

Actors and Interaction

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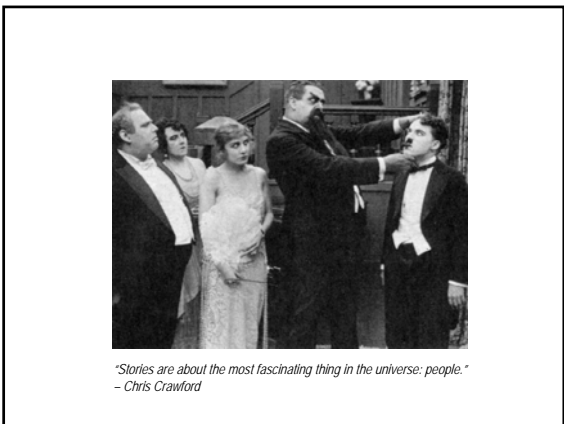
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Lead Actors in Games

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Heroes



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Heroes



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Heroes (?)



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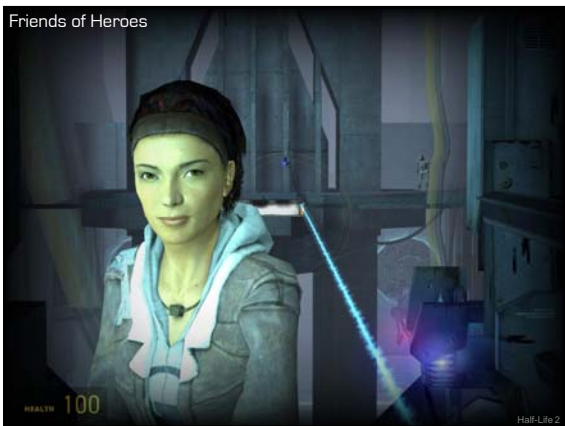
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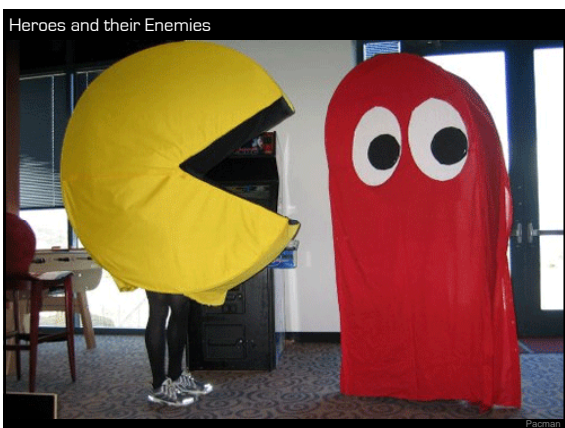
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Speaking of Enemies...

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The Arch-typical End-boss



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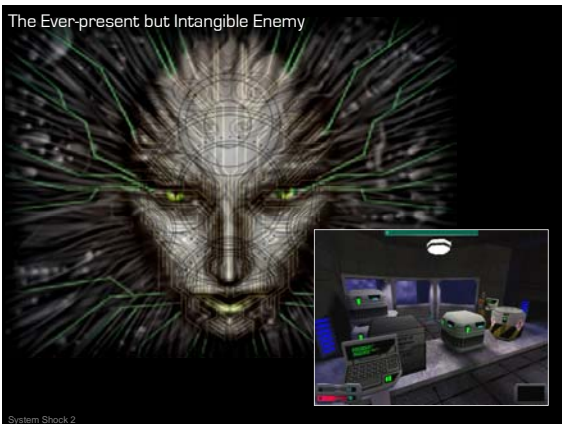
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The Ever-present but Intangible Enemy



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The Sympathetic Enemy



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Lesser Actors

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But Not Just Games

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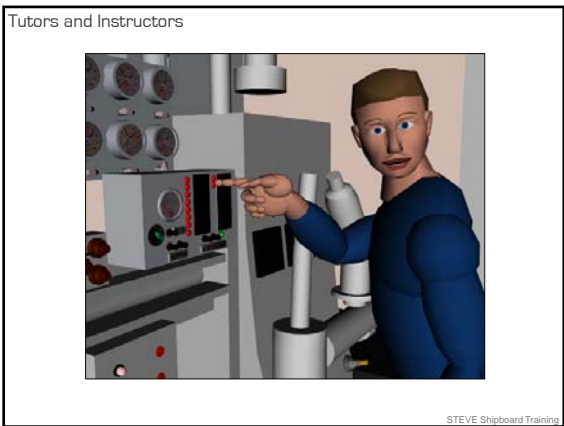
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Pedagogical Drama



Carmen's Bright IDEAS

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Simulated People



Tactical Iraqi

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Guide Characters



Tactical Pashto

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Historic Figures and Story Characters



H.C. Andersen, NICE Project

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Online Avatars



Second Life

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Making Them Act

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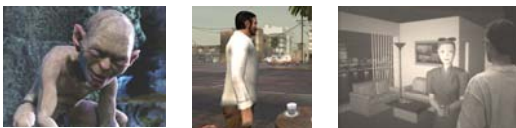
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### Autonomy of Actors



Follow a Script



Make Decisions

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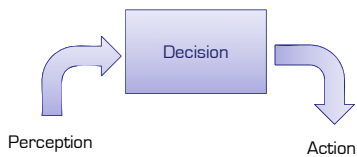
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### Perception Action Loop



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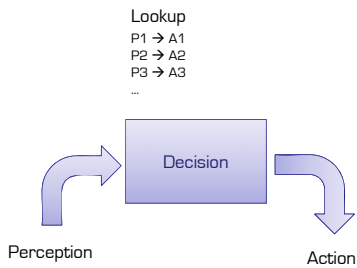
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### Perception Action Loop



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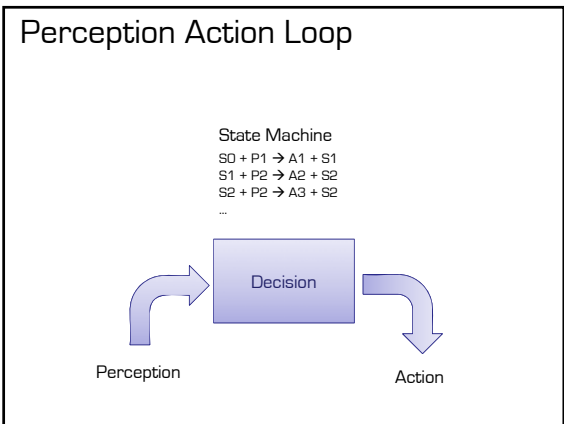
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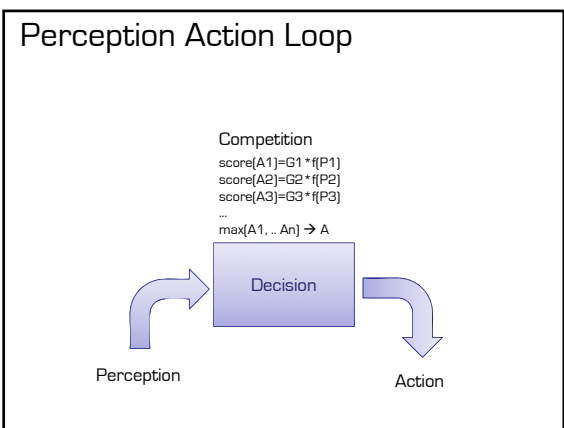
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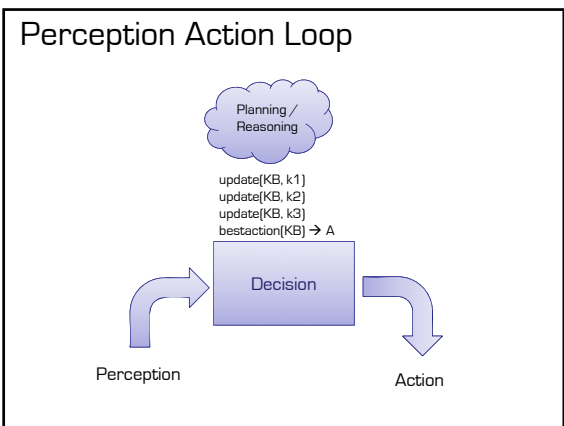
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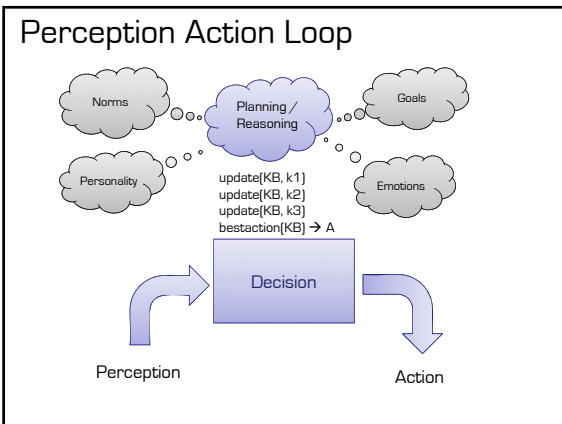
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- ### Visible Action
- Often the actions of an actor will manifest itself as **visible behavior**.
  - The behavior will be performed by an **articulated body**, typically human-like in appearance.
  - The movements **communicate** the **inner world**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

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### But it's very hard to control a visible body

- Over 230 joints
- Over 50 muscles in face
- And we never stop moving!

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Humans control it with little effort



© Josh Lerner

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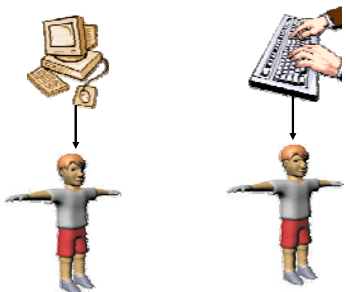
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But hard for computers and "players"



How do we make it easier?

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The answer is a layered approach



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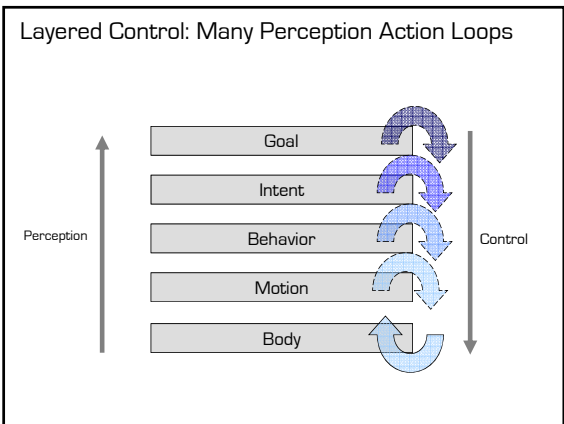
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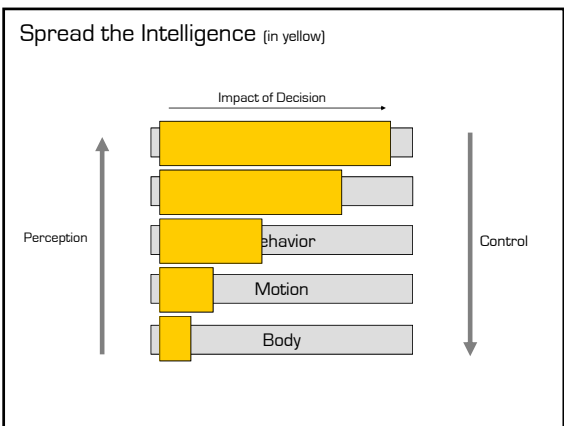
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### Body (physics)

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

• Example: I bumped into another person!

Goal
Intent
Behavior
Motion
Body

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**Motion (Dynamics)**

Goal
Intent
Behavior
<b>Motion</b>
Body

- 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




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**Behavior (Action)**

Goal
Intent
<b>Behavior</b>
Motion
Body

- 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




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**Intent (Cognition Level1)**

Goal
<b>Intent</b>
Behavior
Motion
Body

- 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




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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!



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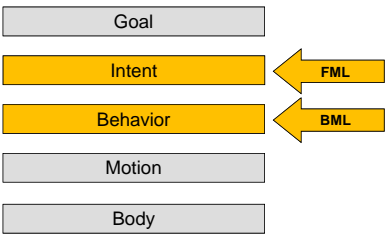
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New Standard Interfaces



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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.

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