Actors and Interaction

“Stories are about the most fascinating thing in the universe: people.”
– Chris Crawford

Lead Actors in Games
Speaking of Enemies...
The Arch-typical End-boss

The Ever-present but Intangible Enemy

The Sympathetic Enemy
But Not Just Games

Tutors and Instructors

Interface Agents

REAC – Natural Interface to a Real-estate Database
Making Them Act
Autonomy of Actors

Follow a Script → Make Decisions

Perception Action Loop

Decision
Perception → Action

Perception Action Loop

Lookup
P1 → A1
P2 → A2
P3 → A3
...

Decision
Perception → Action
Perception Action Loop

State Machine
S0 + P1 → A1 + S1
S1 + P2 → A2 + S2
S2 + P3 → A3 + S2
...

Decision

Perception  Action

Perception Action Loop

Competition
score(A1)=G1*f(P1)
score(A2)=G2*f(P2)
score(A3)=G3*f(P3)
...
max(A1, .. An) → A

Decision

Perception  Action

Perception Action Loop

update(KB, k1)
update(KB, k2)
update(KB, k3)
bestaction(KB) → A

Perception  Action

Planning / Reasoning

update(KB, k1)
update(KB, k2)
update(KB, k3)
bestaction(KB) → A

Decision

Perception  Action
Visible Action

- Often the actions of an actor will manifest itself as visible behavior.
- The behavior will be performed by an articulated body, typically human-like in appearance.
- The movements communicate the inner world of the actor.
- Any movement or lack of movement that is not consistent with that inner world, destroys the credibility of that actor.

But it’s very hard to control a visible body

- Over 230 joints
- Over 50 muscles in face
- And we never stop moving!
Humans control it with little effort

But hard for computers and “players”

How do we make it easier?

The answer is a layered approach
Layered Control: Many Perception Action Loops

**Intent**

**Goal**

**Behavior**

**Perception Control**

**Motion**

**Body**

*Spread the Intelligence [in yellow]*

**Impact of Decision**

**Perception**

**Behavior**

**Motion**

**Body**

**Body (physics)**

- Knows its location and configuration
- Knows its limits
- Knows if it’s touching something
- Knows what’s perceiveable
- Can balance itself

*Example: I bumped into another person!*
Motion (Dynamics)

- Knows what joints are needed
- Knows how joints can move
- Can maintain itself
- Can blend with other motions
- Can synchronize with environment

  • Example: Eyes track an object

Behavior (Action)

- Knows what motions are needed
- Knows which motions are most important
- Knows if the behavior succeeded
- Can change if needed

  • Example: Point at instruments
  • Example: Nod the head

Intent (Cognition Level1)

- Knows what behaviors help intent
- Knows what behaviors are permissible
- Knows the social context
- Can try something different if behavior fails

  • Example: Start conversation
  • Example: Emphasize a word
Goal (Cognition Level 2)

- Knows what intent is most relevant
- Knows intent of others
- Knows needs, desires, emotions, personality...
- Can evaluate progress towards goals

Example: Tell John about the lottery!

New Standard Interfaces

<table>
<thead>
<tr>
<th>Goal</th>
<th>Intent</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>FML</td>
<td>BML</td>
<td></td>
</tr>
</tbody>
</table>

Summary of layered approach

- **Intelligence** is spread across layers, with higher concentration at the top and lower concentration in the graphics hardware at the bottom.
- **Interfaces** between layers provide scripting opportunities, sharing of components, different control paths and levels of detail, as well as being the glue holding a character together.