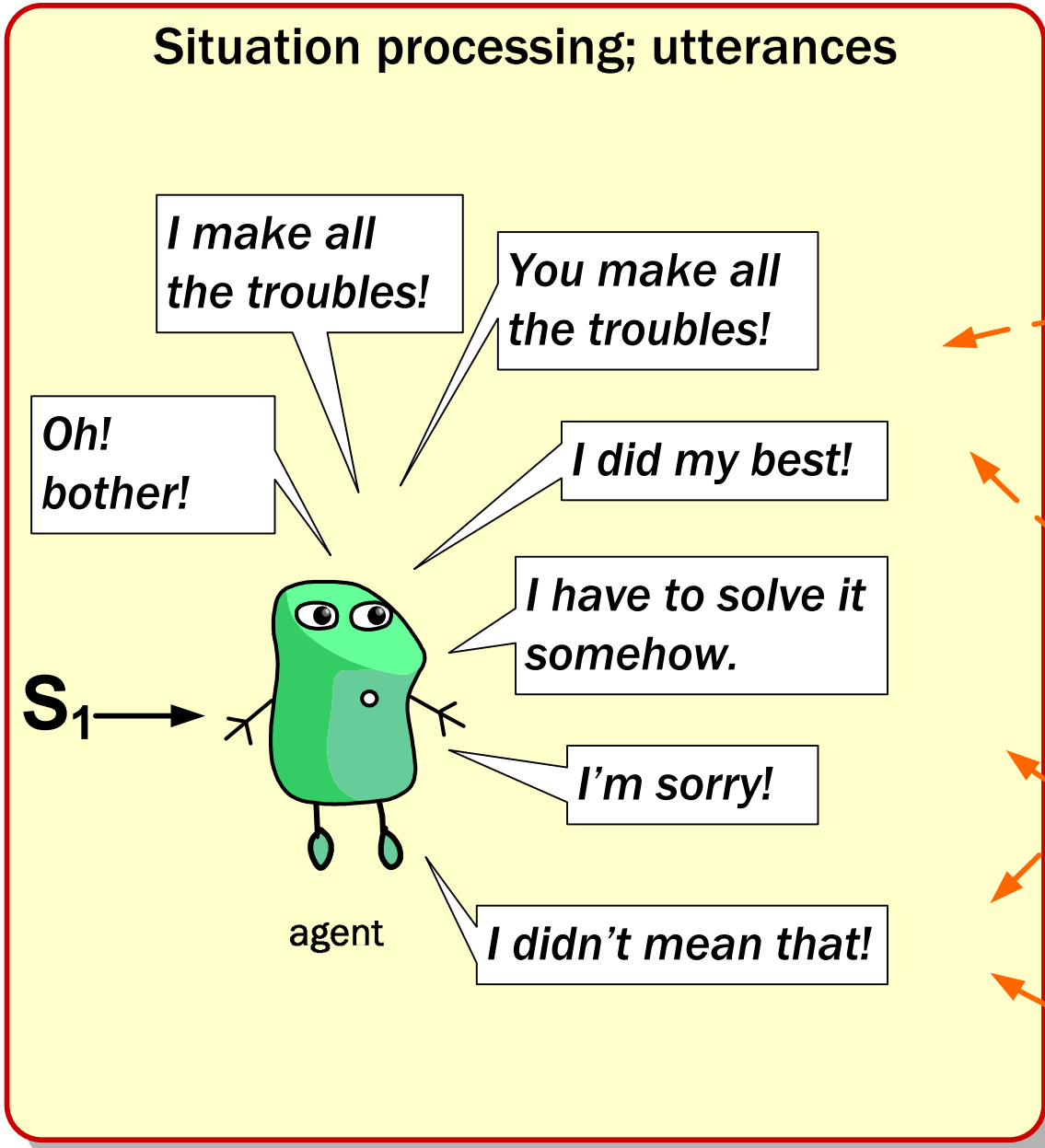
# Rosenzweig Picture Frustration Test (PFT)



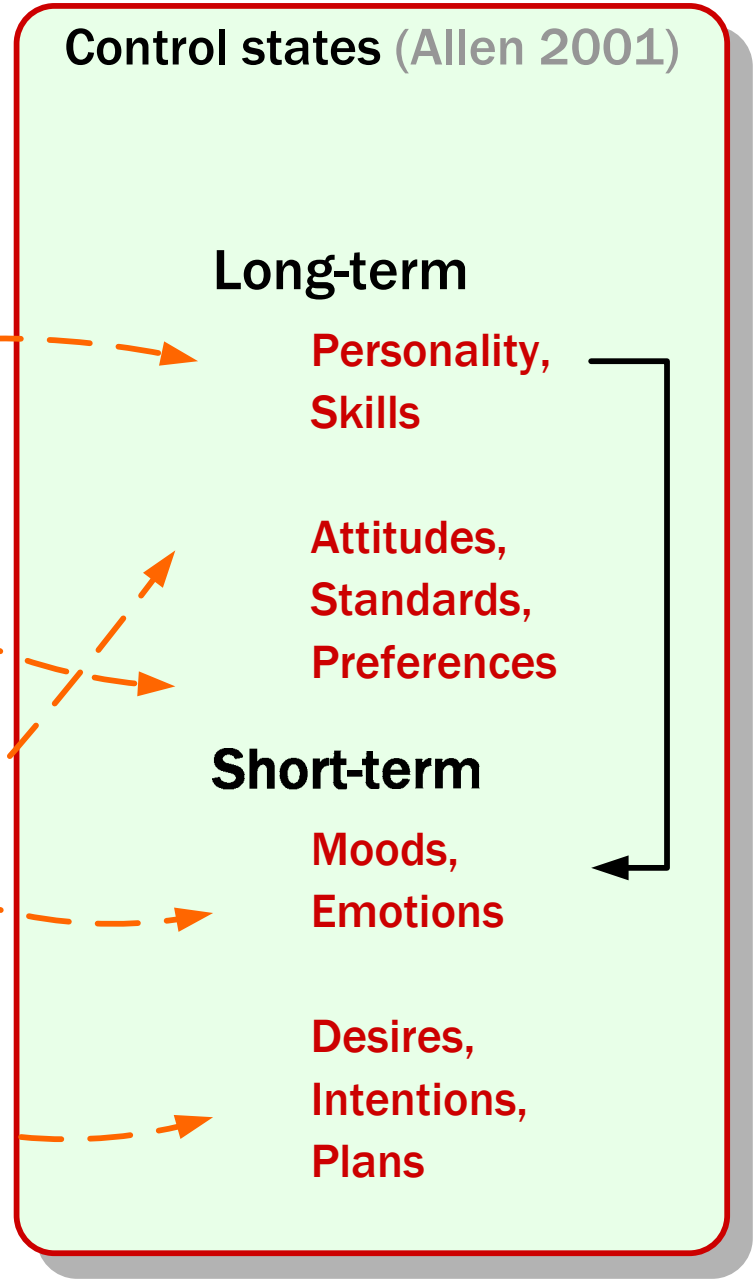
*It's terrible, you broke the favourite vase of my mother.*

- What would you say ? (WWYS)
- What would you think? (WWYT)
- What would you do if you wouldn't have to limit yourself? (WWYD)
- Describe a real situation, where a person feels the same. <conceptualization>

# Preferred utterance may depend on mood and other “control states”

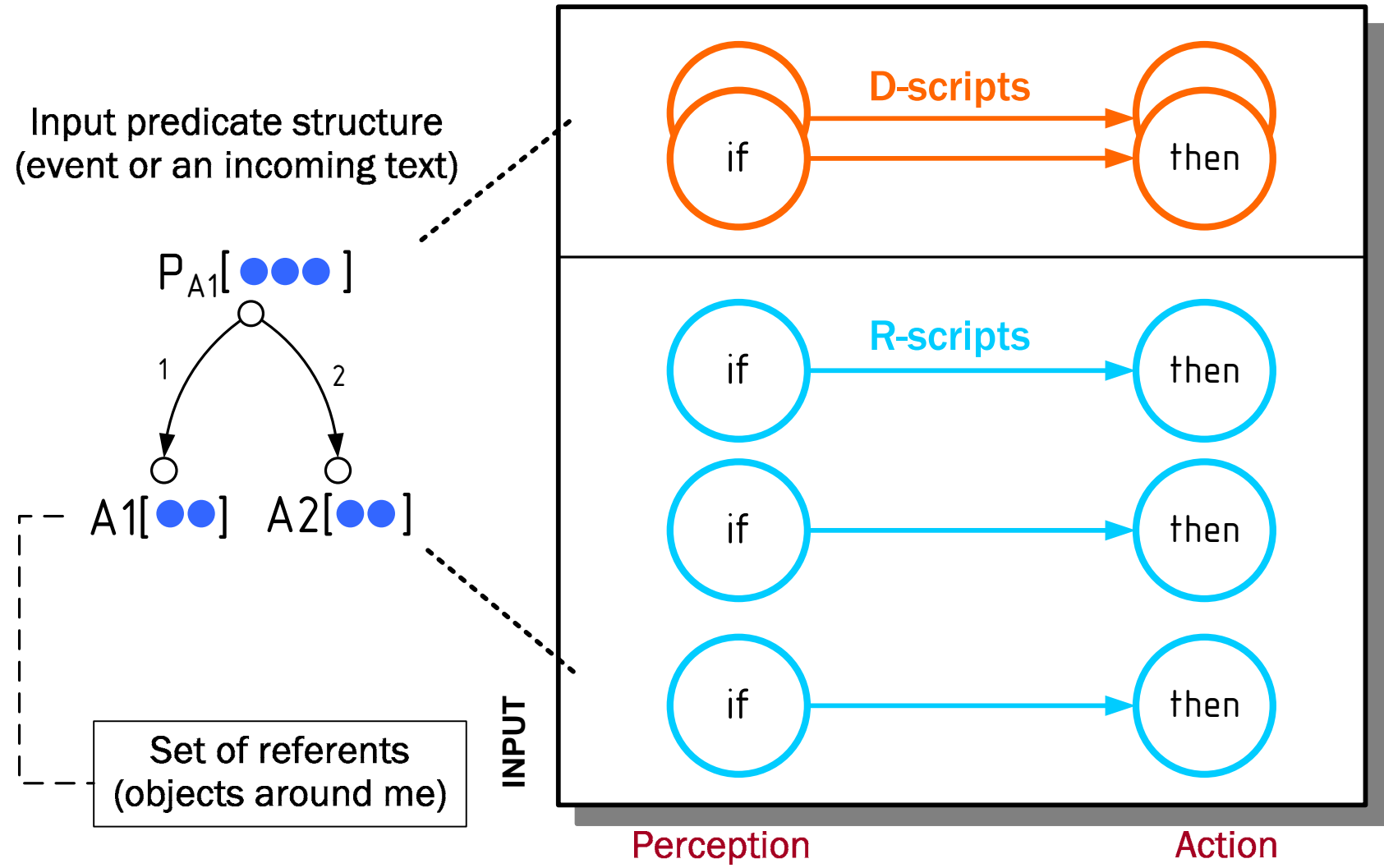


Fictitious links are shown



# General model

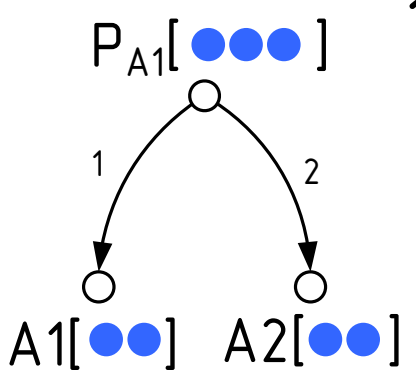
Input is compared with 'if' conditions of the scripts



# General model

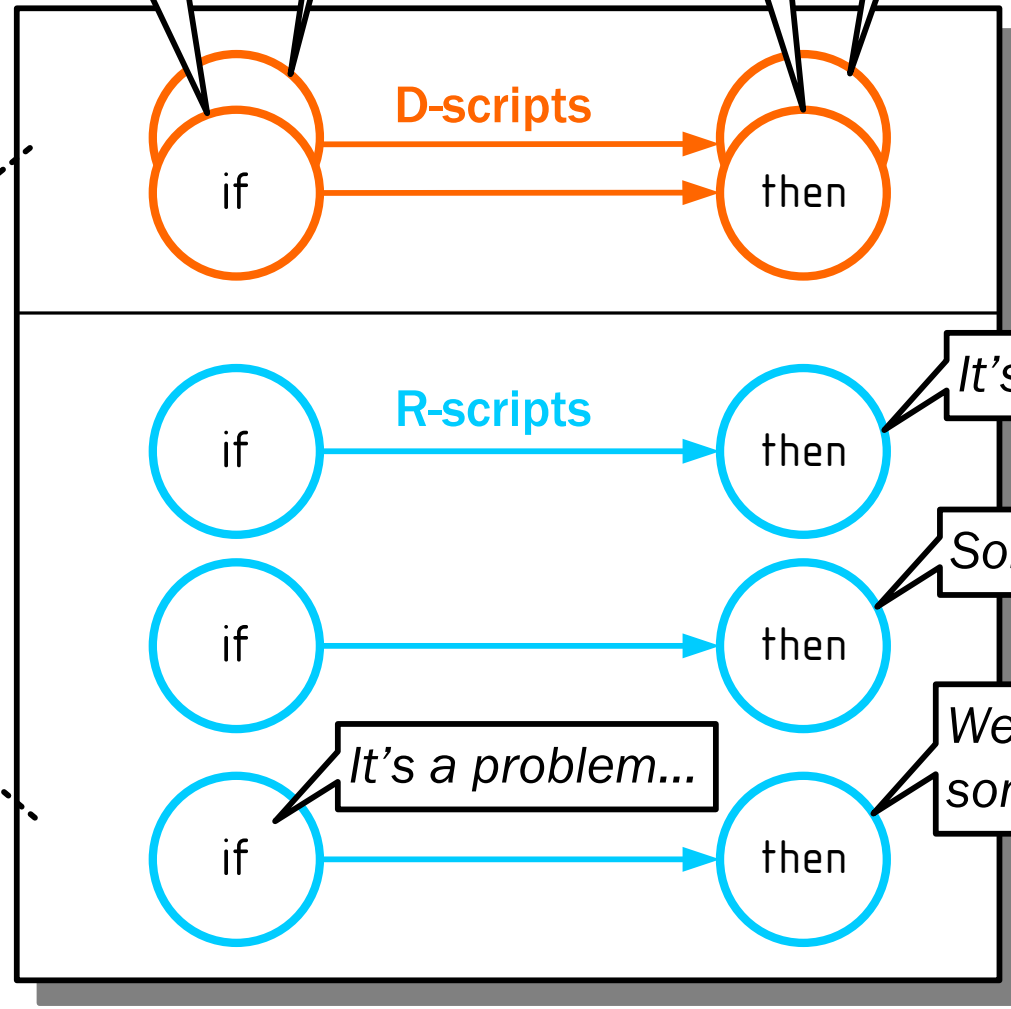
Scripts are linked to speech output

Input predicate structure (event or an incoming text)



Set of referents (objects around me)

INPUT



Perception

Action

I have spoiled everything!

I with the earth would swallow me up! <speech flight>

You are not thinking enough about what you are saying!

Idiot! <speech aggression>

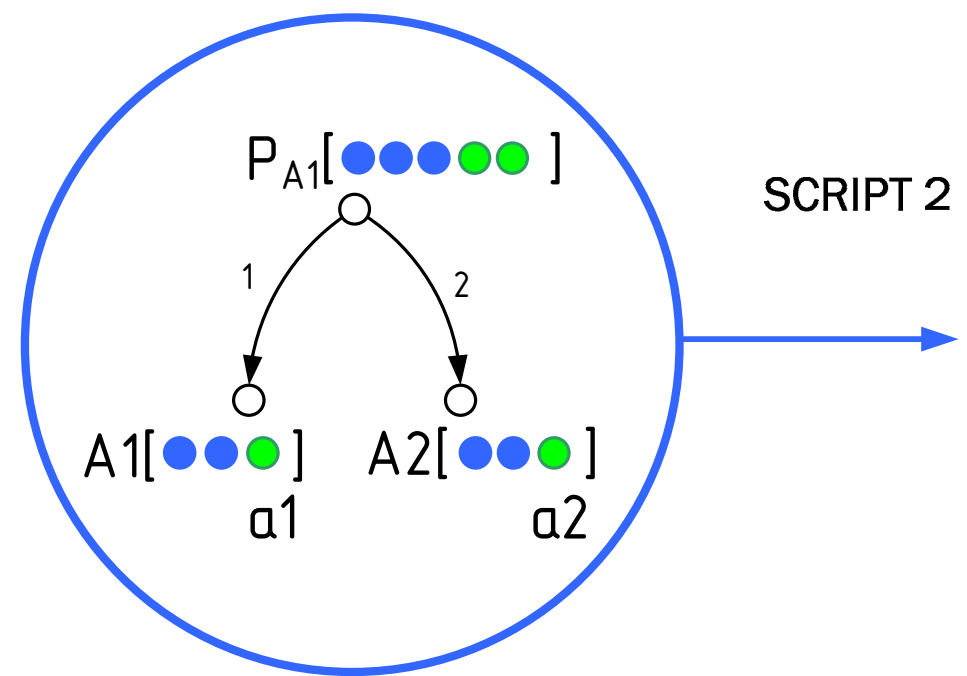
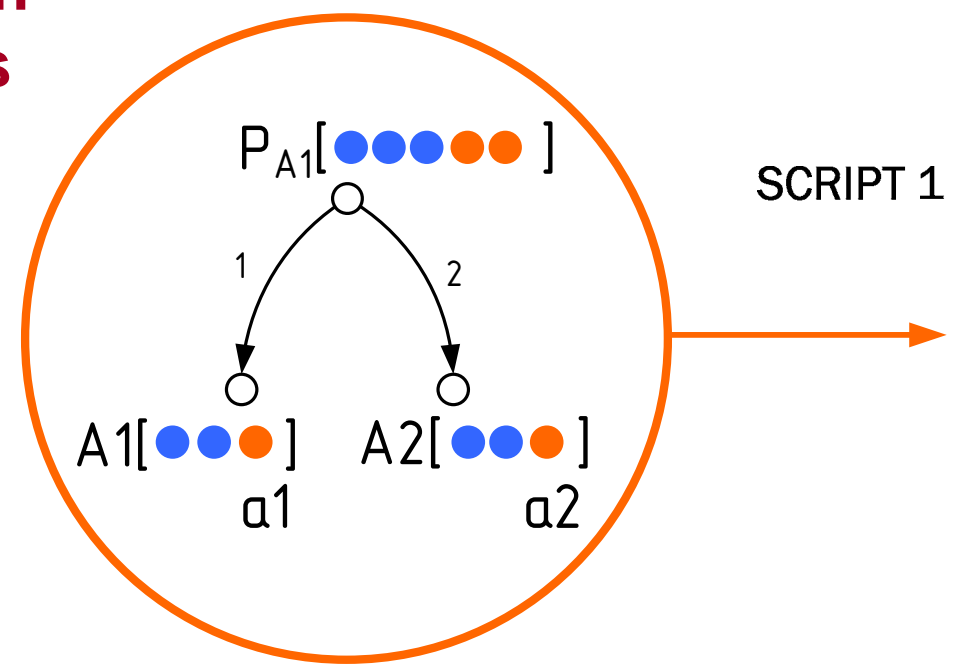
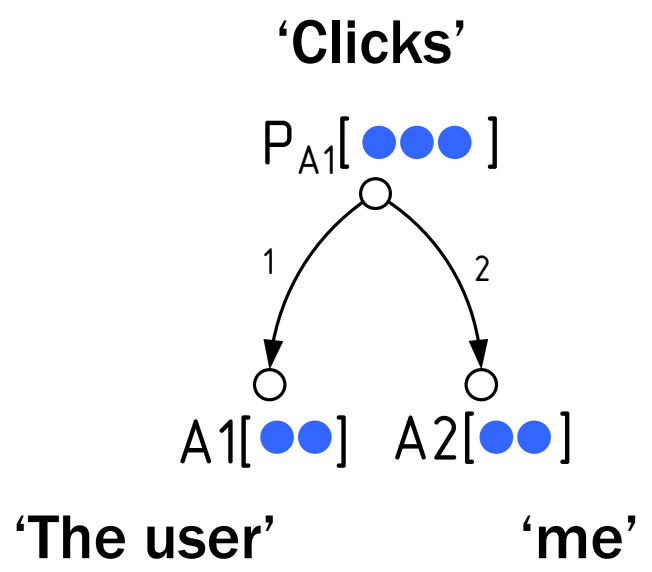
It's all right

Sorry!

It's a problem...

We can solve it somehow!

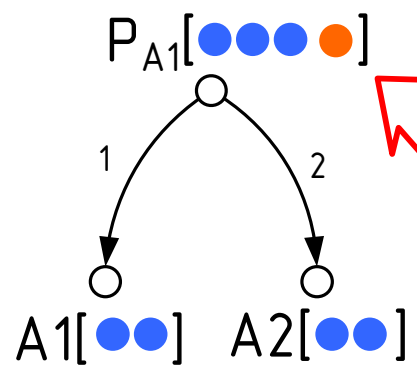
Input event is compared with "if" conditions of the scripts (bottom-to-top)





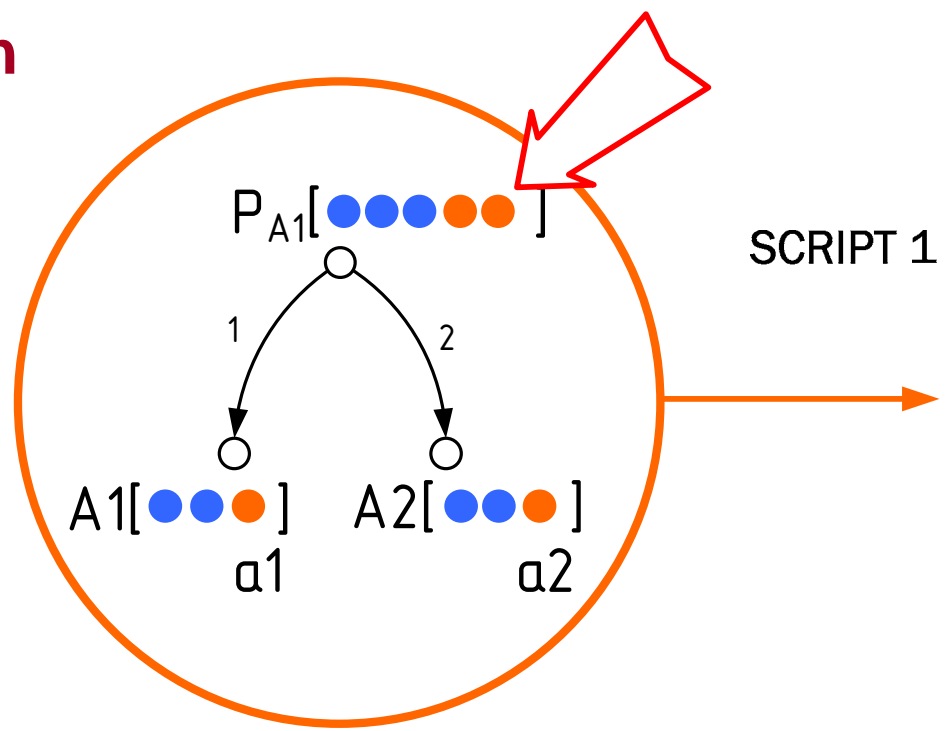
Input event is compared with "if" conditions of the scripts (bottom-to-top)

'Clicks', 'Force:big'

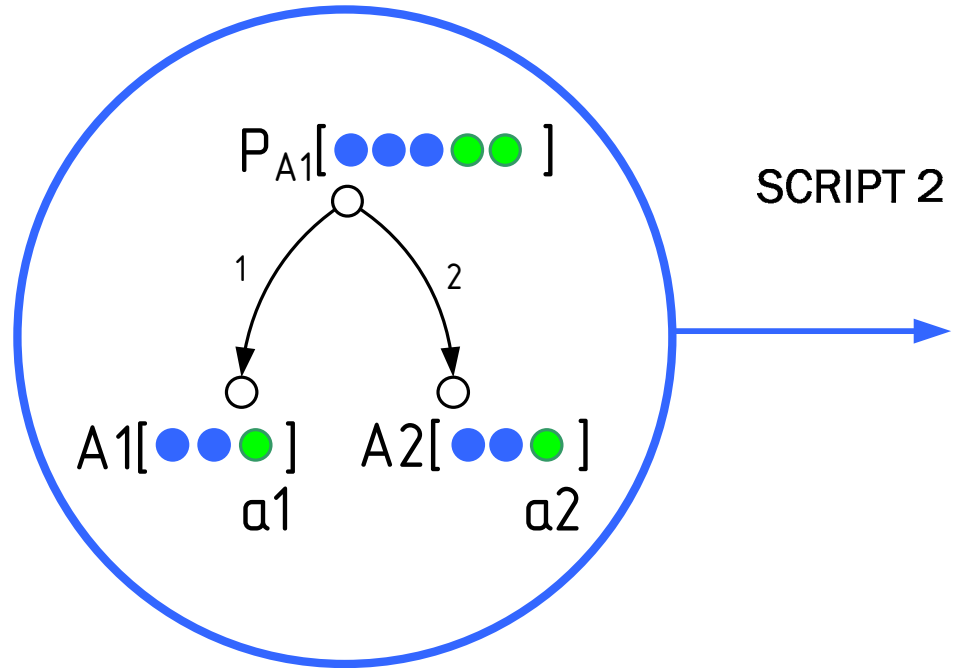


'The user'

'me'



SCRIPT 1

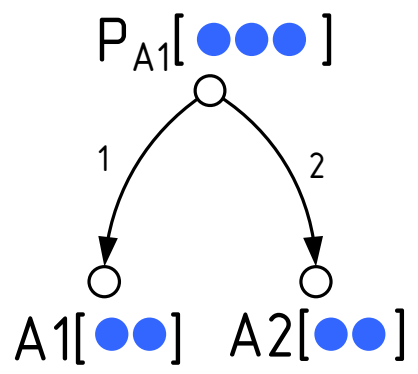


SCRIPT 2



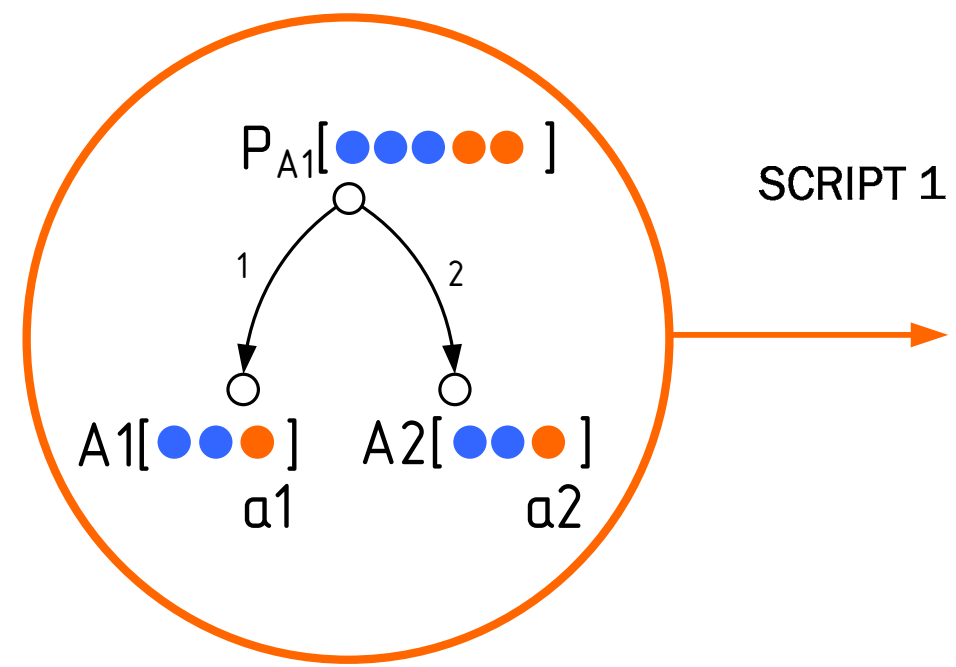
# Input event is compared with "if" conditions of the scripts (bottom-to-top)

'is discussing'

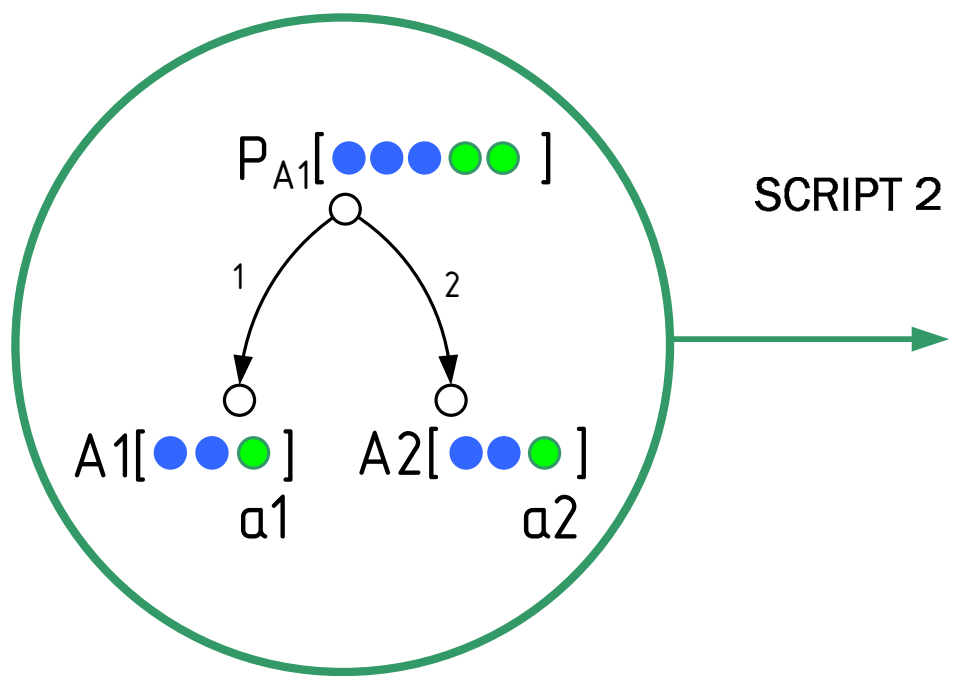


'The government'

'the budget'



SCRIPT 1

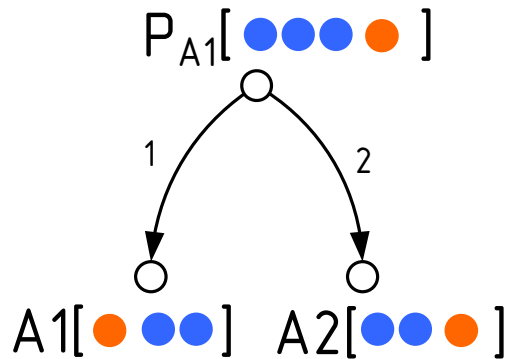


SCRIPT 2



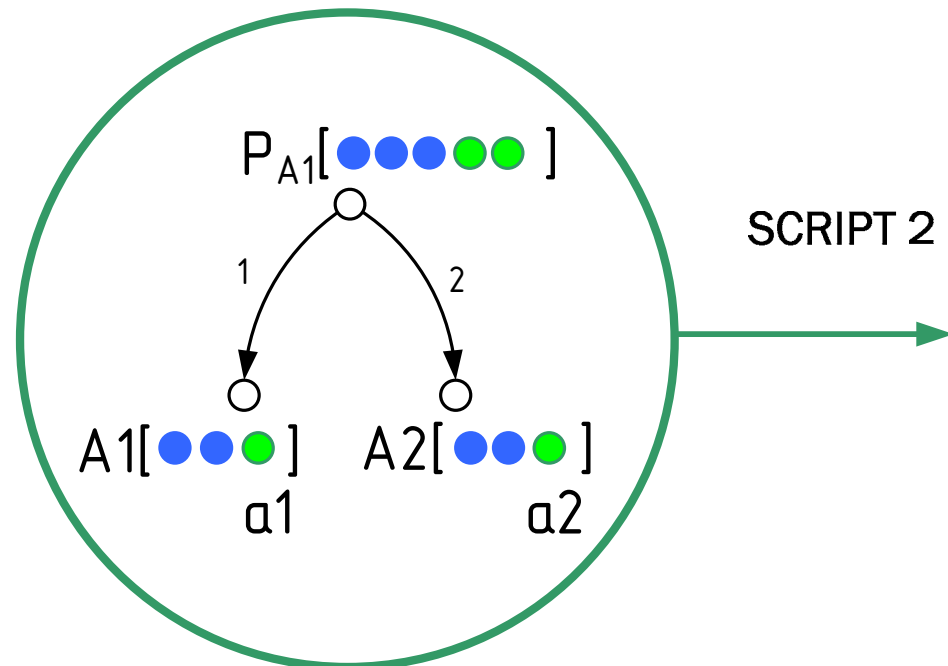
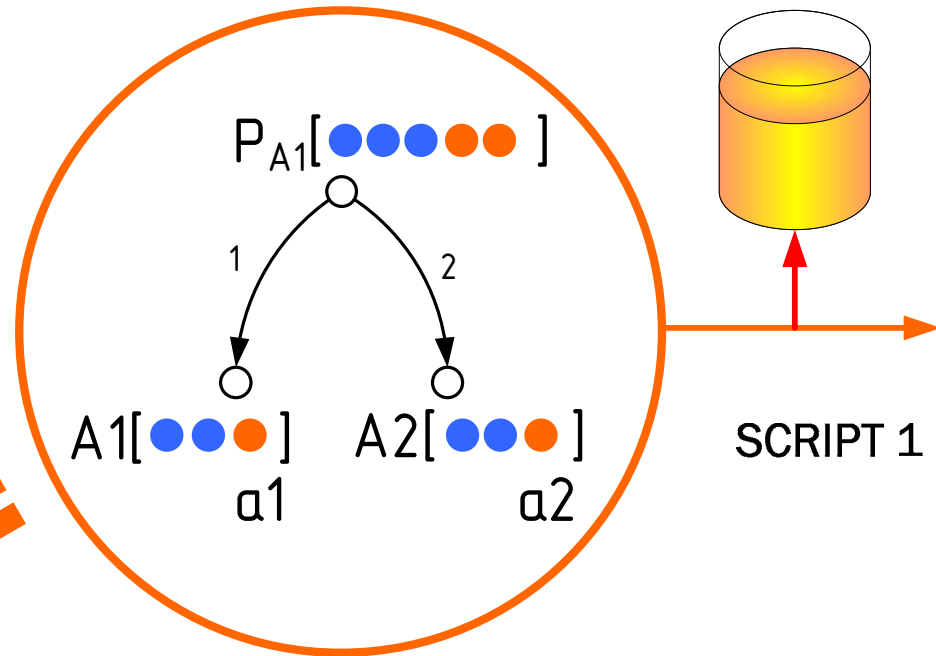
1. Input may contain “emotional” markers stimulating emotional processing  
(bottom-to-top stimulation)

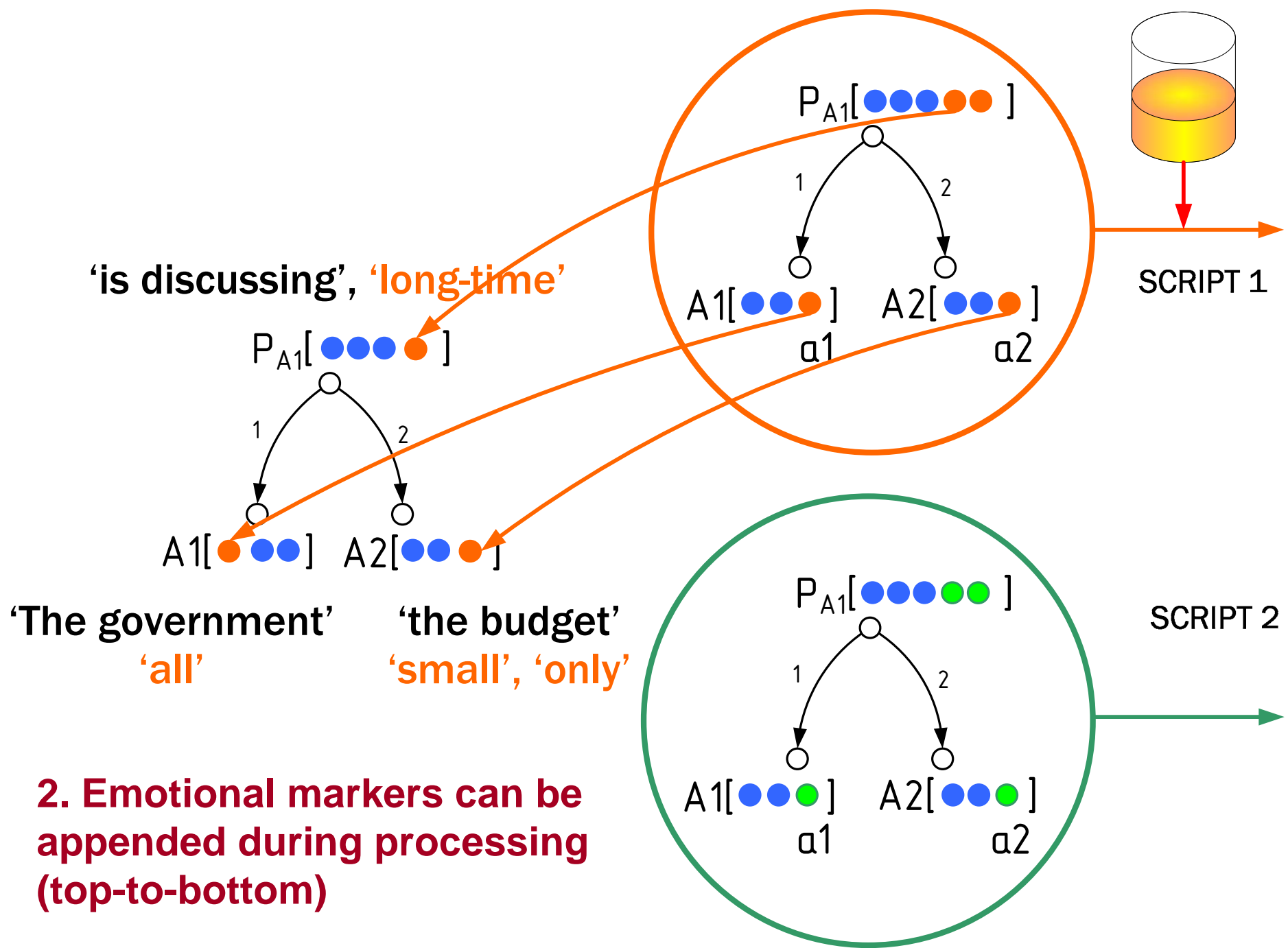
‘is discussing’, ‘long-time’



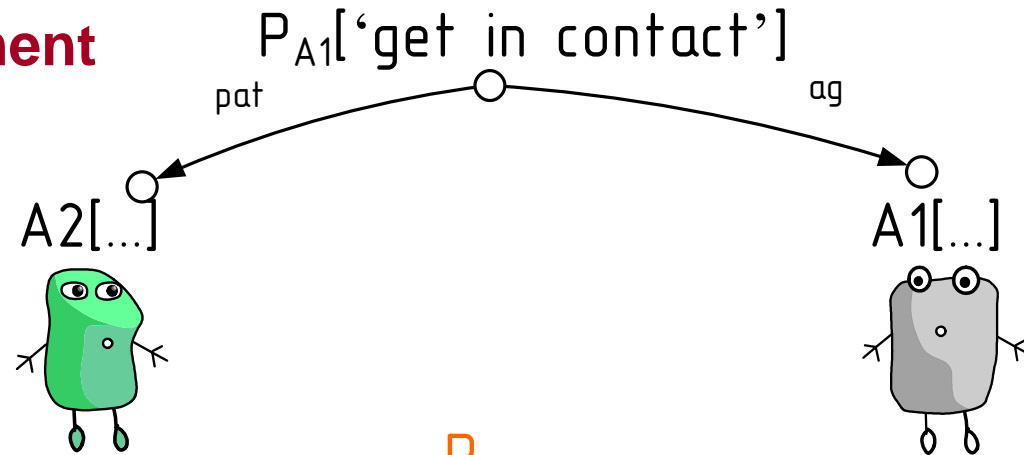
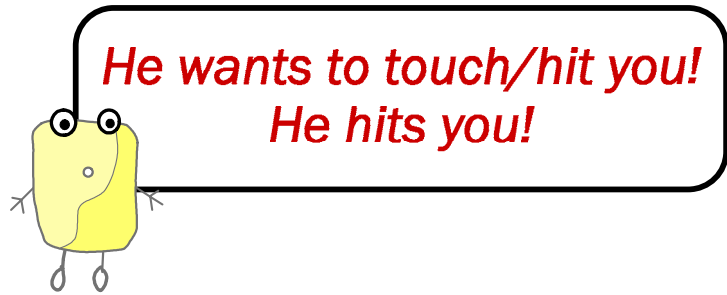
‘The government’  
‘all’

‘the budget’  
‘small’, ‘only’

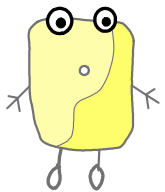
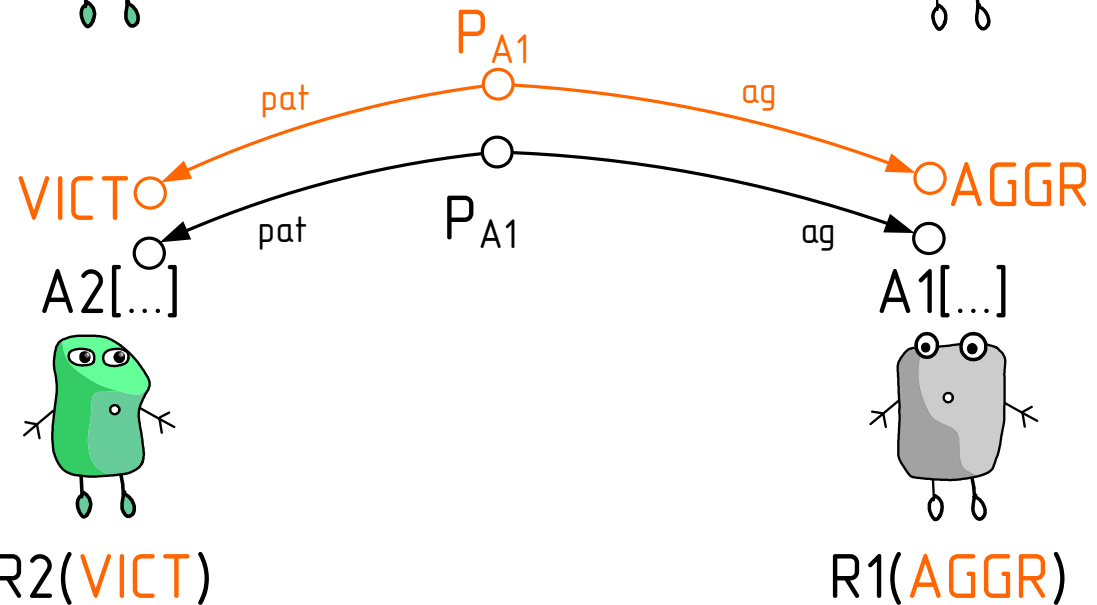




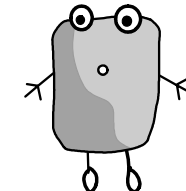
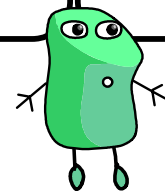
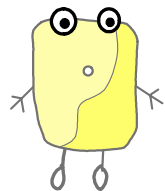
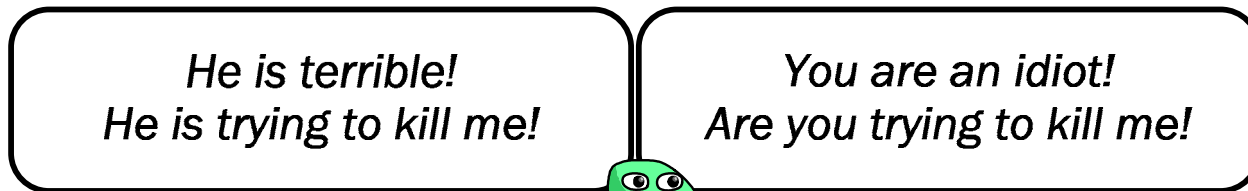
# Communication roles assignment



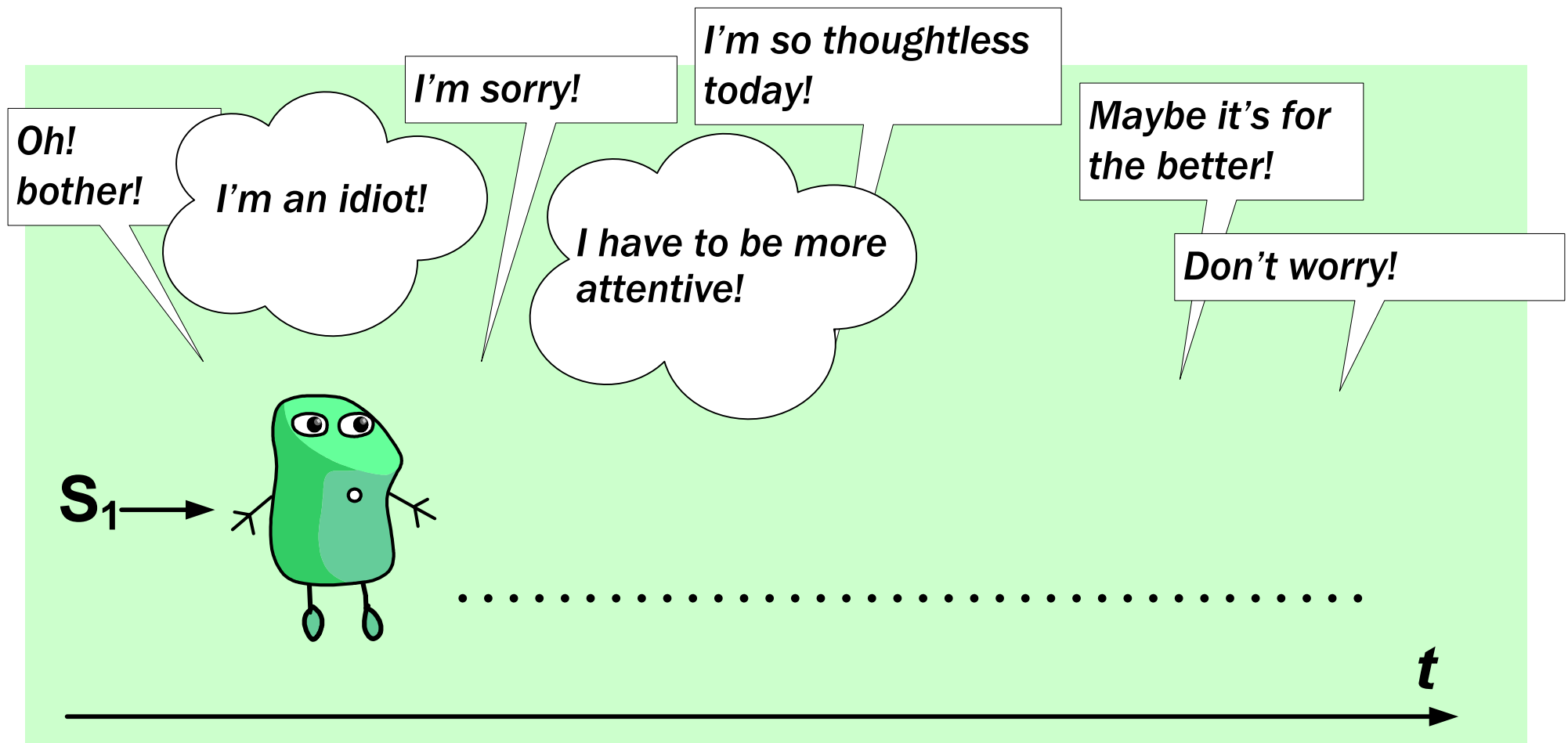
Input predicate structure activates a script (here – d-script)



The script applies communication roles to the agents

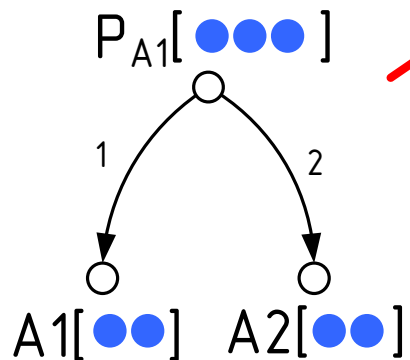


Agents may produce speech behaviour with temporal changes of mood (?)

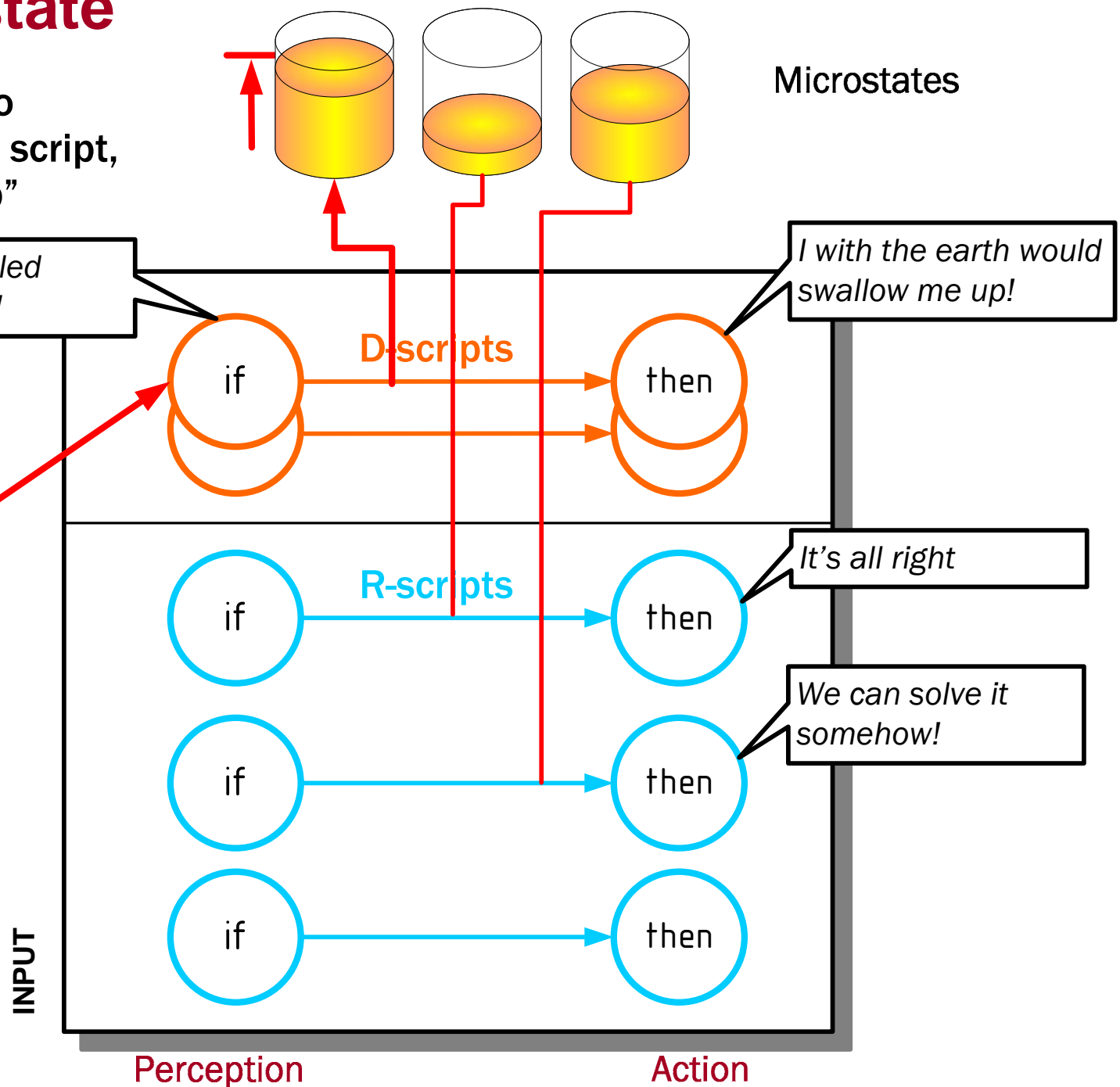


# Filling a microstate

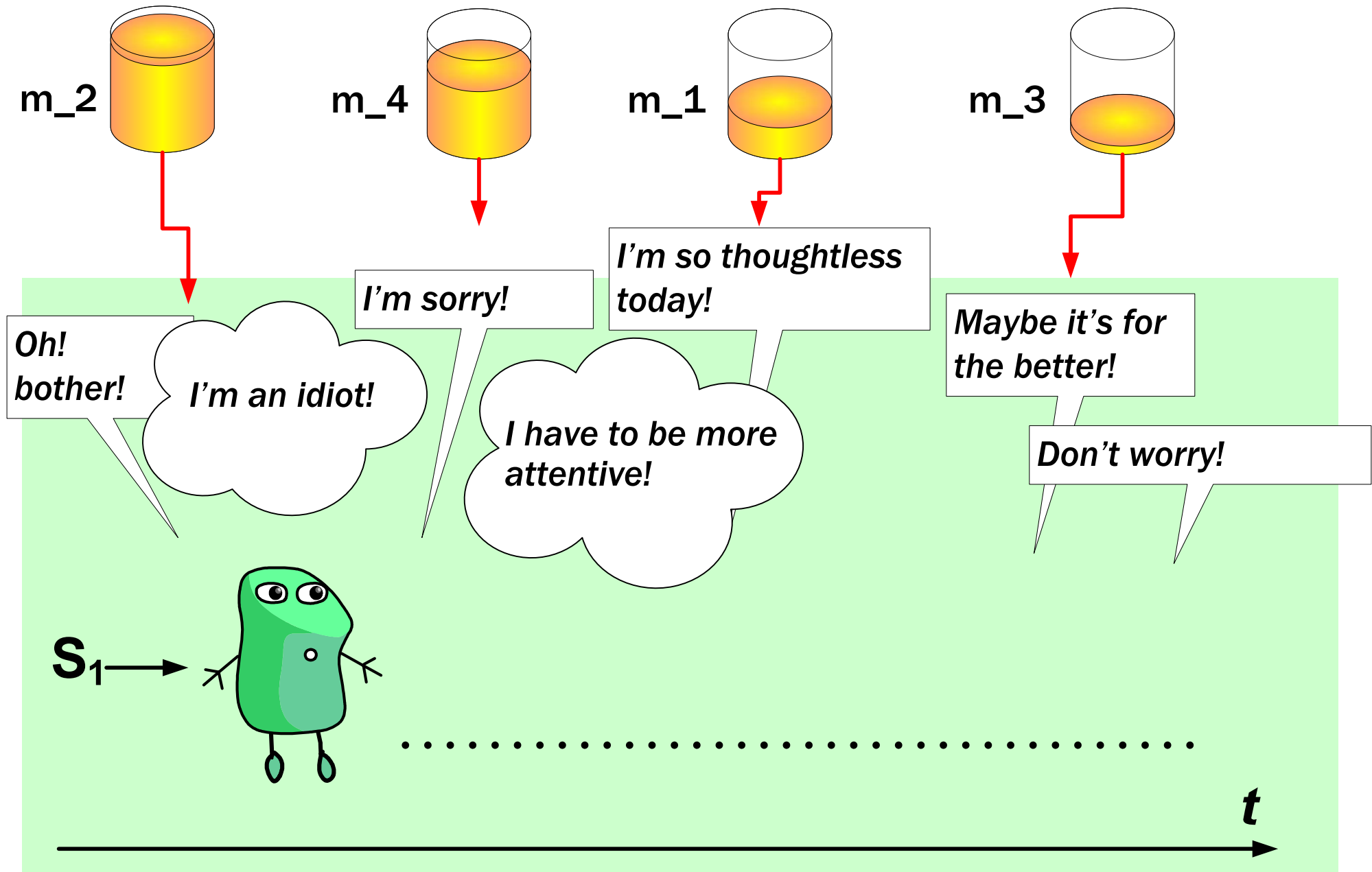
If the input corresponds to "if" condition of a specific script, it's microstate "pumps up"



Input event or text



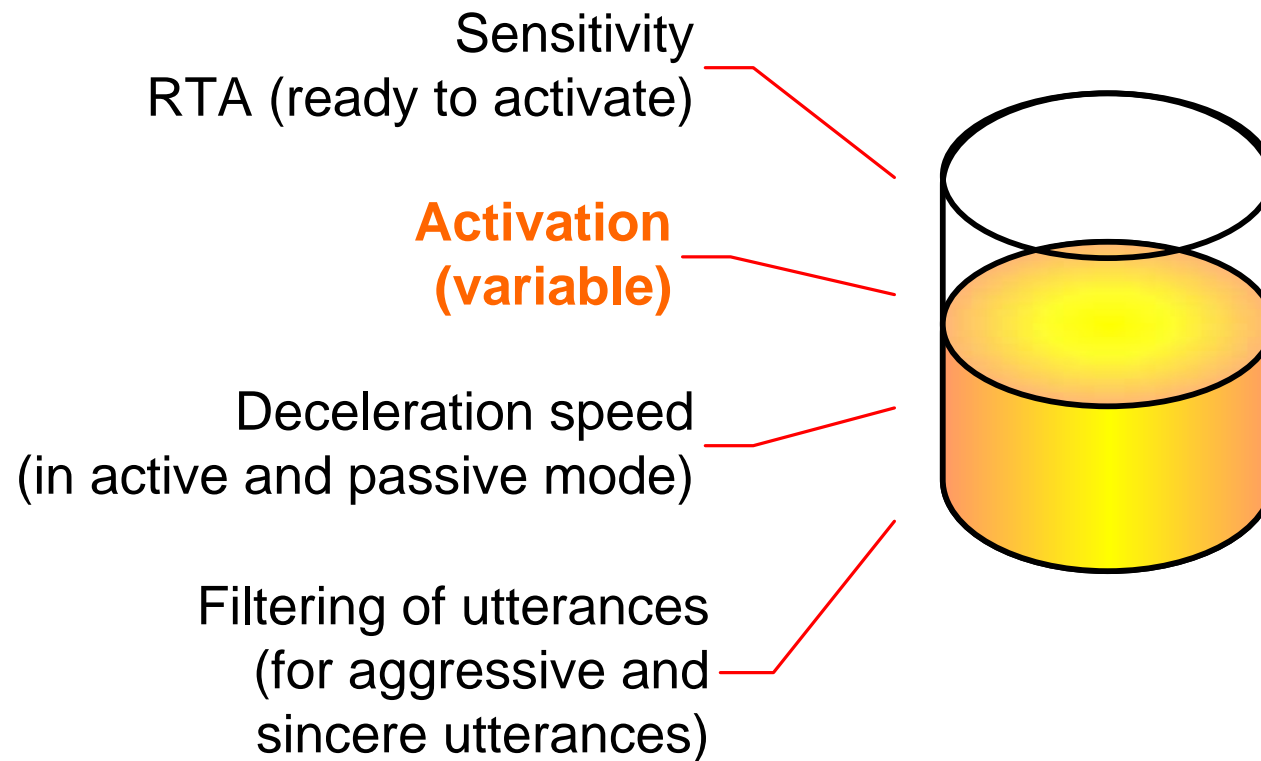
Microstates are arranged according to their activation and form the output for a certain time period





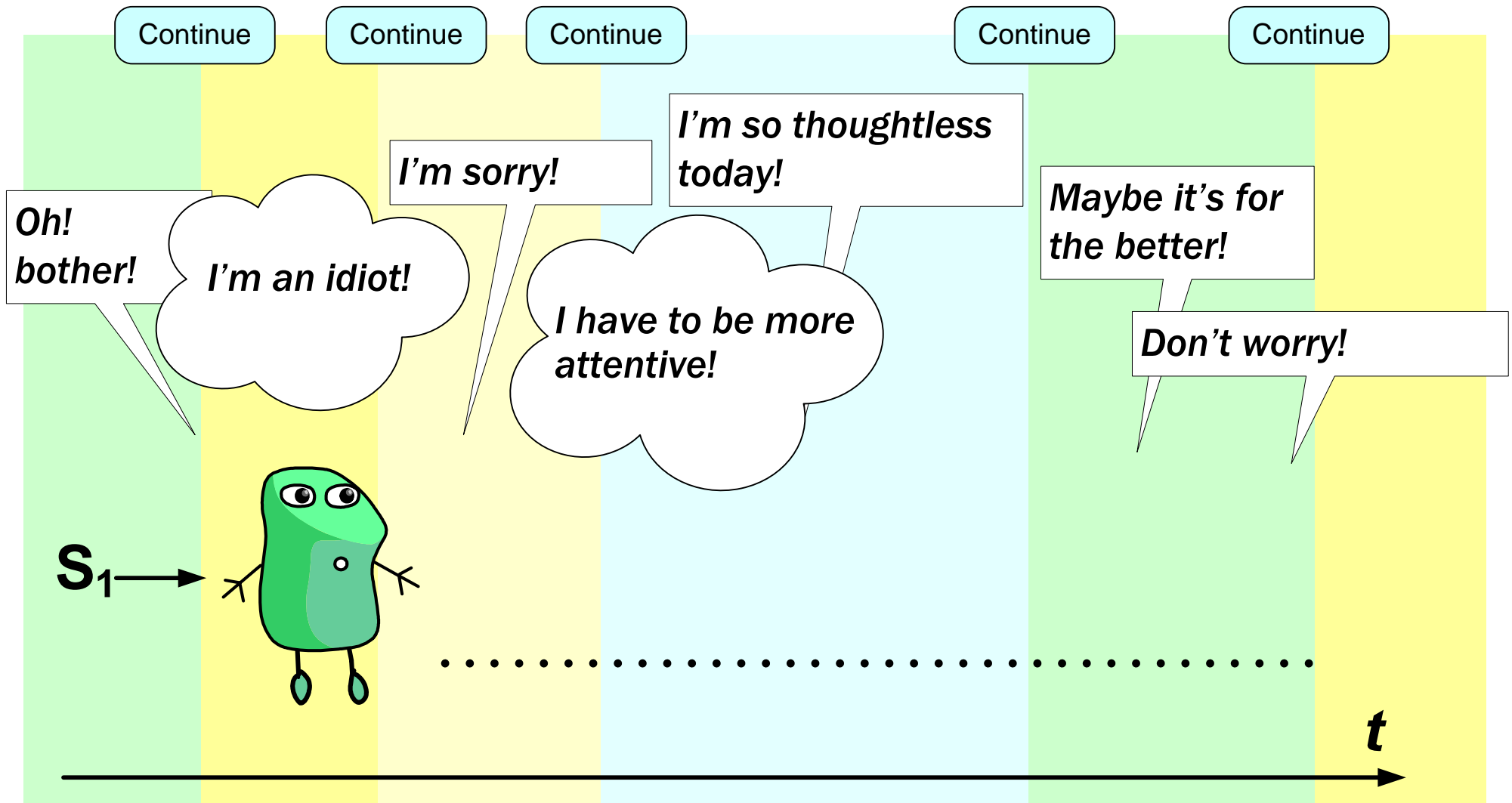
# A microstate

Short internal state, linked to the unified output segments/rules



In this presentation the agent stops after each microstate; we have to press “Continue” to move to the next microstate.

Phrases from each microstate are displayed without any delay.



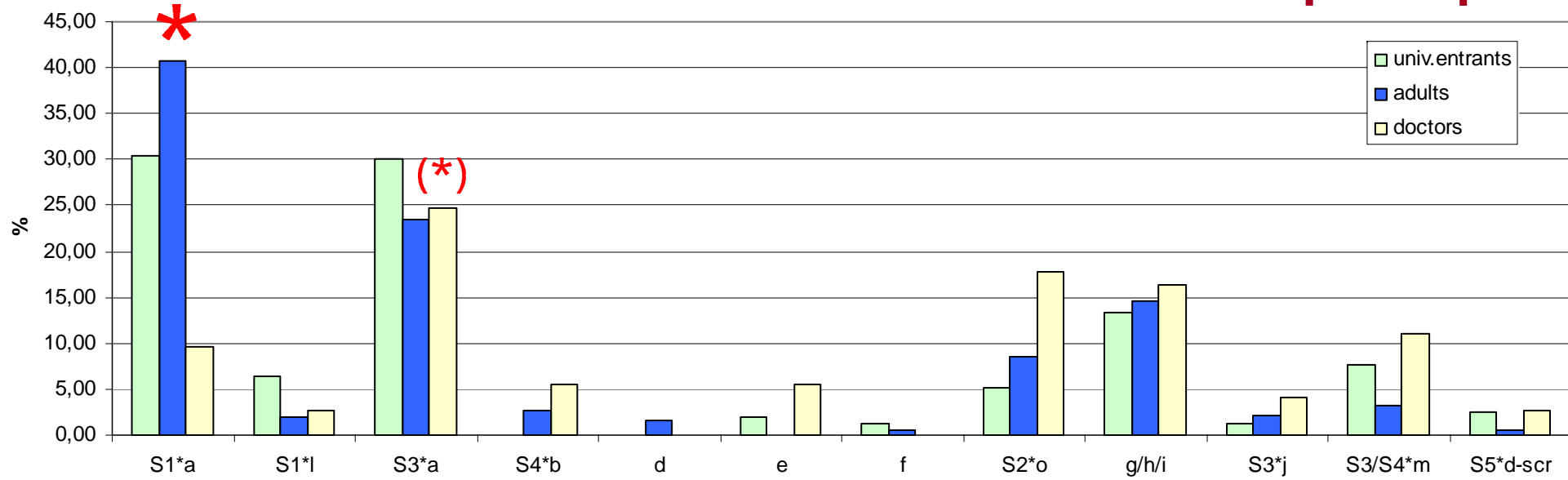
## Construction of microstates through correlation: groups of utterances and psych. characteristics in Big 5 test

Big 5	D/R-scripts marking	p
Neuroticism	+ speech emotionality (d-scripts)	p=0,014
Openness Conscientiousness	- speech aggression	p=0,017 p=0,003
Extraversion	- speech flight	p=0,011
Openness	+orientation on the addressee	p=0,015
Openness	+ rationality (r-scripts)	p=0,034

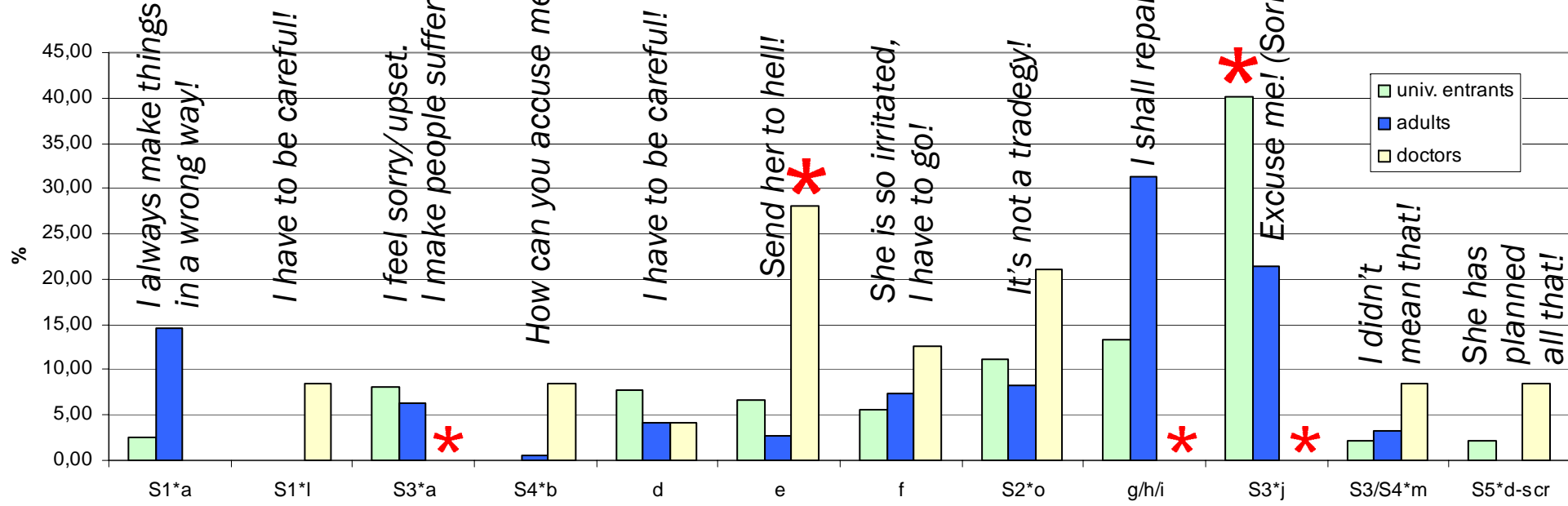
Univerisity entrants (145 probes)  
4 sit. Rosenz. PFT + Big 5 test

### What would you think (WWYT)?

# Group comparison



### What would you do (WWYD)?



\* - Point of interest



# Filtration

Very “sincere” and very aggressive utterances are filtered.

*Sometime I think, that I'm dealing  
with some useless matters.*

(SUBJECT)

*I feel, that I don't care about people  
around me.*

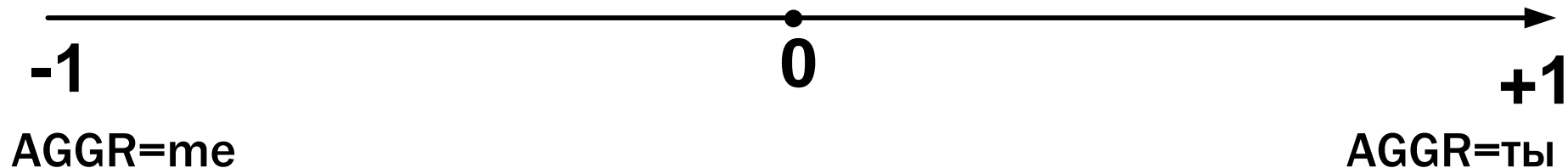
(INACT)

*You are dealing with  
useless matters!*

(SUBJECT)

*You don't care about  
people around you!*

(INACT)



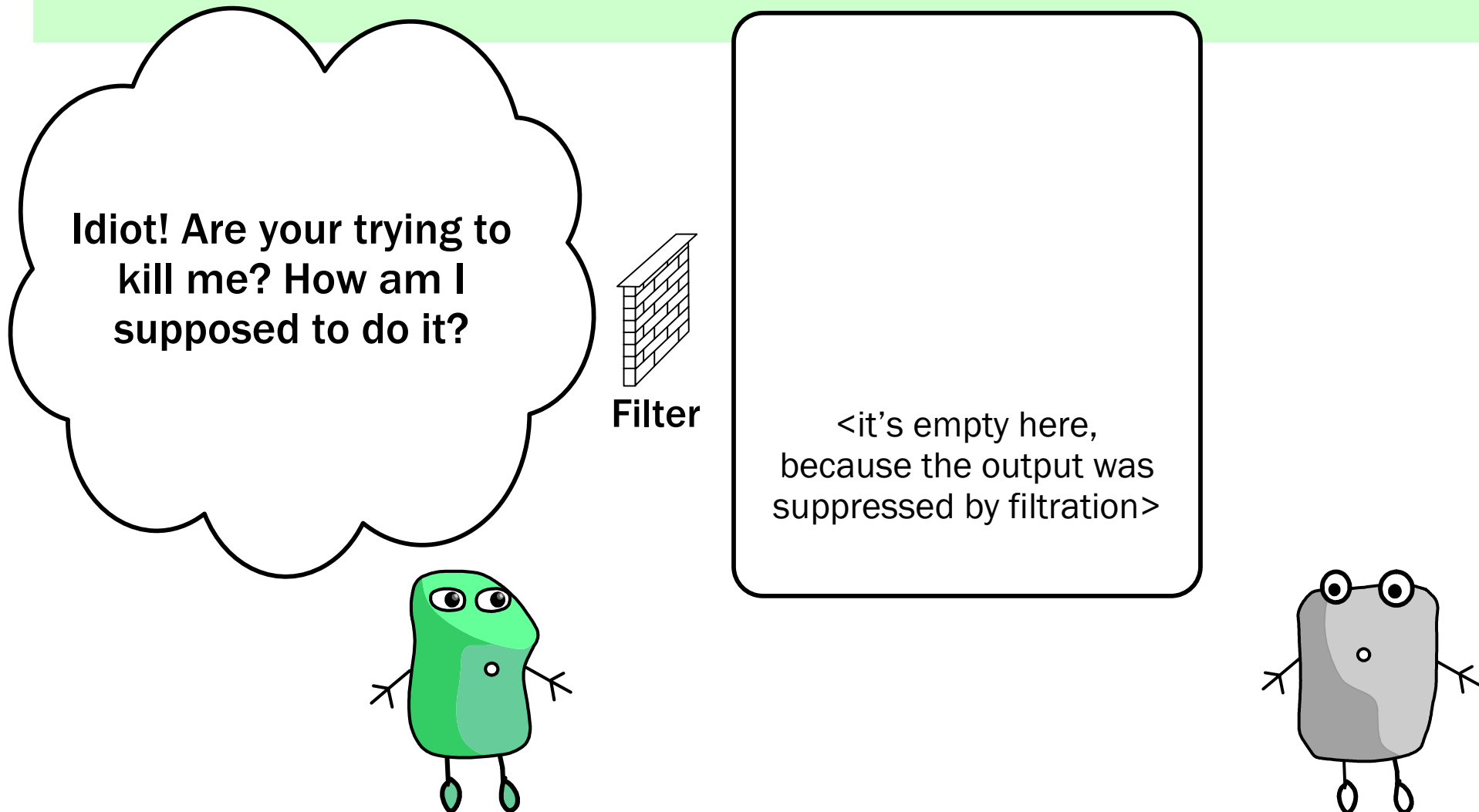
Filtration can depend on

(a) current state of the agent (microstate)

(a) figure of the addressee (local filtration)

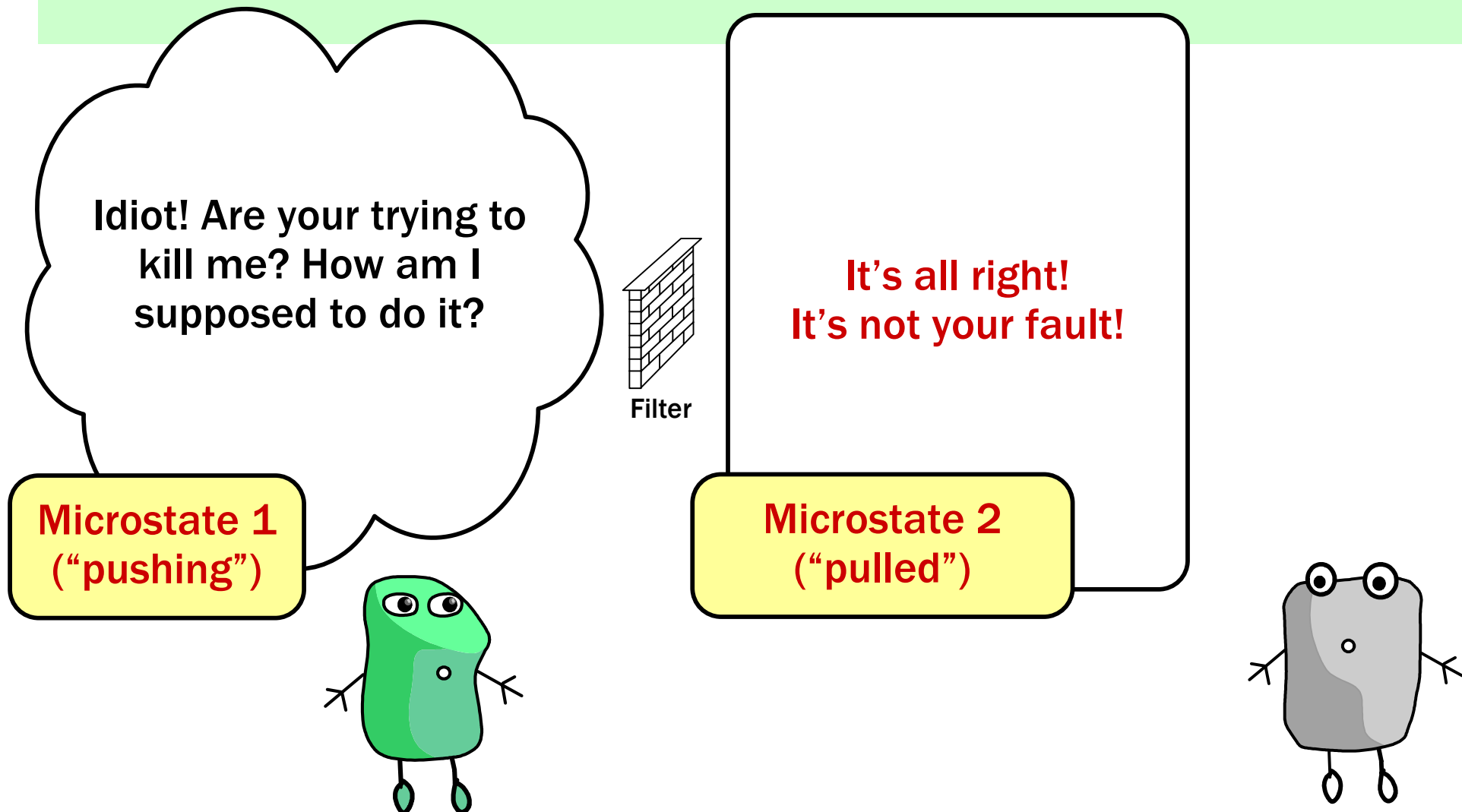
# Simulating hypocrisy

Filtration may completely suppress the speech output



## Simulating hypocrisy 2

If the filtration has suppressed the output... the agent may “exploit” another microstate to construct it’s speech output



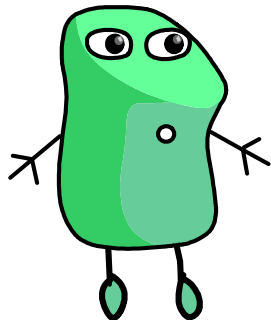
# Constructing «aggressive mask»

The number of “aggressive” emotional replies correlates with dissimulation in Lichko test ( $p < 0,05$ ).

“Aggressive mask” as a mean of dissimulation?

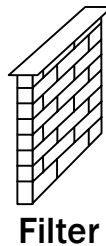
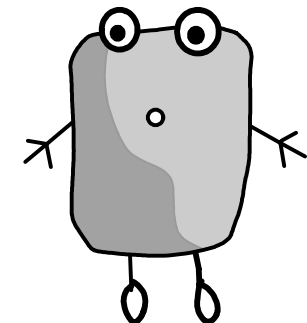
**Microstate 1**  
(~real)

I'm so useless!



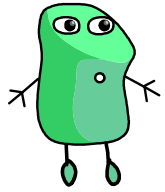
**Microstate 2**  
(exploited)

You are an idiot!





# Perspectives

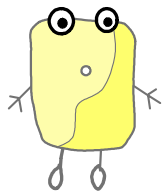


**Processing multiple predicative structures and inferences**

**More complicated interaction of microstates**  
(inhibition, activation, exploitation)

**Humour**

Semantic shifts cause ambiguous emotional texts



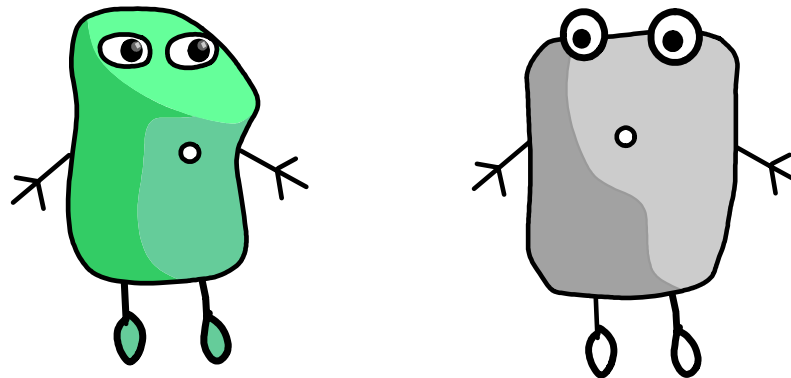
**Prosody and phonetic characteristics**

If a “neutral” utterance is called by an “emotional” script, it changes it’s prosody (irony, mocking – etc.)

**Application to mobile robots**



**We are grateful to Alexander Filatov for programming**



**Thank you for your attention!**

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