Affective Acting: An Appraisal-based Architecture for Agents as Actors

Stefan Rank

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Outline

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Outline

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Conception and Foundation in Theory
Realisation
Results and Prospects

The Idea
The Ends: Dramatic Structure
The Means: Emotion

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- The Basis: Autonomous Agents
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The Idea

An **Appraisal**-based **Architecture** for **Agents** As **Actors**

Autonomous emotional agents
in an environment prone to conflict
for (minimal) dramatic structures?
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- agents on an "acting stage"

- use an emotional architecture

- are the resulting action sequences "dramatically appropriate"?
  (at least for a cliché story)

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Why ?

- applications in education and entertainment:
  AI in games, interactive narratives, pedagogical agents
  "Virtual Characters"

- long-long-long-term:
  - trying to enhance human-computer-interaction
    users take the intentional stance towards computers
  - contribute to emotion theories:
    are they viable, implementable models?

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Eclectic Selection of Drama Features

- premise-character-conflict
  Example: premise "love overcomes all obstacles"

- archetypes in monomyth
  Example: Hero, Villain, Mentor, ...

- structure of plot functions in fixed order
  optional parts, basic/master plots

- emotional reactions often provide the causal links

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Basic setup for ActAffAct

archetypal characters

| Hero | Villain | Victim | Mentor |

in a world ripe for conflict

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Emotions

- emotions are seen as an integral element for dealing with a dynamic environment:
  the emotional subsystem monitors the environment for subjective relevance

- appraisal theory, Ortony's scheme of Valenced Reactions (events/actions/objects vs. goals/standards/tastes)

- appraisal criteria

- appraisal effects: action tendencies and coping

Ortony's Scheme of Valenced Reactions

	Positive Reactions	*Negative Reactions*	
Event happened	"joy"	"distress"	**Goal**
... could happen	"hope"	"fear"	
... didn't happen	"relief"	"sadness"	
one's own **Action**	"pride"	"shame"	**Standard**
... of others	"admiration"	"anger"	
Object	"love"	"hate"	**Taste**

e.g. Victim is relieved that Hero defused the bomb

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Stimulus Evaluation Checks

many theories - consensus on some main dimensions of appraisal
criteria

- relevance, goal significance, focus, ...

- standard compliance, blameworthiness, ...

- intrinsic pleasantness, valence, appealingness, ...

- novelty, unexpectedness, suddenness, familiarity, ...

- who is responsible

- coping potential

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Effects of Emotions

three observable indicators of emotions (response triad):

- physiological reaction
  arousal, mostly uncontrollable,
  preparation according to action tendency

- motor expression (e.g. facial expression)
  signs of internal state and intention,
 may activate emotions in others

- subjective feeling:
  motivation, influence on cognitive processes

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Autonomous Agents

- agents on an "acting stage" (the environment),

- they only perceive the environment
  including their own "physical" actions
  and those of others

- JAM: a BDI architecture as base
  - provides goals (concerns), action plans, execution model
  - standards and tastes as beliefs
  - appraisal process needs to be added

Conception and Foundation in Theory **The Basis: Autonomous Agents**
Realisation Adaptation for Emotions
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An ActAffAct Agent (as Extension of JAM)
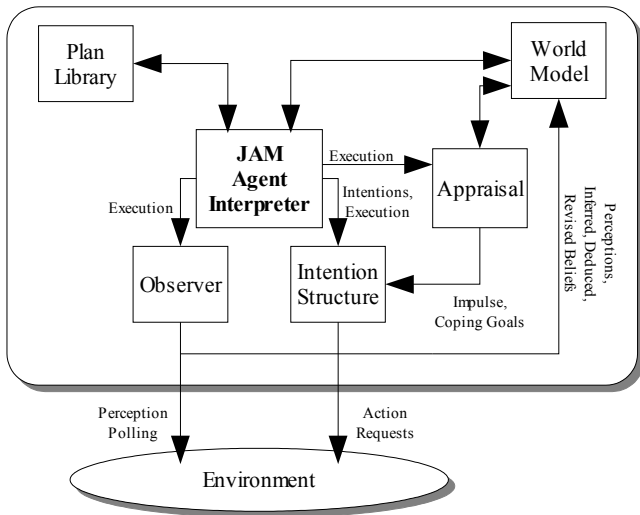
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Perception Plans

- extension of the JAM language

- realise pre-appraisal

- translate perceptions to facts
  that are meaningful for the agent

- include knowledge about intentions of others

Example

- `ObjectAtPosition obj pos;` $\rightarrow$ `ObjectReachable obj;`

- Agent takes flower $\rightarrow$ `AgentWantsTo` give it to me

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Plan Hierarchy

- concern
  ⇓
- activity
  ⇓
- behaviour
  ⇓
- action package
  ⇓
- ACT plan

Example

```
         MAINTAIN beLoved;
                  ⇓
    givePresentsToActor Victim;
                  ⇓
 ... do giveObjectTo Flower Victim; ...
                  ⇓
        ... getObject Flower; ...
                  ⇓
... takeObjectAtPosition Flower pos; ...
```

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Appraisal Intensity Calculation

- matching between
    - *behaviour* goals and interpreted perceptions
    - standards and interpreted perceptions
    - preferences (simple threshold check)
- relevance, conformance, preference
- easy matching because of the format of behaviours

if all thresholds are exceeded an *appraisal object* is registered

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Appraisal Effects

1. impulse
   a sufficiently high intensity leads to an emotional expression
   represented as a simple speech bubble

2. preference change
   every appraisal proportionally changes the preference
   for the responsible actor

3. coping goal
   a goal is added to the intention structure
   that might lead to coping activities

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An Example

Victim's percept: SUCCESS deactivateObject Hero Bomb
$\Downarrow$
relevance: matches GOAL: deactivateObject Bomb
$\Downarrow$
$\Rightarrow$ expressive reaction: sigh and relax (Relief),
$\Rightarrow$ info processing reaction: Hero more likable
$\Rightarrow$ emotion-oriented coping: e.g. calm down

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Ideal Action Sequences ?

- dramatic sequences only in a simple way
- emotional connections between actions
- sensible conflict - resolution sequences, sensible variations, *but*
- rather unstable
  (director as a corrective?, JAM priorities vs. action tendencies as commitments)
- too cumbersome setup, too explicit plans
- no learning strategy used

Outline

Possibilities for further work (1/2)

towards engaging interactive drama

- focus of attention & "simulated vision"
  (active dedication of resources to the process of perceiving)

- an adaptive pre-appraisal step (learning type 1)

- appraisal not only on the level of behaviours,
  include reasoning up to the level of concerns

- twice-removed reasoning (beliefs about beliefs of others)

- explicit domain ontology for the environment:
  meta-data about actions, objects, temporal constraints,
  relations between actions (preconditions, hinder/further),
  shared between agents (a starting point for their knowledge)

Possibilities for further work (2/2)

towards engaging interactive drama

- plan-relations: similar adaptive structures for behaviours, (more explicit than in JAM, learning type 2), useful for coping activities, treatment of plan failures

- reduction of the necessary tweaking done by the "author", what has to be domain-specific? at what level can a user influence an agent (**interaction**)? explicit personality model for the agents.

- social roles and norms and communication acts

- more formal drama theory treatment

- 3D-environment

The End

Thanks for your attention!

Have a nice day!