

Entertainment Game AI vs. Serious Game AI

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Serious games

- An entertaining virtual experience that's purpose goes beyond entertainment
- Serious game purposes include:
 - Education
 - Training
 - Communications
 - Public Policy
 - Marketing
 - Mental Health Therapy
 - Medical Diagnosis



ICT's Game Portfolio

- Full Spectrum Command Boardgame
- Full Spectrum Command
- Full Spectrum Warrior
- Full Spectrum Leader
- LEADERS
- Joint Fires & Effects Trainer System
- SLIM-ES3
- ELECT BiLAT
- ADFO-CCLT
- DMCTI
- ELECT urbanSIM
- PTSD VR Therapy



ICT's Serious Game Process

1. Define task looking at COE and current needs
2. Identify target users and SMEs
3. Define the domain/task
4. Conduct a cognitive task analysis
5. Identify the learning objectives
6. Develop an instructional/game design
7. Identify appropriate research technologies
8. Develop a prototype
9. Pre-production
10. Production
11. Formative & Summative assessment
12. Refinements & Enhancements
13. Transition to non-University partner

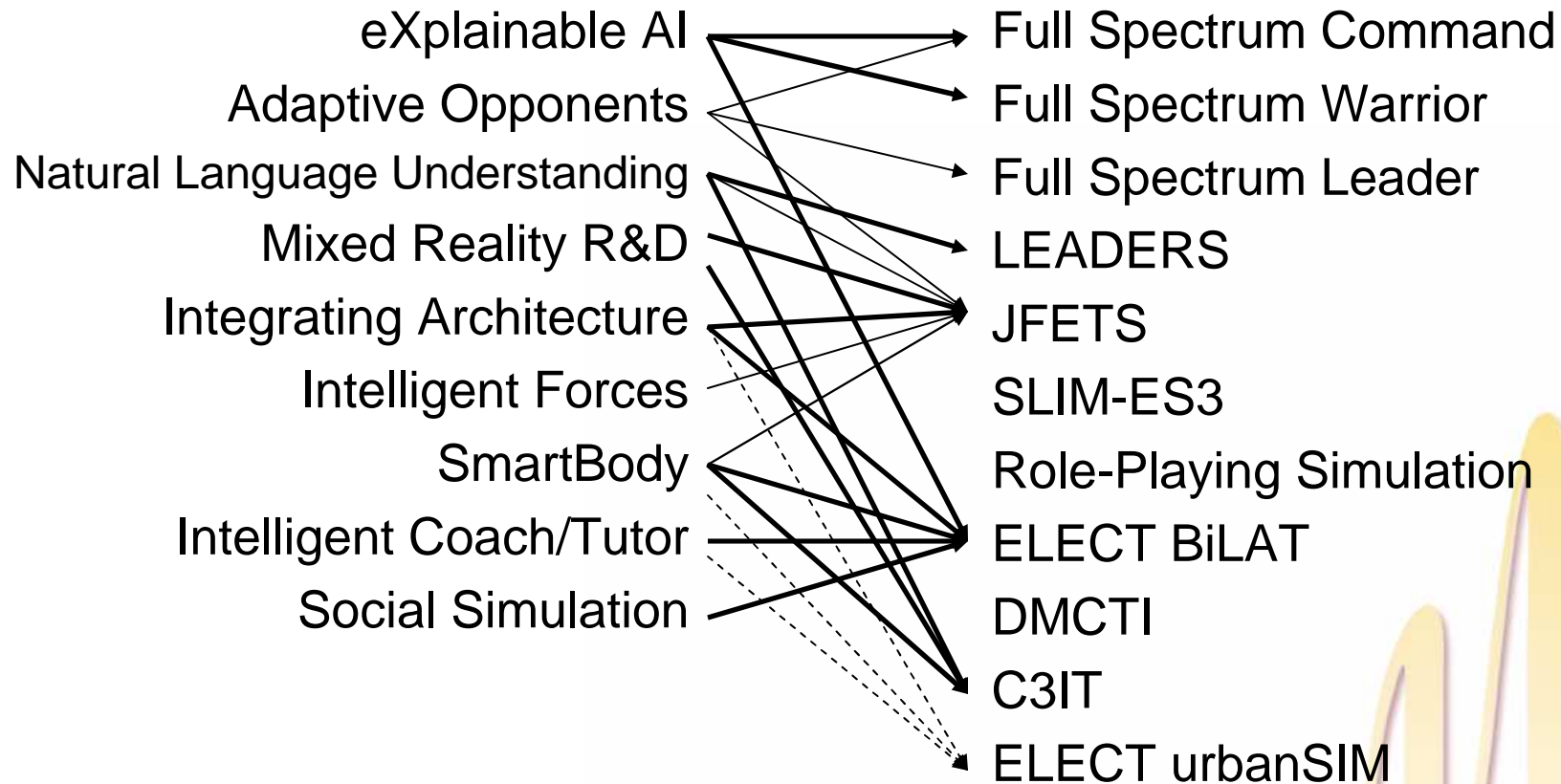
DMCTI

ELECT urbanSIM

ADFO-CCLT

ELECT BiLAT

Research integration



Similarities and Differences

Entertainment Game AI

Serious Game AI



Similarities and Differences

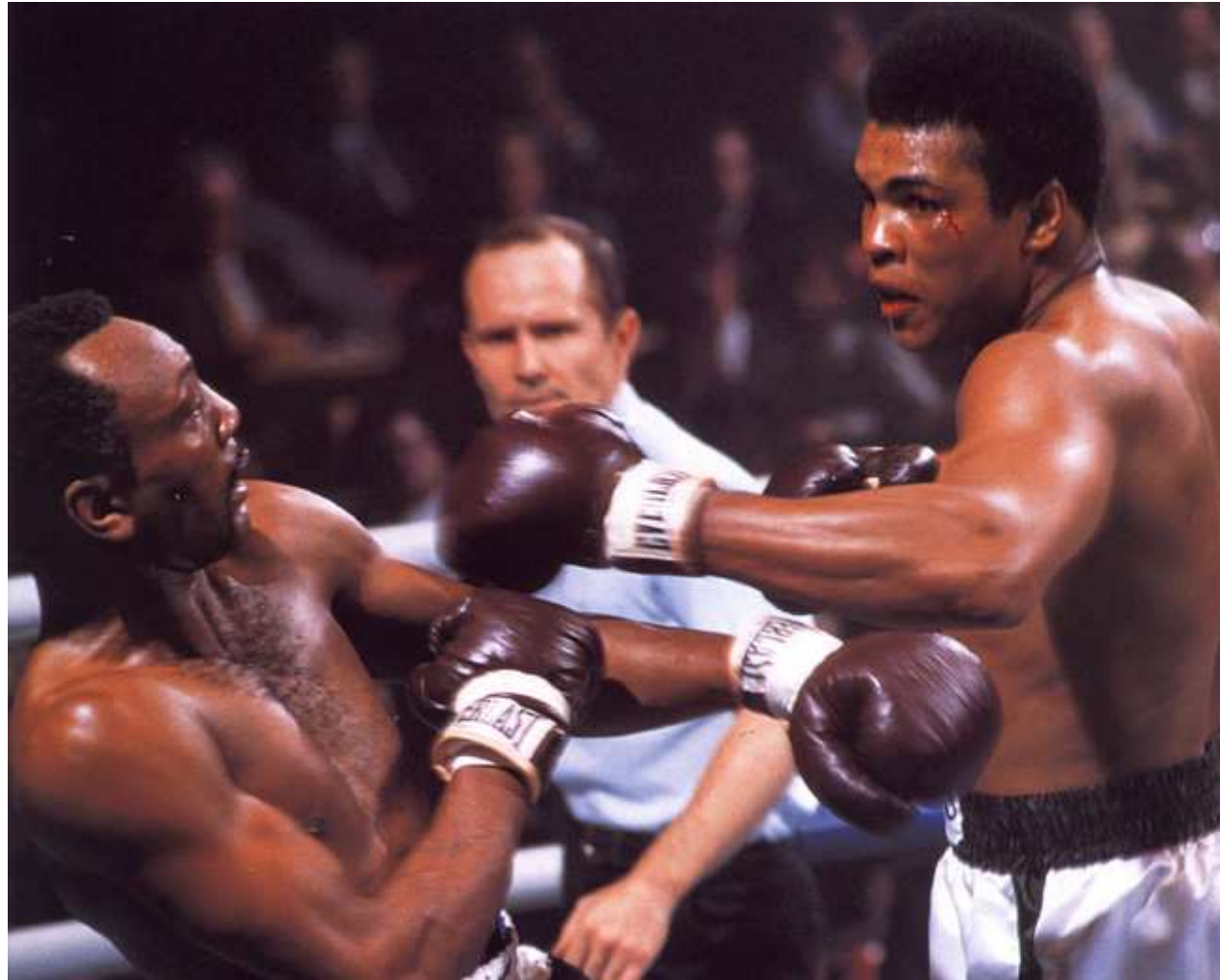
Entertainment Game AI

- Not about winning

Serious Game AI



Wrong view of game AI



Right view of Game AI



Similarities and Differences

Entertainment Game AI

- Not about winning

Serious Game AI

- Not about winning



Wrong view of serious game AI



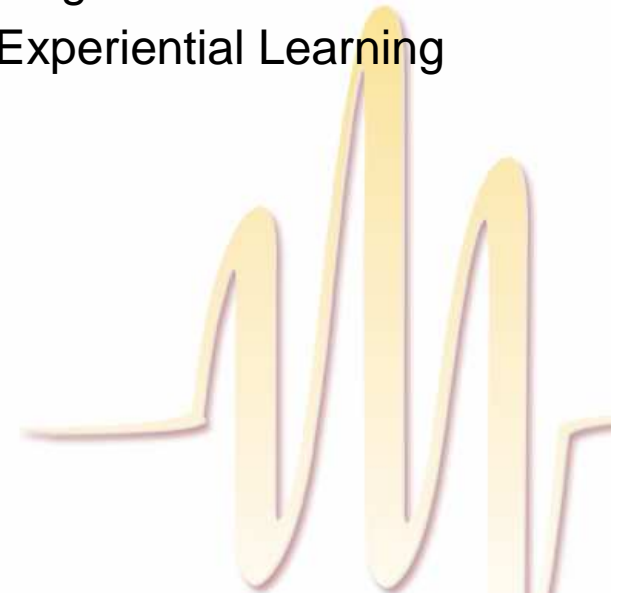
Similarities and Differences

Entertainment Game AI

- Not about winning
- Cheating is often okay

Serious Game AI

- Not about winning
 - Explicitly reason about learning goals
 - Intelligent tutoring
 - Positive/negative reinforcement
 - Guided Experiential Learning



Entertainment Game AI

```
(defrule  
  (true)  
=>  
  (enable-timer 4 3600)  
  (disable-self))  
  
(defrule  
  (timer-triggered 4)  
=>  
  (cc-add-resource food 700)  
  (cc-add-resource wood 700)  
  (cc-add-resource gold 700)  
  (disable-timer 4)  
  (enable-timer 4 2700))
```

Similarities and Differences

Entertainment Game AI

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- Static behavior works

Serious Game AI

- Not about winning
- Cheating is sometimes okay



Entertainment Game AI

- ; The AI will attack once at 1100 seconds and then again
- ; every 1400 sec, provided it has enough defense soldiers.

```
(defrule  
  (game-time > 1100)  
=>  
  (attack-now)  
  (enable-timer 7 1100))
```

```
(defrule  
  (timer-triggered 7)  
  (defend-soldier-count >= 12)  
=>  
  (attack-now)  
  (disable-timer 7)  
  (enable-timer 7 1400))
```



Similarities and Differences

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PLAN

Show All

FRAGO

Init Pos

1

Examine Plan

PHASE: 1

+ Add New



Tasks

- Black: Commander**
 1
- White: Rifleman**
 1
- Blue: Rifleteam**
- Green: MG Crew**
 11
- Purple: MG Crew**
 12
- Grey: RPG/Rifleman Tea**
 19

RESET

CLEAR FRAGO

ZOOM:

VIEW MAPS:
Map 1 Map 2

STATS

OPO

BLUE PLAN

RED PLAN

REVIEW

SCENARIO EDITOR: OPFOR PLAN

Show All

FRAGO

Init Pos

1

Browse the Matrix

PHASE: 1

+ Add New

Tasks



Blue: Rifleteam



Green: MG Crew



Purple: MG Crew



Grey: RPG/Rifleman Tea



Orange: Reinforced Rifle



NONENONECSS



RESET

CLEAR FRAGO

ZOOM:



VIEW MAPS:

Map 1 Map 2

FILE

BRIEFING

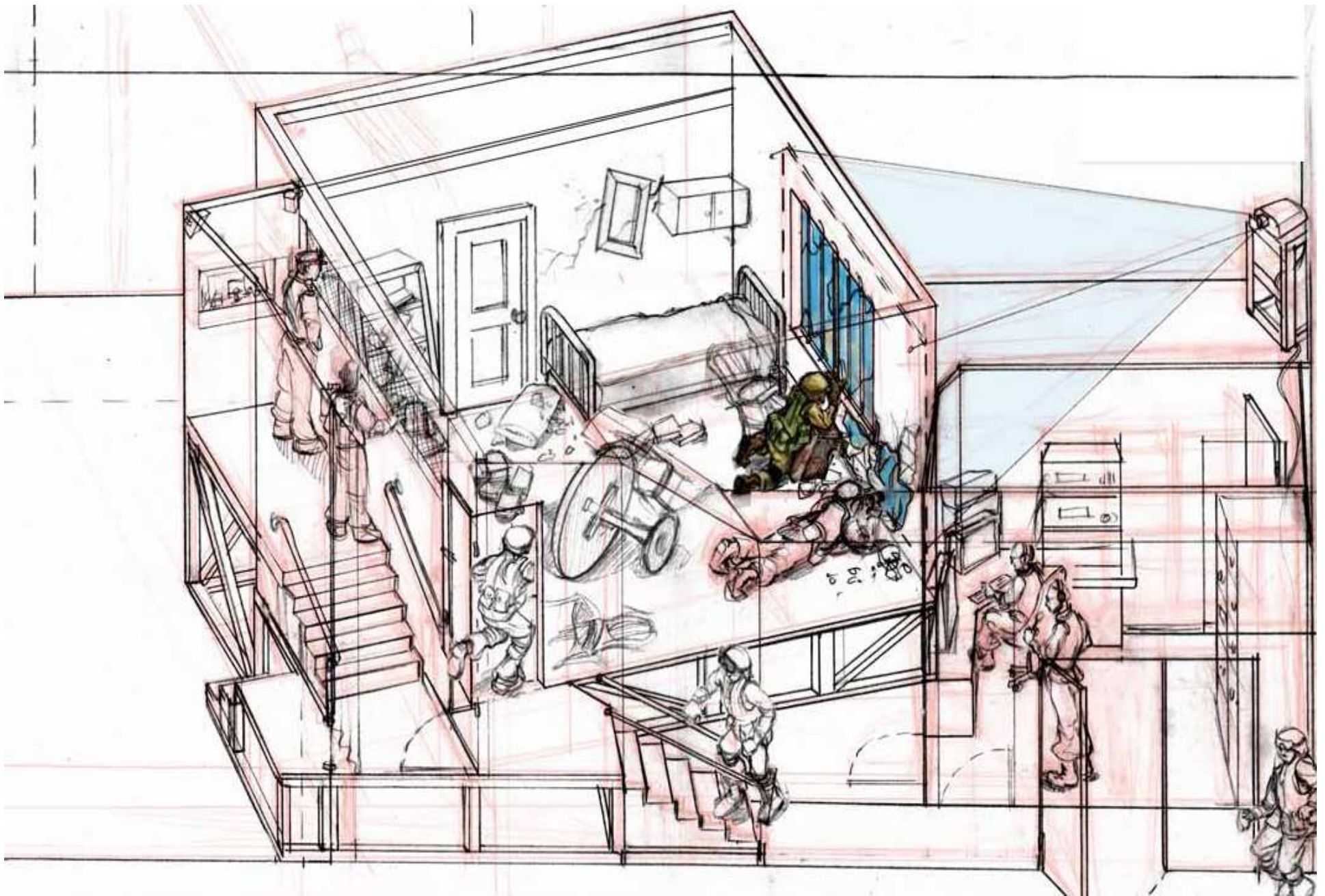
BLUEFOR UNIT
SELECTION

OPFOR UNIT
SELECTION

OPFOR PLAN

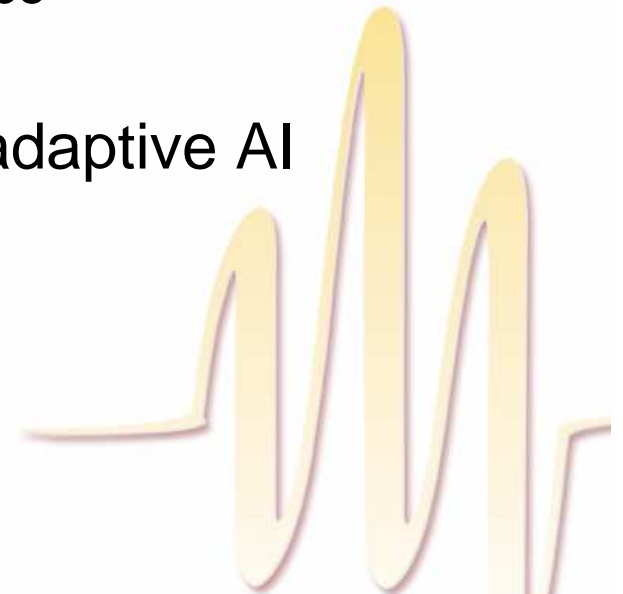
CIVILIAN UNIT
SELECTION

CIVILIAN PLAN



Adaptive Opponents

- Two inspiring occurrences:
 - FSC game designers “tricking” the SMEs
 - B-training at Ft. Sill
- Most entertainment game AI is static and scripted
 - Learning to beat the script is fun
 - Designer can control the player’s experience
 - Quality assurance is manageable
- Serious games required variable and adaptive AI
 - Prevent gaming the game
 - Address student’s specific needs
 - Give instructors “sufficient” control

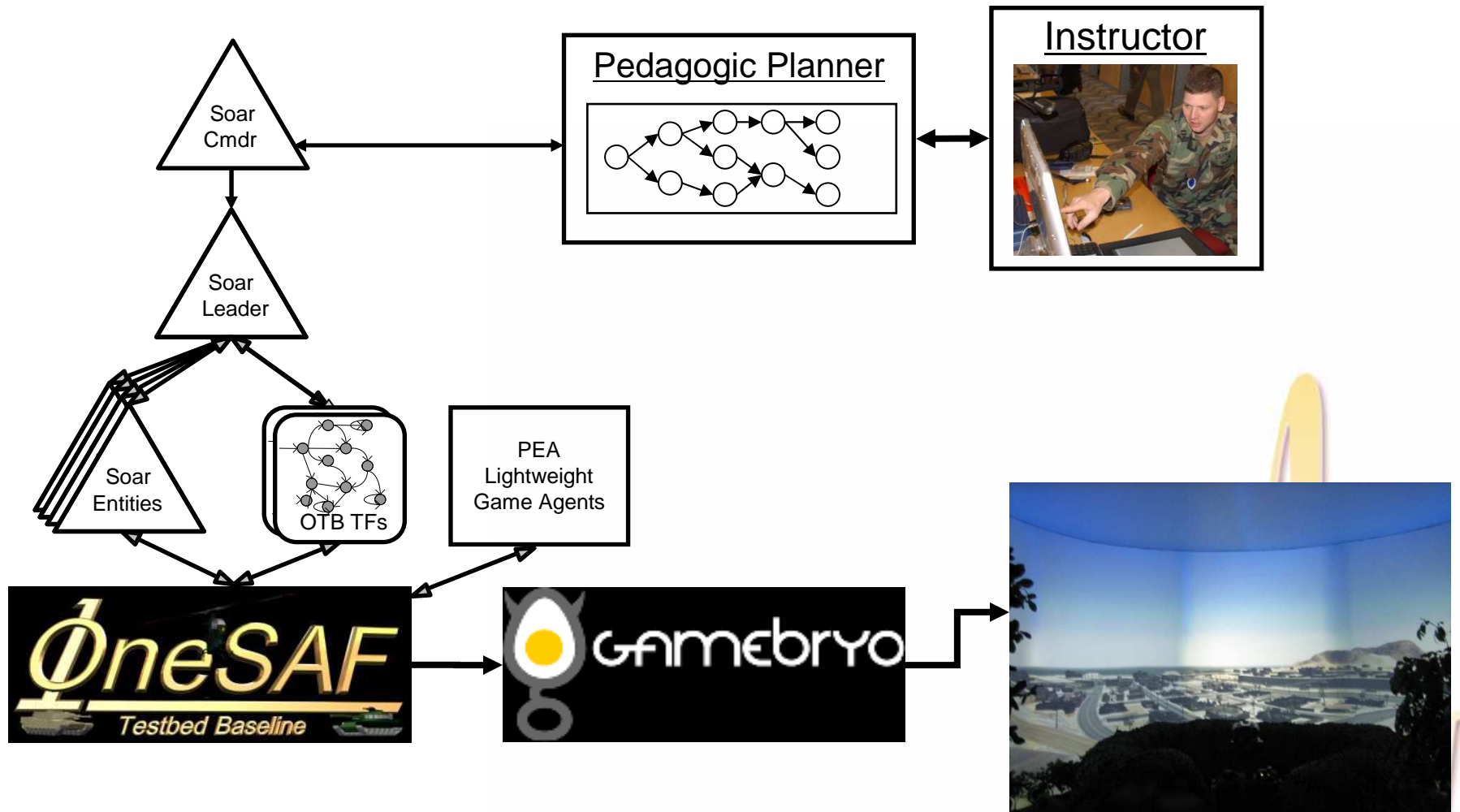


Adaptive Opponents Requirements

- Generate multiple plans for the same scenario
 - Prevent gaming the game
 - Remember what this specific student has seen
 - Challenge the student to adapt on the fly
- Support the instructor (don't replace the instructor)
 - Instructor provides high-level guidance
 - Adaptive Opponents fills in the details
 - Reason about learning objectives



AO/IFOR System Architecture



Similarities and Differences

Entertainment Game AI

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- Static behavior works
- Little after-action review
- Observational fidelity is the goal

Serious Game AI

- Not about winning
- Cheating is sometimes okay
- Static behavior doesn't work
- Extensive AAR is valuable
- Observational fidelity is not enough



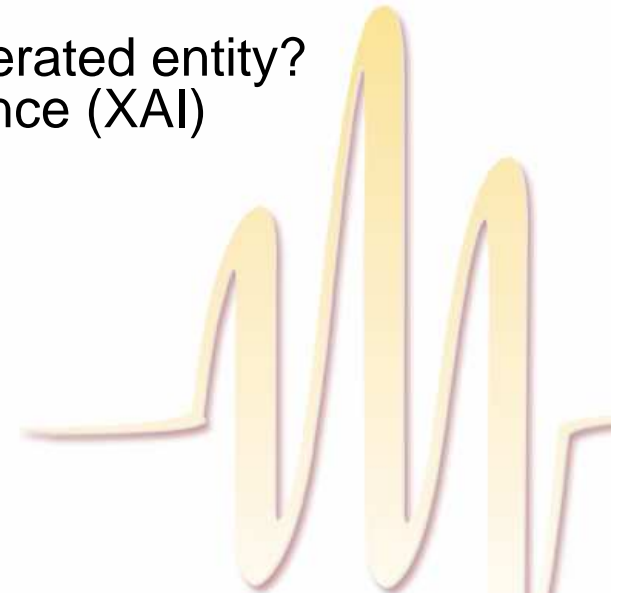
Explainable AI Motivation

- **XAI for Training**

- “The OPFOR can provide valuable feedback on the training based on observations from their perspectives. ...the OPFOR can provide healthy insights on:
 - OPFOR doctrine and plans
 - The unit’s actions.
 - OPFOR reactions to what the unit did.”

US Army Field Manual 25-101 “Battle Focused Training

- What if the OPFOR is a computer-generated entity?
 - Solution: Explainable Artificial Intelligence (XAI)
- **XAI for Analysis**
 - Validation, Verification & Accreditation
 - Debugging
 - Causality analysis



FULL SPECTRUM COMMAND

AFTER-ACTION REPORT

DECISION POINTS:

- 12:09:37 - Enemy KIA
- 12:09:37 - Enemy WIA

ANSWER TO QUESTION:

There are 34 soldiers in 3rd Platoon. 33 soldiers are healthy. 1 soldier has been wounded.



Review Questions:

- What is 3rd Platoon's mission?
- What is 3rd Platoon's mission status?
- How is 3rd Platoon task organized?
- How many soldiers are in 3rd Platoon?
- What is 3rd Platoon's ammo status?

GPS: 06353:83221 DIRECTION: N TIME: 12:09:37 TEMPERATURE: 70
VISIBILITY: 2000 meters WIND SPEED: 1 KPH WIND DIRECTION: W

12:09:33

12:00:00

12:13:41

VIDEO PLAYBACK CONTROLS

STATS

OPORD

BLUE PLAN

RED PLAN

REVIEW

Jump to time:

GO



Similarities and Differences

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- Must support user authoring of new scenarios

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Transitioning the Learning Process

- Authoring tools
 - Potentially a different set of target users
 - End user as author
 - Instructor as author
 - TRADOC developer as author
 - Computer programmer as author
 - Parallel production effort
 - Assessment of the authoring tools
- Instructional package
 - Stand-alone learning materials
 - Trainer support materials
 - Distributed learning package



MEETING PARTNER Farid  TRUST  6	OBJECTIVE Learn why market is not being used	PREPARATION						REHEARSAL	MEETING	AAR	
		OBJECTIVE REVIEW	MEETING PARTNER	INTENDED OUTCOME	RESEARCH	PREP SHEET	BRAINSTORM	REQUISITIONS	REHEARSAL	MEETING	NEGOTIATION

MEET WITH MEETING PARTNER

TIME: 25:40

Help Options Info



Plan	Text
<input type="checkbox"/>	I'm not here to talk about any of that. I'm here because I hear you've been having some trouble with the market.
<input type="checkbox"/>	If you tell me the name of the person who promised you things and make me a list of the things you need, I will look into it as quickly as I can. I'm also hoping you can help me with some information.
<input type="checkbox"/>	Is it true that there is trouble with the market? We would like that to stop.
<input type="checkbox"/>	I want to help you, and I promise I'll talk to my superiors. Meanwhile, can you give me some information?

CHALLENGE Say Ask Do Give

Leave meeting

[Compliment locale]

Farid: Do not measure us based on our station. Measure us by the safety of our neighborhoods.

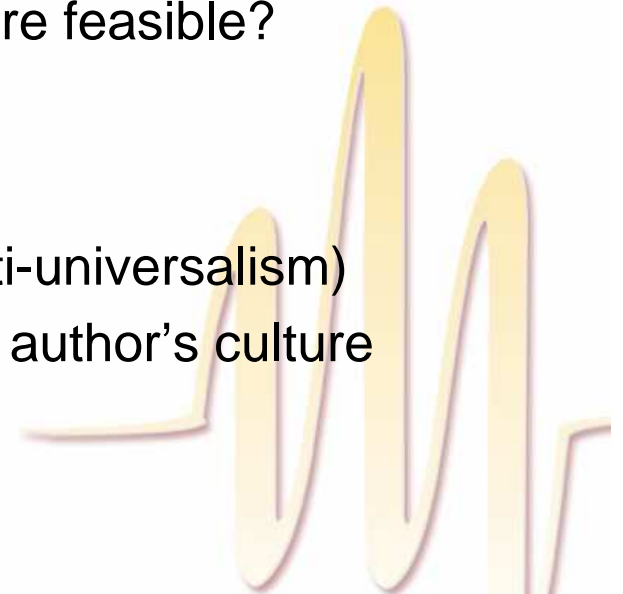
[Compliment host's generosity]

Farid: [Farid nods at your compliment.]

Farid: I hope you've come with some good news for me. My department, it is not running well. We have many things that we need. I've had some bad experience with some of the people who came before you. Too many times I've been promised things I do not receive.

Modular cultural data model

- What if we want to swap out Iraqi culture for Japanese culture?
 - What changes and what stays the same?
 - What does a modular, cultural data model look like?
 - How does a HBM use the cultural data model?
 - Is a standard for all HBM architecture feasible?
- Counter arguments
 - Culture is too pervasive
 - Every culture needs its own model (anti-universalism)
 - Every data model will be biased by the author's culture
 - Emic vs Etic perspectives

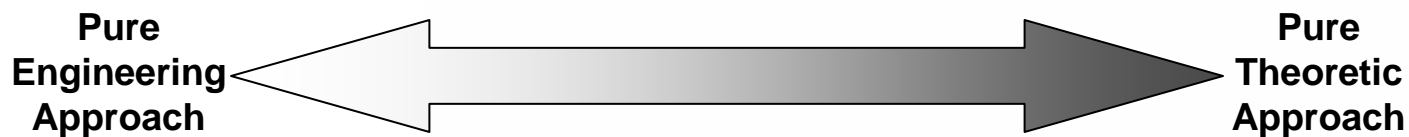


Culturally Affected Behavior (CAB)

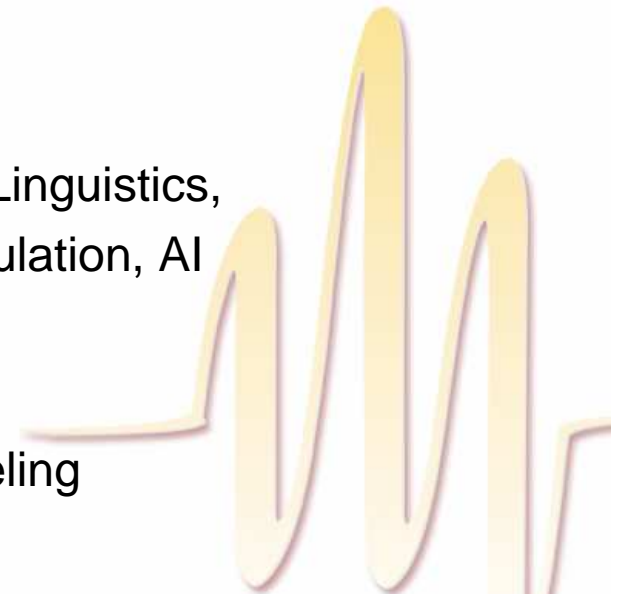
- CAB goal: develop a computational approach for **representing** and using cultural knowledge modularly at the individual and aggregate level.
 - Appearance
 - External behavior (including language and gestures)
 - Internal knowledge (including reasoning strategies)
- Scoping the problem
 - Not modeling individual variations (personality)
 - Not modeling how an individual learns cultural knowledge
 - Not modeling how culture groups form
 - Not modeling how cultures change over time

CAB Approach

- Approaches to social & cultural modeling



- CAB is aiming for the theoretic end of the spectrum
- CAB Approach v1
 - Step 1: Literature Survey
 - Anthropology, Sociology, Psychology, Linguistics, International business, Modeling & simulation, AI
 - Step 2: Select the right theory
 - Evidence-based
 - Mature enough for computational modeling
 - Step 3: Implement the theory



CAB Approach v2

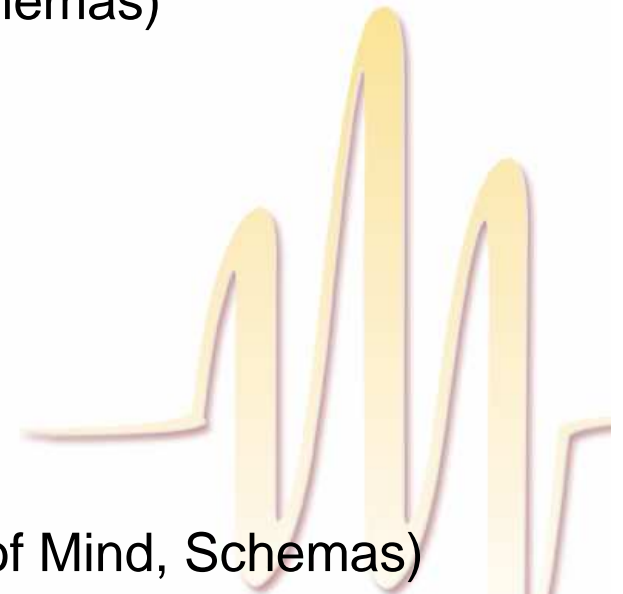
- CAB Approach 2.0
 - Step 1: Literature Survey
 - Step 2: Select one or more candidate theories
 - Mature enough for computational modeling
 - Community support
 - Engineer acceptance
 - Step 3: Implement the candidate theories
 - Step 4: Validate the system and the theory
 - Go to step 2
- Advantages
 - We benefit from generations of smart social scientists
 - We can provide evidence to the social scientists

Candidate Theories (so far)

- **Shared Symbols:** members of a culture share a common mapping from perceived symbols (objects, gestures, words...) to internal concepts. [Warner 1959, Shweder & Levine 2003]
 - Culturally-specific perception
 - Cross cultural misperception
- **Schemas:** frameworks for organizing knowledge and actions such as scripts, stereotypes and worldviews. [DiMaggio 97]
 - Conventionalized cultural behaviors
 - Biases
- **Theory of mind:** the ability to understand that others have beliefs, desires and intentions that are different from one's own. [Nichols & Stich 2003]
 - Cultural awareness
 - Biases

The CAB Data Model

- Physical appearance
 - 2D images
 - 3D models
 - Skins/textures
- External behavior
 - Linguistic model (Shared Symbols, Schemas)
 - Animations (Shared Symbols)
 - Action schemas (Schemas)
- Internal knowledge
 - Task model
 - Perceptions (Shared Symbols)
 - Reasoning schemas (Schemas)
 - Second order culture models (Theory of Mind, Schemas)



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