Interfacing Emotional Behavior Moderators with Intelligent Synthetic Forces

by

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Project Background

- Research contract with ARI

- Develop models of emotion for CGFs

- CGF system is SOF-Soar, developed for MSIAC

- Implement method by which emotional reactions of command entity can affect outcome of reconnaissance mission

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SOF Reconnaissance
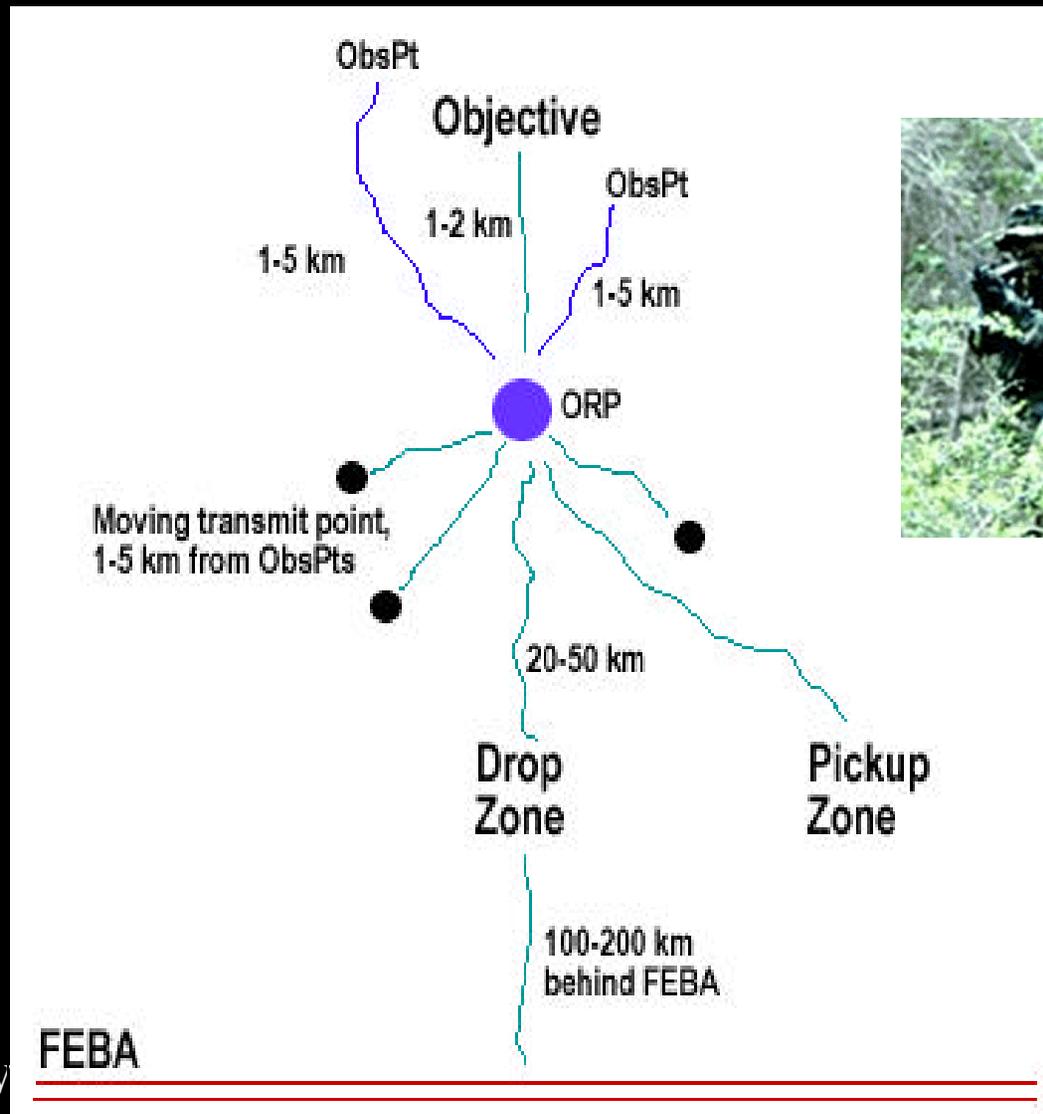
Symbolic/Connectionist Hybrid

- Symbolic
  - Rich, expressive representation language
  - Traceable, explicit, systematic
  - Limited by knowledge in system
  - Proven to be good at modeling high-level, cognitive behavior
- Connectionist
  - Vector-based or attribute-based representations
  - Implicit, not (typically) traceable, tolerant of noise or local failure
  - Term created by psychologists to describe use of neural networks in modeling human processes
  - Proven to be useful in signal-processing applications

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Model Components

- Symbolic model – Behavior system
  - Cognition/Decision making (symbolic)

- Connectionist model – Emotional signal processor
  - Emotional intensity (connectionist)
  - Pleasure/Pain (connectionist)
  - Clarity/Confusion (connectionist)

- Interfaces
  - Emotional appraisal
  - Attention and responses

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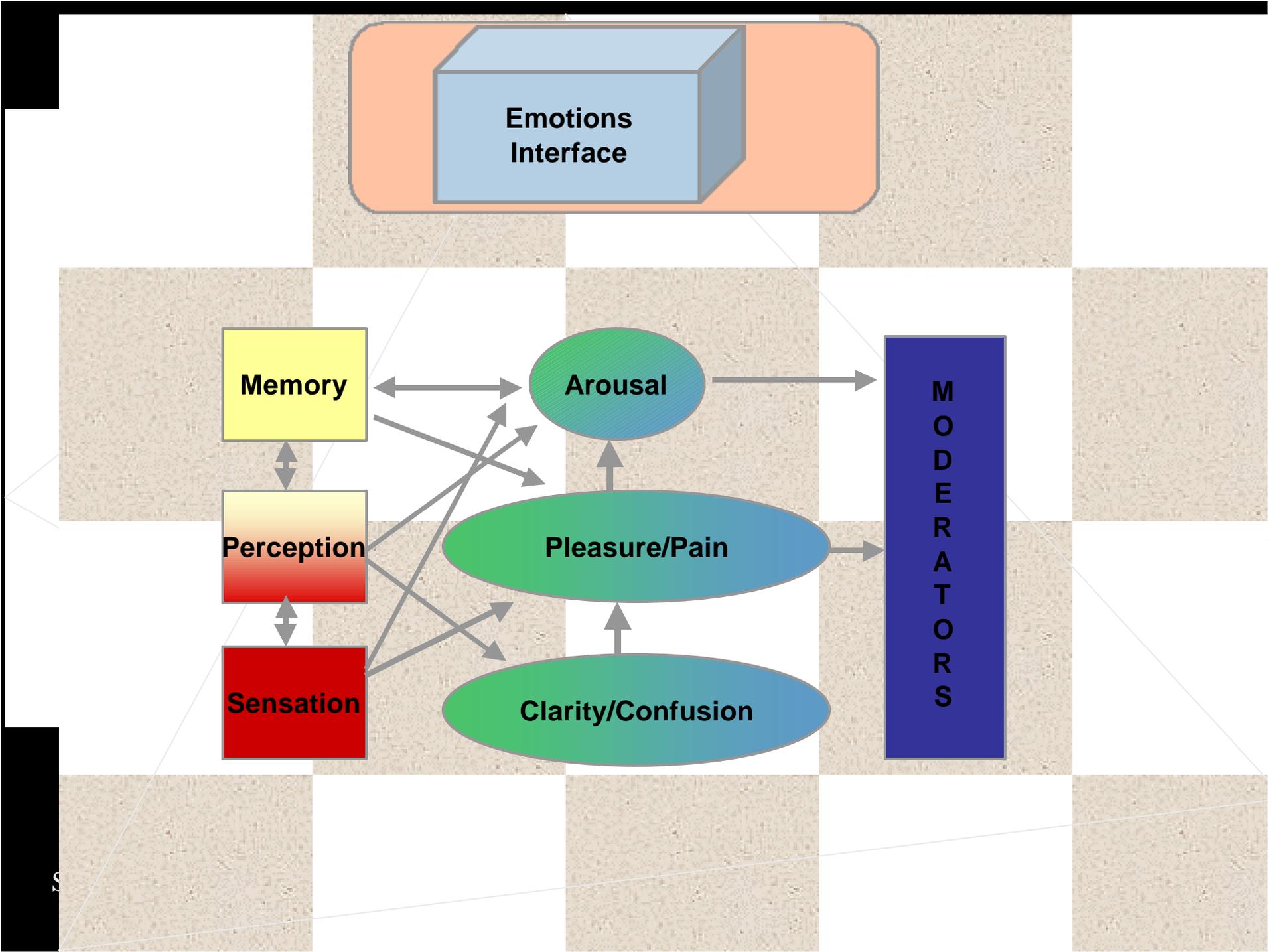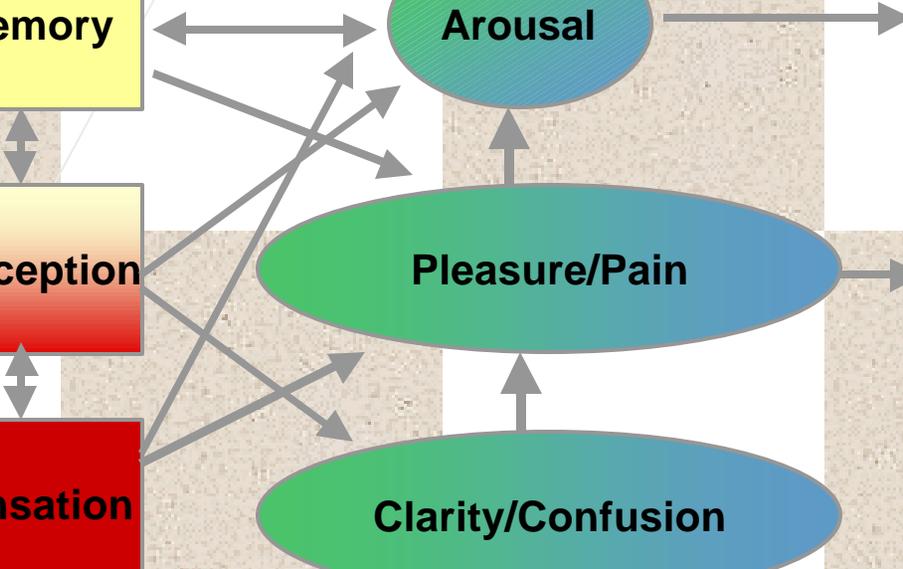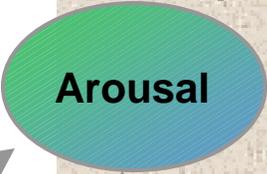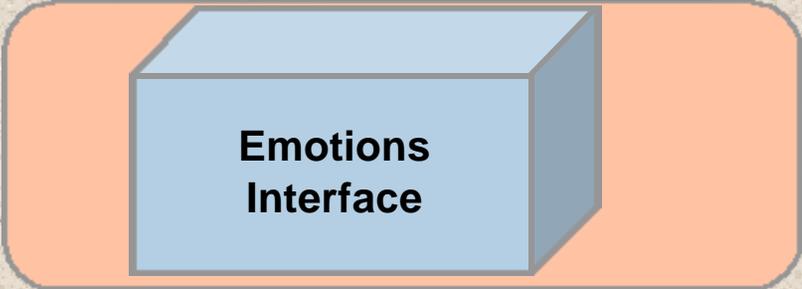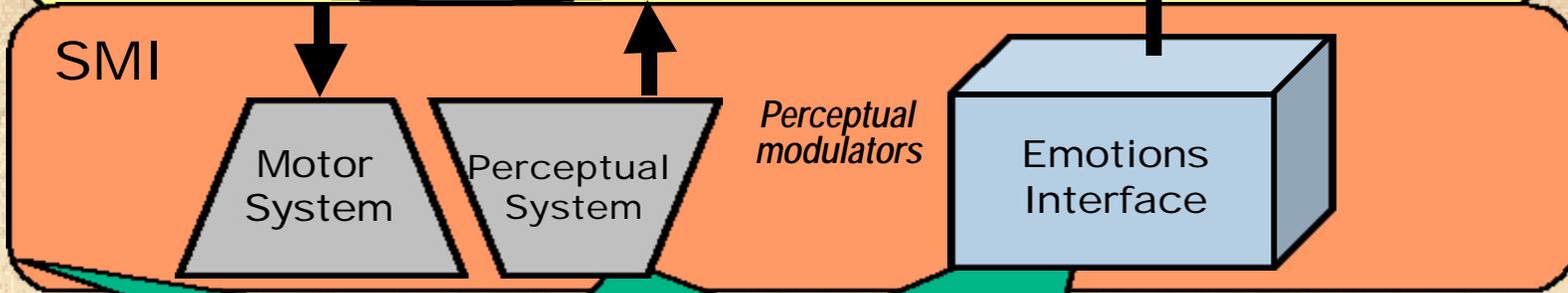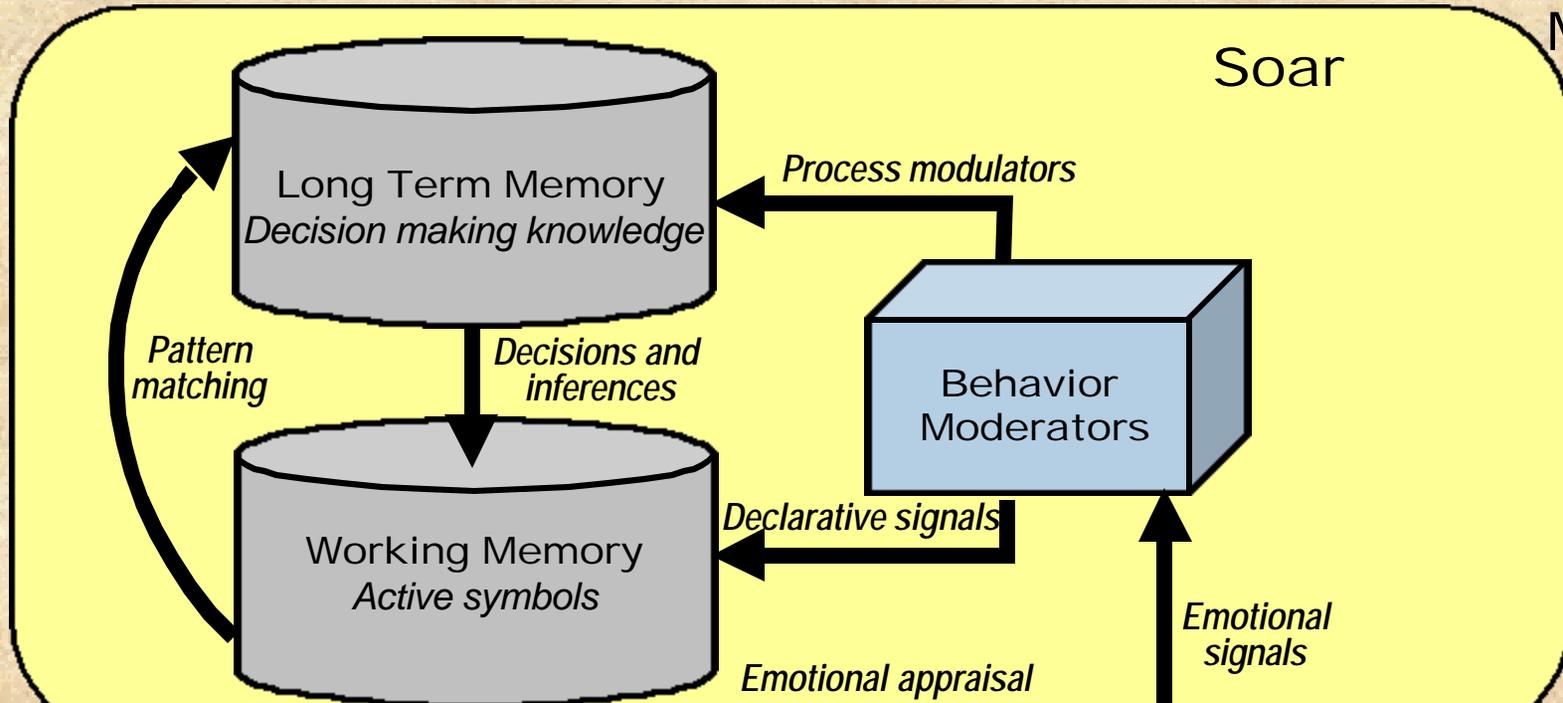
Cognitive Response to Emotion

- Emotions $\rightarrow$ Cognition
- Arousal
  - Short-term memory
    - Tags to focus attention
  - Long-term memory
    - Arousal thresholds to filter potential actions
    - Favor well-rehearsed knowledge under high arousal
- Pleasure/Pain
  - Long-term memory
    - Pursuit/avoidance preferences to filter potential actions
    - Goals represent "pleasurable" pursuits

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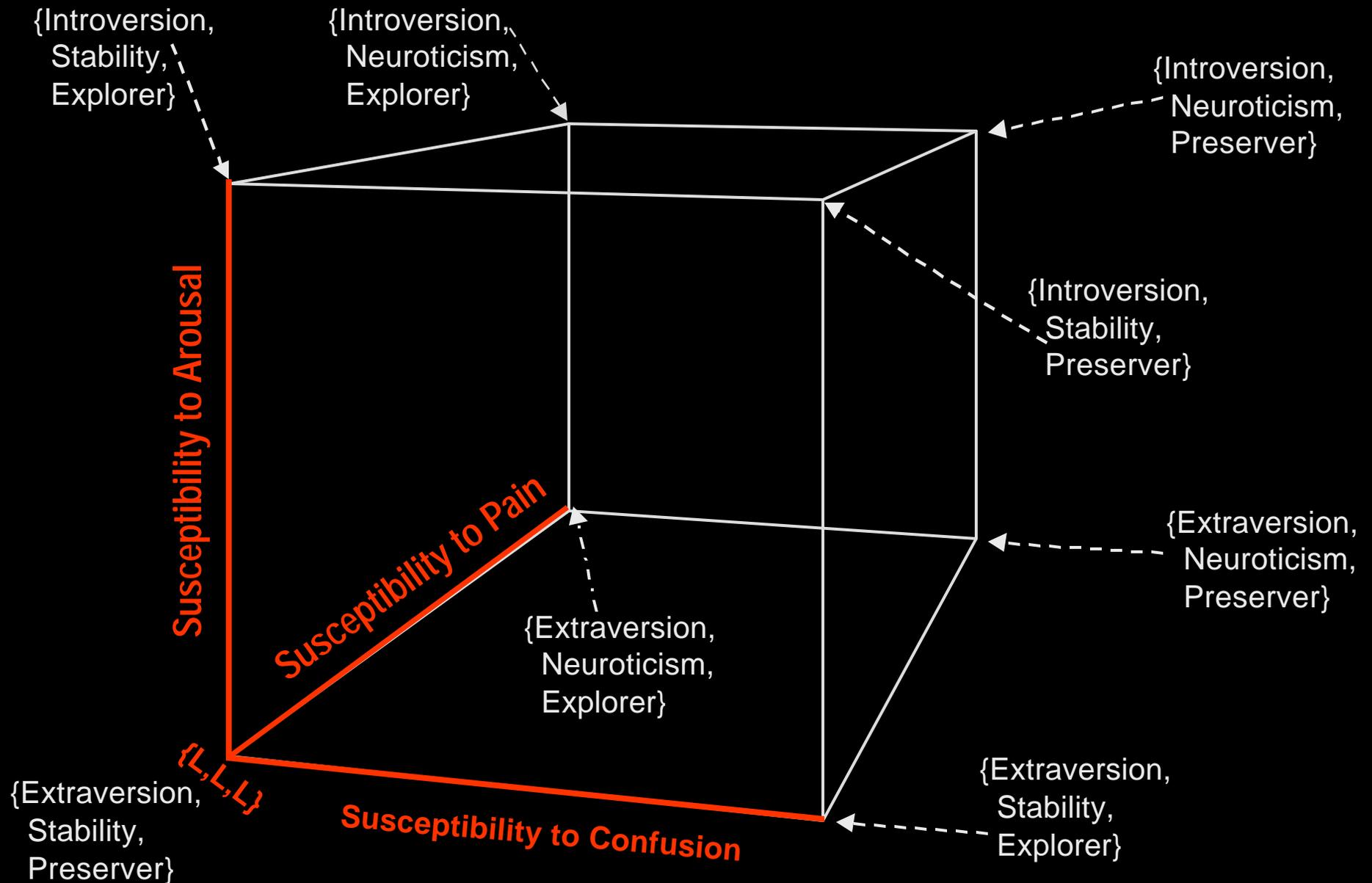Thinking *inside* the box.

Cognitive Situation Appraisal

- Cognition $\rightarrow$ Emotions
- Clarity/Confusion
  - Coherent and confounding situation assessments
  - Match observations to expectations
- Pleasure/Pain
  - Physical sensations
  - Cognitive interpretations
    - Impact on goals, anticipation of sensation
- Arousal
  - Purely arousing stimuli

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Example Interaction

Emotional Subsystem	Inputs	Value
Confusion	Enemy-exists	0.4
Confusion	Enemy-sees-me	0.2
Pain	People-shooting	0.3
Pain	People-shooting-at-me	0.6
Pain	Enemy-sees-me	0.5
Pain	Mission-in-jeopardy	0.3
Pain	High-enemy-to-friendly-ratio	0.3
Arousal	Loud-noise	0.3
Arousal	Dangerous-location	0.3

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Experimental Design

{Introversion, Stability, Explorer}

{Introversion, Neuroticism, Explorer}

{Introversion, Neuroticism, Preserver}

{Introversion, Stability, Preserver}

Susceptibility to Arousal

Susceptibility to Pain

{Extraversion, Neuroticism, Explorer}

{Extraversion, Neuroticism, Preserver}

{L,L,L}

{Extraversion, Stability, Preserver}

Susceptibility to Confusion

{Extraversion, Stability, Explorer}

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