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

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1. Conception and Foundation in Theory
   - The Idea
   - The Ends: Dramatic Structure
   - The Means: Emotion

2. Realisation
   - The Basis: Autonomous Agents
   - Adaptation for Emotions
   - Appraisal in Action

3. Results and Prospects
   - Summary
   - Future Work
Outline

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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? ActAffAct

- agents on an “acting stage”
- use an emotional architecture
- are the resulting action sequences “dramatically appropriate”? (at least for a cliché story)
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?
Conception and Foundation in Theory

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Realisation

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Results and Prospects

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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
Basic setup for ActAffAct

archetypal characters

- Hero
- Villain
- Victim
- Mentor

in a world ripe for conflict

- Sword
- Flower
- Hat
- Key
- Bomb
- Block
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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

<table>
<thead>
<tr>
<th>Event happened</th>
<th>Positive Reactions</th>
<th>Negative Reactions</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>“joy”</td>
<td>“distress”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“hope”</td>
<td>“fear”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“relief”</td>
<td>“sadness”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>one’s own Action</td>
<td>“pride”</td>
<td>“shame”</td>
<td>Standard</td>
</tr>
<tr>
<td>“admiration”</td>
<td>“anger”</td>
<td></td>
<td>Taste</td>
</tr>
<tr>
<td>“love”</td>
<td>“hate”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e.g. Victim is relieved that Hero defused the bomb
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
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
An ActAffAct Agent (as Extension of JAM)

- Plan Library
- World Model
- JAM Agent Interpreter
- Appraisal
- Observer
- Intention Structure
- Action Requests
- Environment
- Perception Polling
- Execution
- Execution
- Perceptions, Inferred, Revised Beliefs
- Impulse, Coping Goals
- Intentions, Execution

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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; → ObjectReachable obj;
- Agent takes flower → AgentWantsTo give it to me
Plan Hierarchy

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

Example

```
MAINTAIN beLoved;
  givePresentsToActor Victim;
  ... do giveObjectTo Flower Victim; ...
  ... getObject Flower; ...
  ... takeObjectAtPosition Flower pos; ...
```
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
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
⇓
relevance: matches GOAL: deactivateObject Bomb
⇓
⇒ expressive reaction: sigh and relax (Relief),
⇒ info processing reaction: Hero more likable
⇒ emotion-oriented coping: e.g. calm down
The Basis: Autonomous Agents
Adaptation for Emotions
Appraisal in Action

ActAffAct in Action

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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
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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!