

CSE 591: Visual Analytics

Lecture 5: Computational Modeling and Graph-Based Analytics

Klaus Mueller

Computer Science Department
Stony Brook University

Motivating Quote

Gary Ackerman

(Director of the Center for Terrorism and Intelligence Studies)

“There are tools where they build a world in a bottle. They put down every single mosque, river, camel, and school in, say, Saudi Arabia. Then they have millions of software agents who each have desires, grievances, all these different variables. They go about their little lives and then you ask a question: What if we build a McDonald’s in Mecca? Does this lead to more people joining terrorist groups or not?”

Motivating Quote

Gary Ackerman

(Director of the Center for Terrorism and Intelligence Studies)

“There are tools where they build a world in a bottle. They put down every single mosque, river, camel, and school in, say, Saudi Arabia. Then they have millions of software agents who each have desires, grievances, all these different variables. They go about their little lives and then you ask a question: What if we build a McDonald’s in Mecca? Does this lead to more people joining terrorist groups or not?”

The key message here: build of model of the “enemy” and predict what they will do given some input and situation

- bound to overcome many of issues that came up in the “Psychology of Analysts” book

Simulations via Game Technology: The Sims

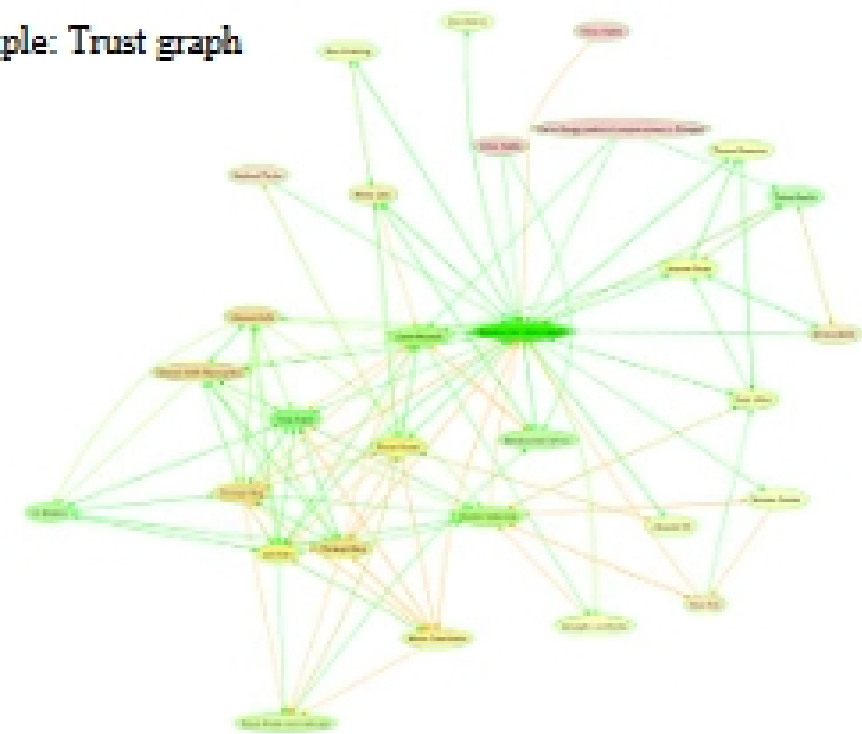


Simulations via Game Technology: Unreal Tournament



Games Have Analytical Tools

Example: Trust graph



Barry Silverman (U Penn):

“A jihadist terrorist has a preferred state of the world: the whole world is fundamentalist, and no loose-valued Westerner should walk on the land that Muhammad felt was sacred.”

Long-term preferences of the “jihadist terrorist”:

- control of the land
- control of who’s allowed to do what

Moral standards:

- it’s okay to kill
- in fact, I’ll go to heaven and be a martyr
- and my family will get money

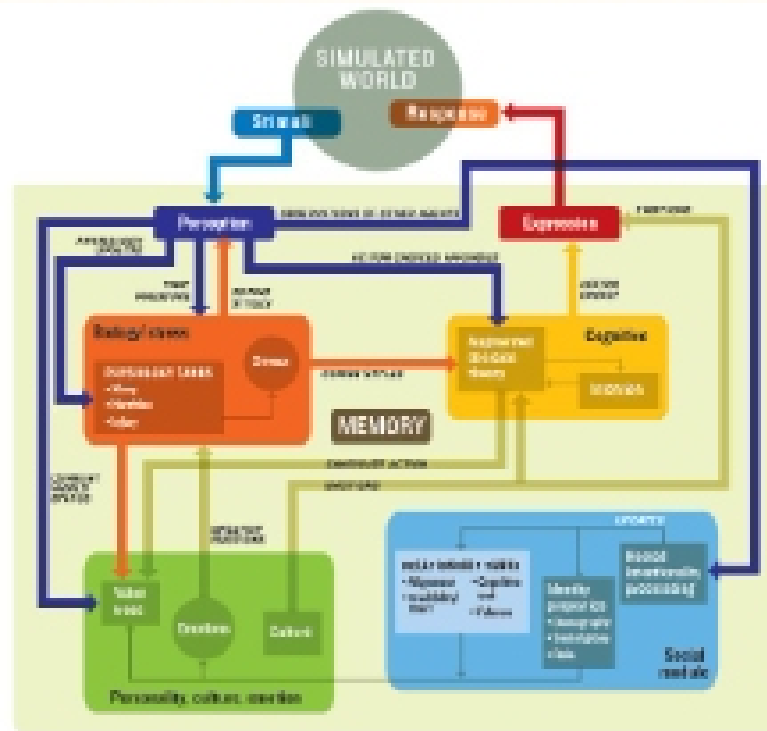
Marc Sageman (U Penn)

A typical jihadist terrorist:

- Is a male who grows up in a decent family, never gets into much trouble.
- Goes to a religious school. There he learns Islamic fundamentalist credos.
- In many cases he goes abroad to study—often engineering and often in Europe, where he feels alienated and has trouble finding work.
- He then gravitates to mosques to find comfort in the familiar, and there he meets men with similar feelings of isolation.
- Gradually, he is drawn toward a politicized existence and into a terrorist cell.

By incorporating more than a dozen such models and data sets, some of Silverman’s simulations can emulate how a jihadist agent might feel about his group, when he will become radicalized, and what he might do as a result.

Getting Inside The Mind: Overall System (Silverman):



Getting Inside The Mind: Narration

Each of the simulated terrorists responds to stimuli through a complex process that mimics human thinking.

An agent's perception is influenced by various physical and psychological stressors and coping styles.

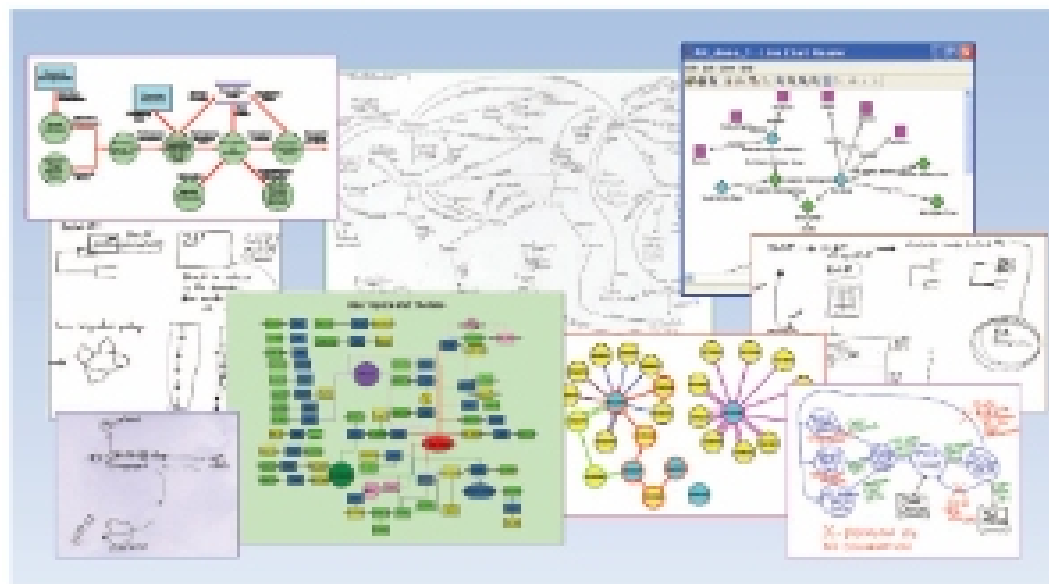
- this perception is then viewed in light of an agent's values, emotions, and culture.

Once the agent has processed its perception of the stimuli, it must decide how to best attain its goals.

- It evaluates which actions will advance its values, but this is subject to constraints of its social relations, emotions, and stress.
- When the agent determines what it wants to do, it expresses that decision through action.

Graphs, Hierarchies, Networks

Powerful way to show relations:



Kathleen Carley (Carnegie Mellon)

compressed view of Iraq's Diyala region

expansion into known connections among suspected insurgents (right after US invasion):

sized relates to importance

