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Interactive Computer Generated Stories & Potential Outcome Exploration

Zyda, Michael

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Interactive Computer Generated Stories & Potential Outcome Exploration

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Outline

The MOVES Institute Research Program

Directions in Computer Generated Autonomy

- Interactive Computer Generated Stories
- The Center for the Study of Potential Outcomes

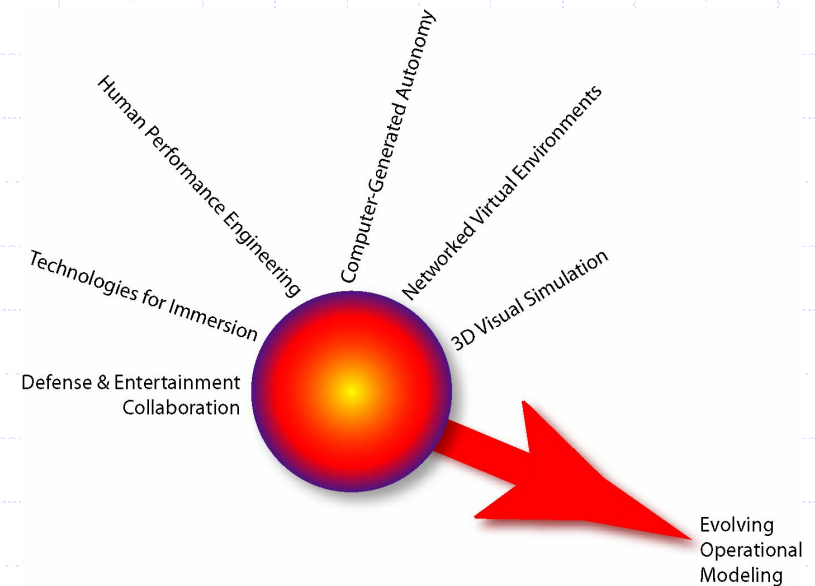
The MOVES Institute

Research Programs

MOVES Institute Mission

Research, application and education in the grand challenges of modeling, virtual environments and simulation.

- 3D Visual Simulation
- Networked Virtual Environments
- Computer-Generated Autonomy
- Human Performance Engineering
- Technologies for Immersion
- Defense and Entertainment Collaboration
- Evolving Operational Modeling



Organizational Structure

Director

- Michael Zyda

Technical Directorate

- John Hiles - Computer-Generated Autonomy
- Don Brutzman - 3D Visual Simulation & Networked Virtual Environments
- Rudy Darken - Human Performance Engineering
- LCDR Russ Shilling, USN - Immersive Technologies
- Michael Capps - Defense & Entertainment Collaboration
- Alex Callahan - Evolving Operational Modeling

Collaborations

Academic

Boston College
CalPoly
Carnegie-Mellon University
CSUMB
ENIT, France
George Mason University
Georgia Tech, MSREC
INRIA
Miami University
MIT Lincoln Laboratories

Academic

Old Dominion University,
VMASC
Queens University,
Kingston, Ontario
UCB, Center for Design
Visualization
UCF IST
UCSC
University of Newcastle,
Newcastle-upon-Tyne
University of Virginia

Non-Profit

Fraunhofer Center for
Research in Computer
Graphics
CNA
HPCC, Maui
Institute for Defense
Analysis
MBARI
Monterey Bay National
Marine Sanctuary
Sea Grant
S. E. A. Lab Monterey Bay

Collaborations

Corporate

Bios Group

Boeing

Critical Mass Labs

Dolby

Emergent Designs

Epic Games

John Mason Associates

Corporate

**Lucasfilm Skywalker
Sound**

Lucasfilm THX

MathEngine

Microstrain

MITRE

Nexternet

Potomac Institute

Red Storm Entertainment

Rolands & Associates

SAIC

Walt Disney Imagineering

Collaborations

Navy

**CHSWP, Helicopter Wing
Pacific Fleet**

**Commander, Submarine
Development Squadron
TWELVE**

**HS-8 - Helicopter Anti-
Submarine Squadron
EIGHT, FRS**

**HS-10 - Helicopter Anti-
Submarine Squadron TEN,
FRS**

**Navy Modeling &
Simulation Management
Office, N6M**

**Naval Oceanographic
Office**

Naval Research Laboratory

Navy

**Naval Research
Laboratory, Electronic
Warfare Group**

**Naval Sea Systems
Command, Advanced
Systems & Technology
Office**

Naval Submarine School

**Navy Toxicology
Detachment, Wright
Patterson Air Force Base**

**Naval Undersea Warfare
Center, Newport**

NAWC-TSD

Office of Naval Research

Third Fleet

Marines

**Marine Corps Combat
Developments Center**

Marine Forces Pacific

**Training & Education
Command**

Collaborations

OSD

DARPA

Defense Modeling &
Simulation Office

Defense Threat Reduction
Agency

J9

Office of the Director,
Operational Test &
Evaluation

Office of the Secretary of
Defense

OSD Program Analysis &
Evaluation

Army

Army Research Office

Assistant Sec. Army for
Manpower & Reserve
Affairs

Office of Economic &
Manpower Assessment

TRAC Monterey

TRADOC

USA OTC, Fort Hood

Air Force

Medical Command, San
Antonio

Other

Los Alamos National Labs

Computer-Generated Autonomy

Interactive Computer Generated Stories
Center for the Study of Potential
Outcomes

Interactive Computer Generated Stories

Prof. John Hiles
Jhiles@mindspring.com

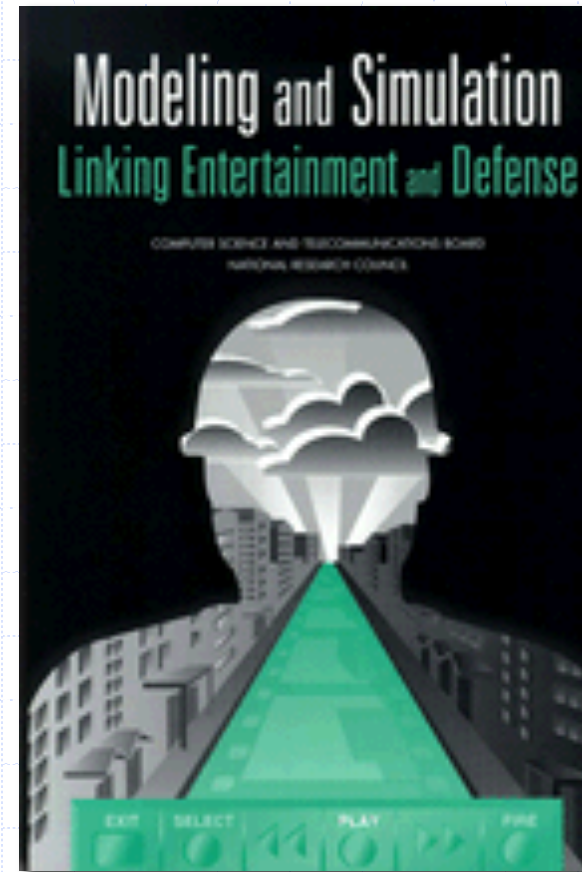
CDR Brian Osborn
baosborn@nps.navy.mil

Modeling & Simulation - Linking Entertainment & Defense

“... skilled storytelling techniques help participants in a virtual environment sense that they are in a real environment and behave accordingly.”

Develop autonomous agent technology to carry out high level behavior of characters in a networked virtual environment

Develop technology to guide those behaviors within the parameters of a given story line.



Motivation

National Research Council Report

Applications

- Scenario Based Training
- War Gaming
- Interactive Entertainment

Interactive Story

Virtual World

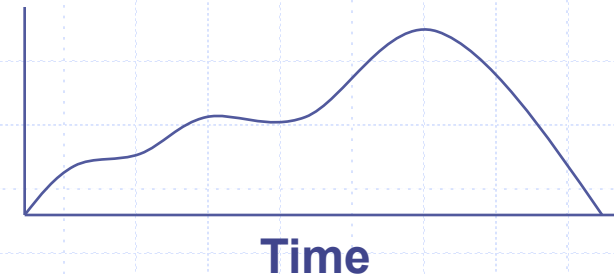
Believable Autonomous Characters

**Interactive User – Direct or indirect participant
in the story...not an observer!**

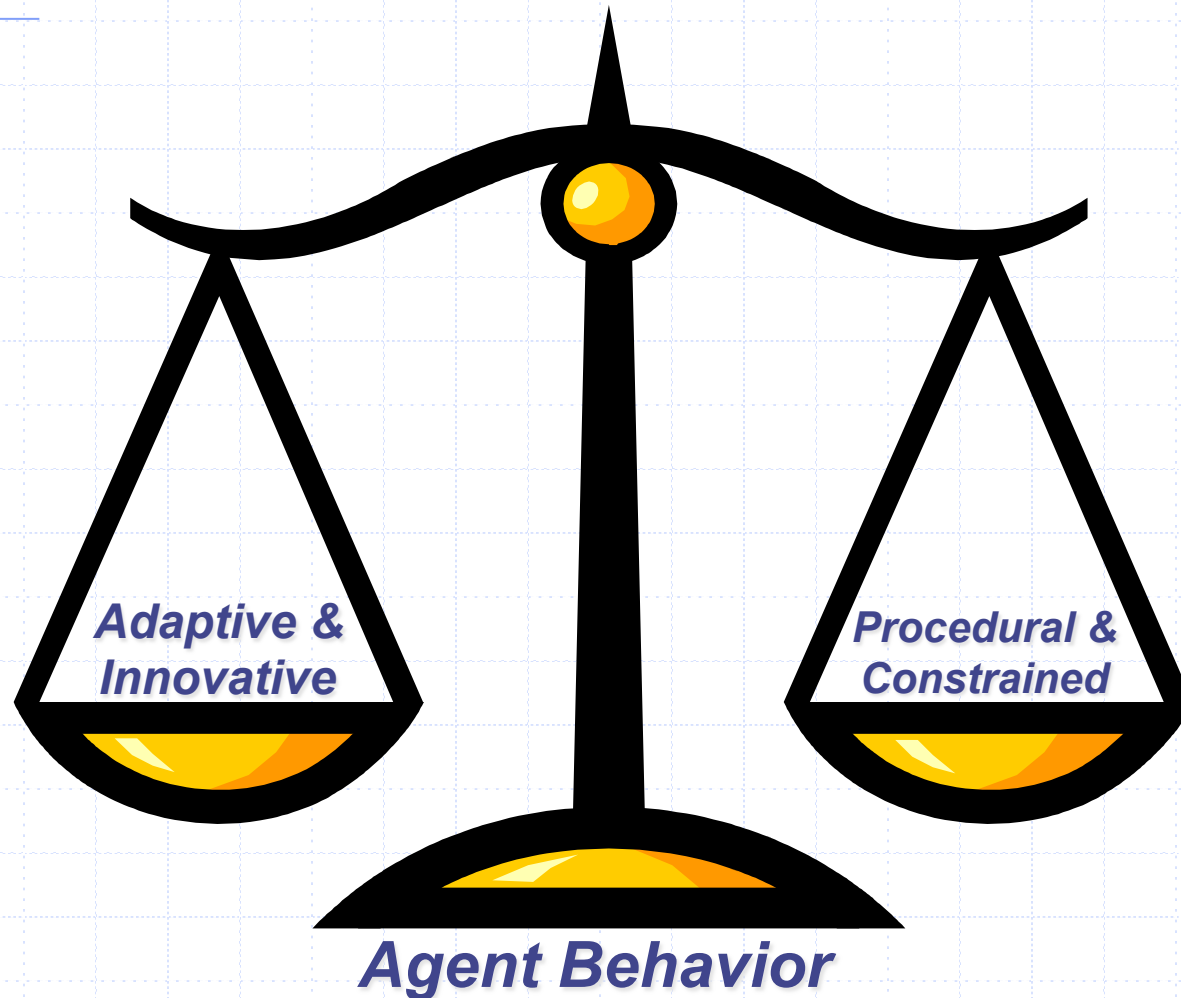
Dynamic Storyline

Dramatic Presentation

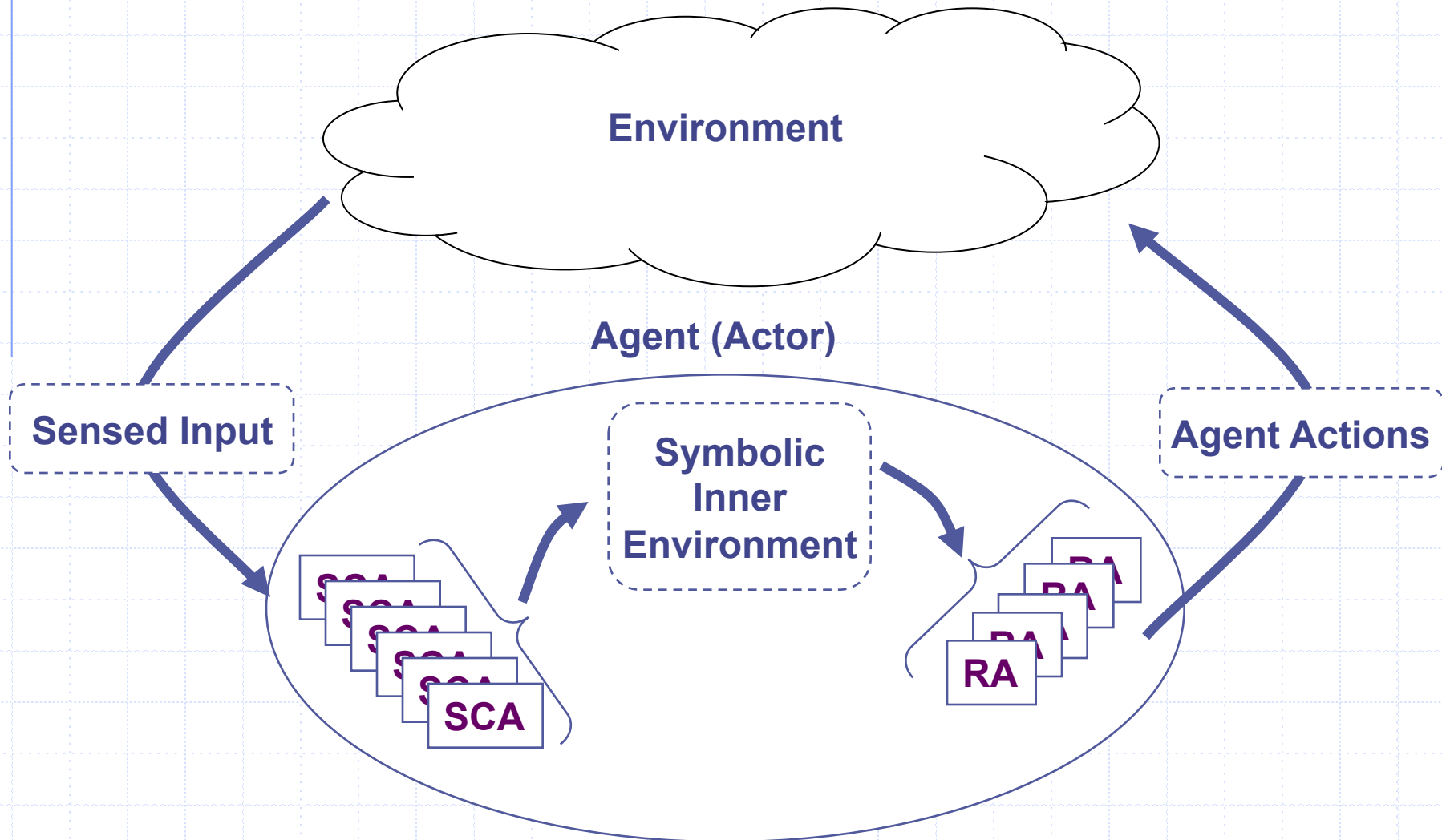
Intensity



Believable Characters



Composite Agent



Tickets

Constrain agent behavior when appropriate and provide a means for controlling events to promote the story.

nonsequential



sequential



sequential
non-interruptible



sequential
non-interruptible



Narrative Structure

Allows the story to progress from it's beginning, through the body of the story and finally to a climactic ending.

Aristotle's Poetics [Aristotle, ≈ 350 BC]

Storytelling in the New Hollywood [Thompson, 1999]

The Anatomy of a Screenplay [Siegel, 2001]

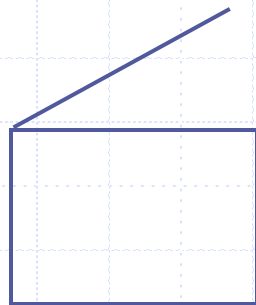
Myth and the Movies [Voytilla, 1999]

Dynamic Storyline

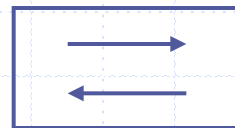
Storyline that adapts to the participant's interaction and the state of the participant's character

Bottom up approach

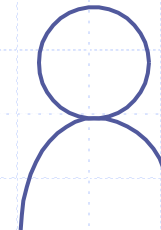
Story elements combined at runtime to generate the story



Scenes



Interactions



Characters

Scene: Smoking

Main character is asked by a friend to sneak out of school for a cigarette.


Characters: Jones (Main Character), buddy (student), Teacher, Principal

Character traits of interest:

- Integrity
- Maturity
- Trustworthy
- Risk Management

Create a Character

Create A Character



Jones

Personality

Hard Working

0 10 20 30 40 50 60 70 80 90 100

Social

0 10 20 30 40 50 60 70 80 90 100

Trustworthy

0 10 20 30 40 50 60 70 80 90 100

Mental Toughness

0 10 20 30 40 50 60 70 80 90 100

Ambitious

0 10 20 30 40 50 60 70 80 90 100

Charismatic


0 10 20 30 40 50 60 70 80 90 100

Character Points

OK

View Characteristics

View Character [-] [□] [×]



Jones

Personality	Traits	Goals
Hard Working 0	Education 17	No Active Goals
Social 50	Risk Management 23	
Trustworthy 10	Relationships 50	Social HealthyStress MedIntegrity ← IrresponsibleResMgt ← NoviceEducation NoAmbition Untrustworthy Lazy
Mental Toughness 60	Integrity 35	
Ambitious 0	Physical Fitness 50	
Charismatic 60	Leadership 45	
	Maturity 33	

OK

Scene: Smoking (Run Away)

** Setting ** <School hallway>

Buddy: Hey look, I've got some cigarettes.
Let's sneak around behind the gym and smoke 'em.

Jones: Oooohhh. I would kill for a cigarette. Let's go!

** Setting ** <Outdoors behind building>

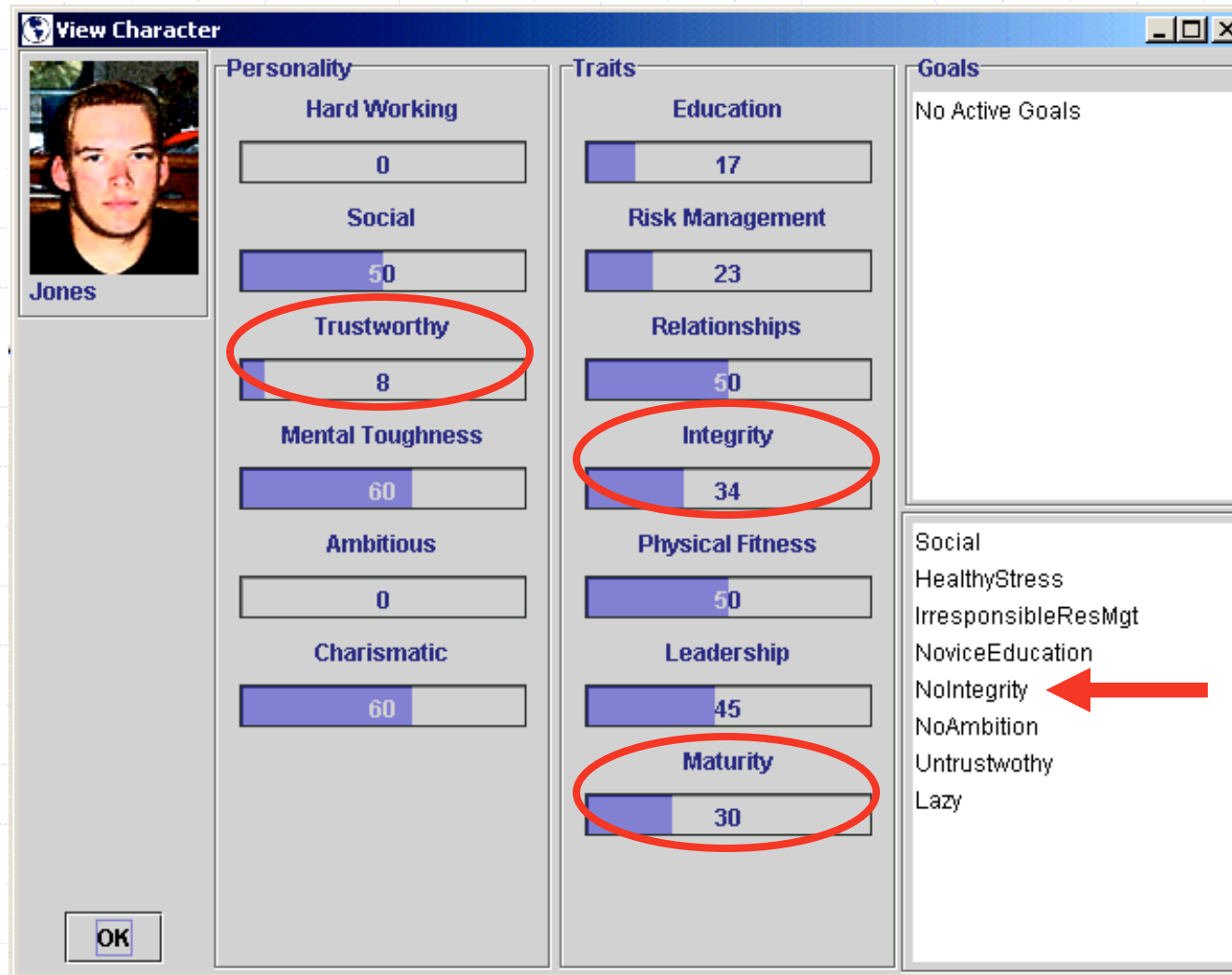
Teacher: What are you two doing out here??!!

Jones: It's Mr. Smith! Run!!!

** Setting ** <Inside school's front office>

Teacher: Principal Myers you may want to be on the watch for Jones
and his sidekick. I caught them out back smoking, when they saw me,
they ran. They should be trying to get back in the building pretty soon.
If I catch them first I'll send them to you!

Post-Scene Characteristics



So what's the point?

Create realistic, believable stories and scenarios from a knowledge base of story elements relevant to a given problem domain

Capture tacit knowledge and project through meaningful training scenarios and stories

An advanced technique coupling autonomous believable behavior with story-based control

Story Engine is for the Army Game Project



The Army Game Project

We are building two intertwined game titles

- One 3D - using the Unreal Engine
- One 2D - similar to The Sims but with interactive story!



Army Game Project

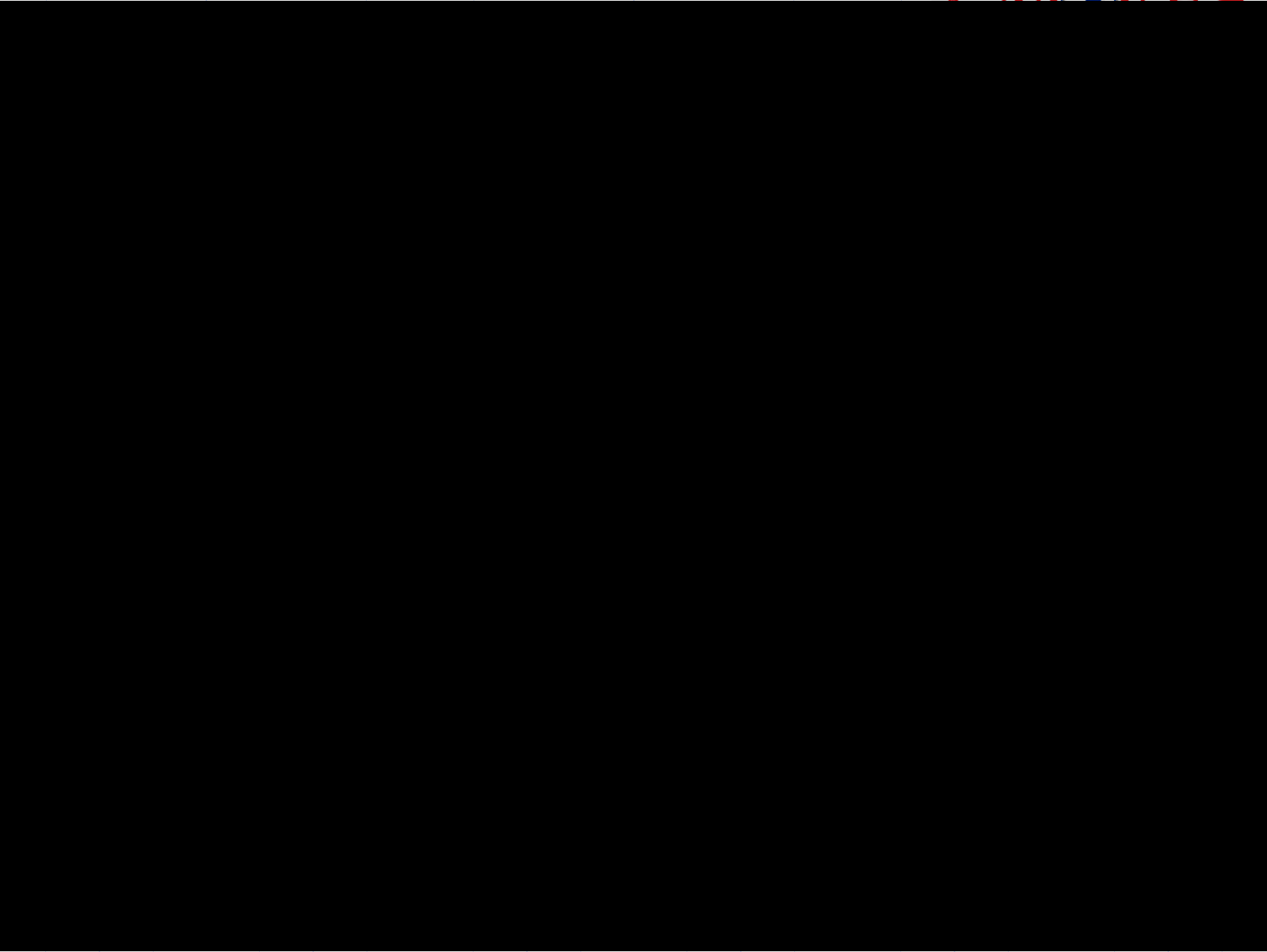


We are looking into how videogames can provide strategic communication about our client's organization, the US Army.

In addition, the games are instrumented to determine:

- Aptitude, leadership abilities & psychological profile.
- The games allow the exploration of potential career paths in an entertaining fashion ...

A





The Center for the Study of Potential Outcomes

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S



Motivation for the Center

Our society is built upon highly complex, interacting systems.

Most of the time, people present at the systems

- don't understand how they work,
- how they can fail,
- or what would happen if they did fail
 - ◆ these are blind spots

Attackers leverage precise answers to all three of these questions

The Center's job is to help us to see our most dangerous blind spots.

The Center

Leverages Work at MOVES

Novel Multi-Agent (MAS) simulation technology will be applied to the problem of anticipating unexpected actions and threats by organizations such as terrorist groups

The Center leverages expertise and technology developed by the MOVES Institute at NPS

The Center leverages institute expertise in terrorist behaviors.

MAS Research at MOVES (1)

MOVES faculty have focused on a research goal of producing richer/faster adaptive models and simulations:

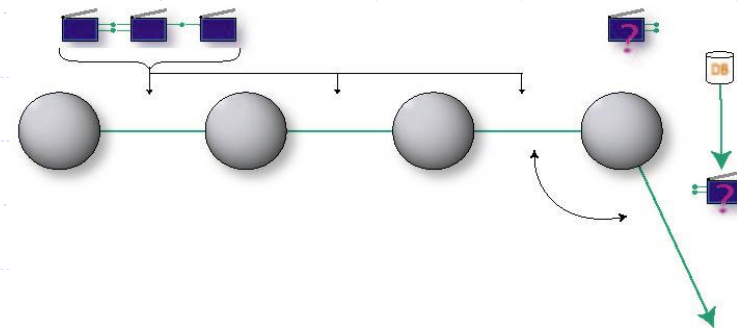
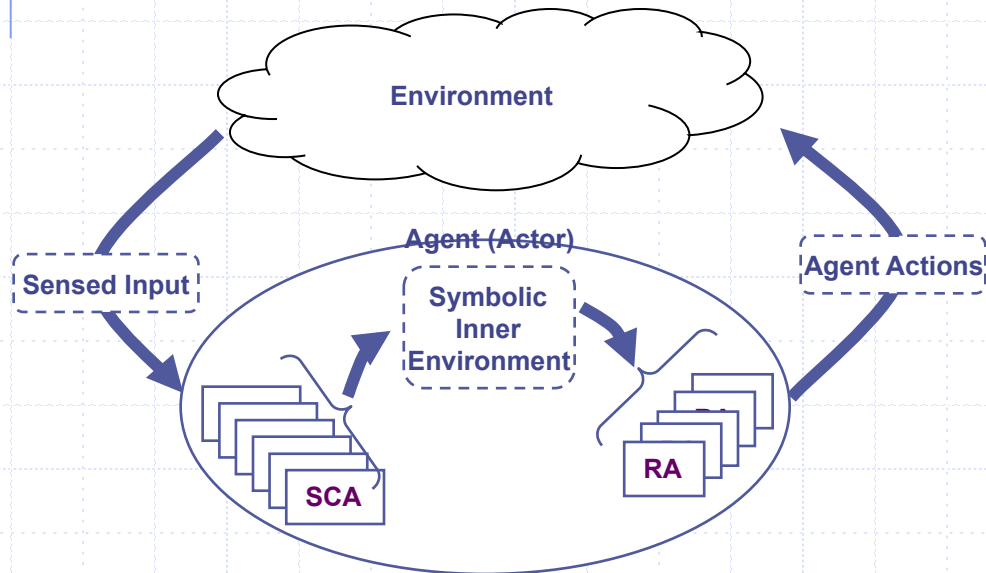
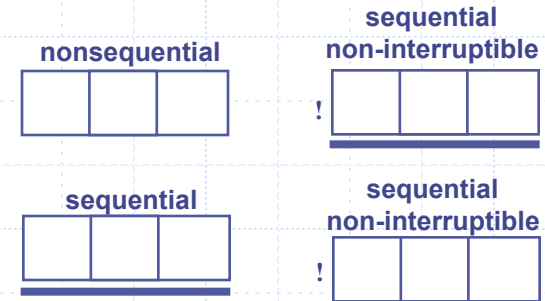
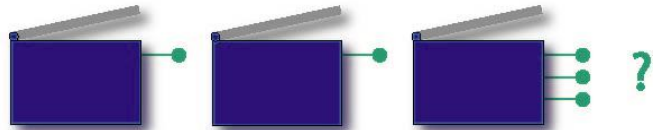
- models with richer and more complex behavior that can be produced in less time than were previously possible.

MAS Research at MOVES (2)

MOVES is achieving this goal through the development of five technical innovations:

- A social and organizational relationship management engine (RELATE)
- A composite agent architecture
- An agent goal apparatus
- A structure for capturing and applying procedural knowledge within an agent (Tickets)
- An internal, contextual and temporal means of organizing the actions of agents (Connectors)

NPS MOVES MAS Technologies



MAS Research at MOVES (3)

Other MOVES expertise combined with its MAS technology:

- Visual Simulation
- Human Performance Engineering
- High performance computing
- SMEs - terrorist behavior & asymmetric warfare

Technology for Potential Outcome Modeling

High level MAS authoring tool usable by SMEs

Auto-narrator package

- To provide SMEs an analysis without the requirement for understanding the underlying technology
- Movie Generator!

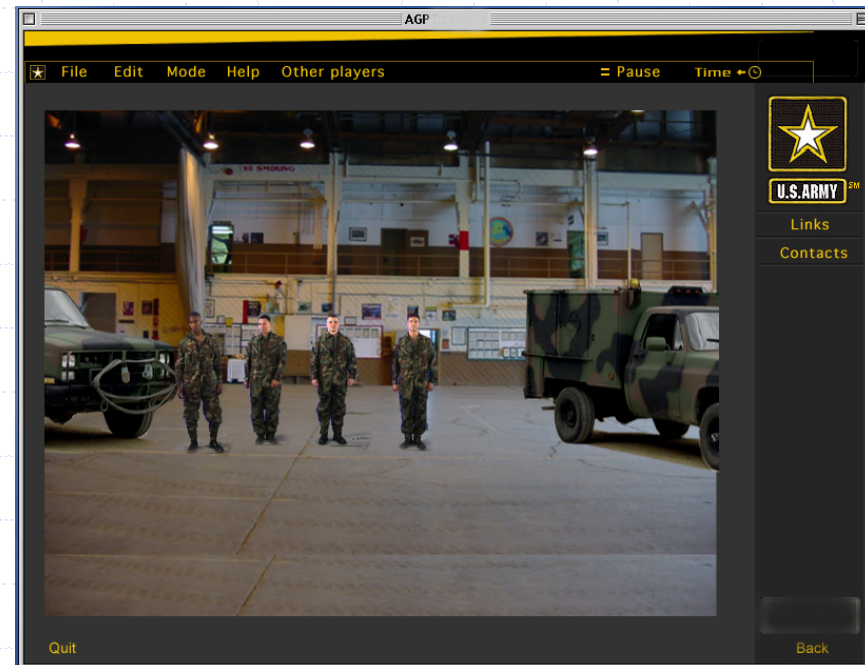
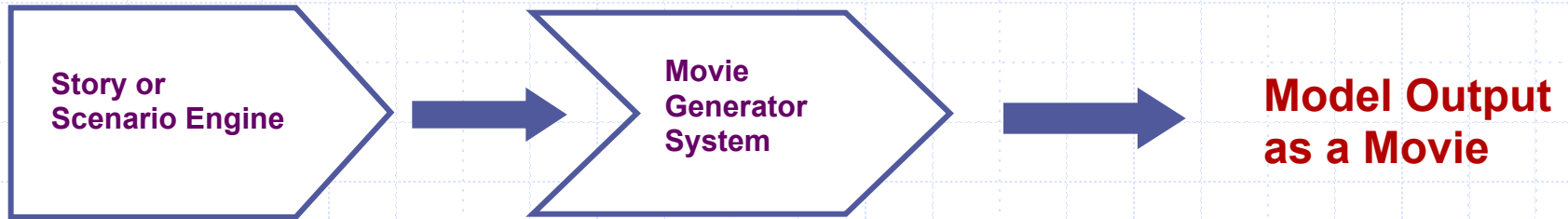
New Agent-based Engines

Story Engine – Army Game Project, other training and communication jobs

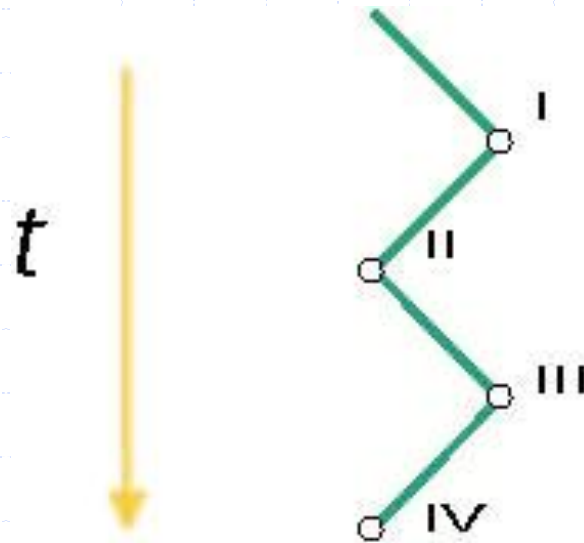
Scenario Engine – Exploring blind spots and unintended consequences

Coupled with Movie Generator System

Story as the Human Interface

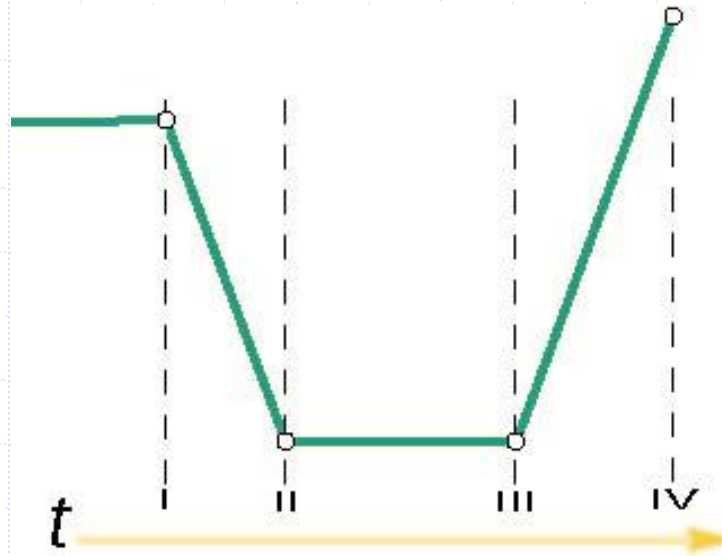


Templates Focus Scene Selection



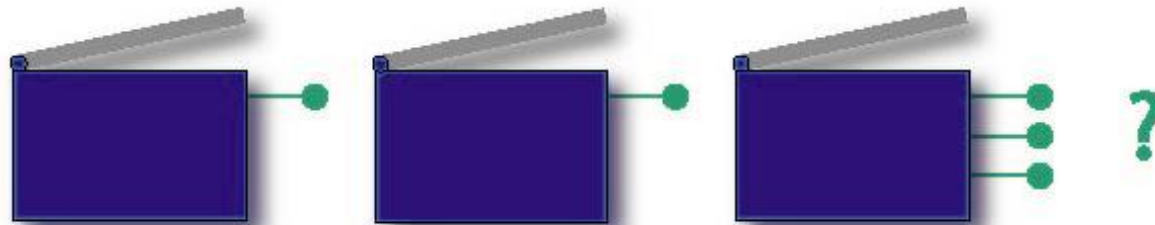
Story Engine Template Gives Narrative Structure...

New Templates for New Jobs



Scenario Templates For Exploring Blind spots or Unintended Consequences

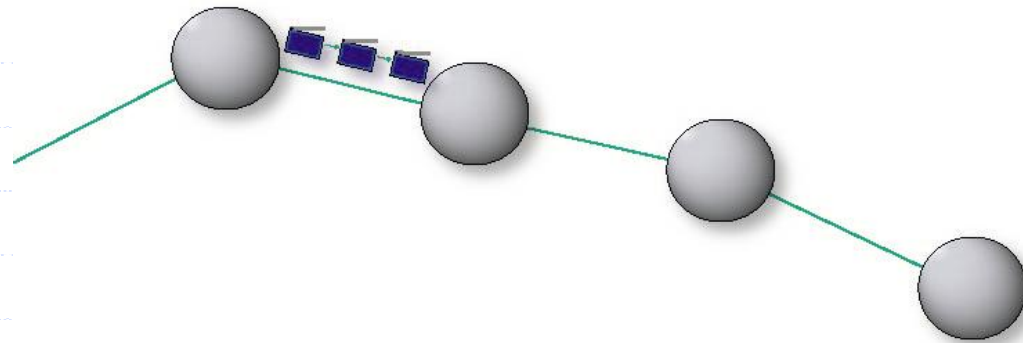
Story Engine



Engine selects sequences of scenes based on some match of connectors.

Budget and Policy Decisions

Budgets and policy decision place constraints on an organization.
 Model the succession of budgets or policies as if they were a story.
 Simulator can use different structures to reveal consequences.



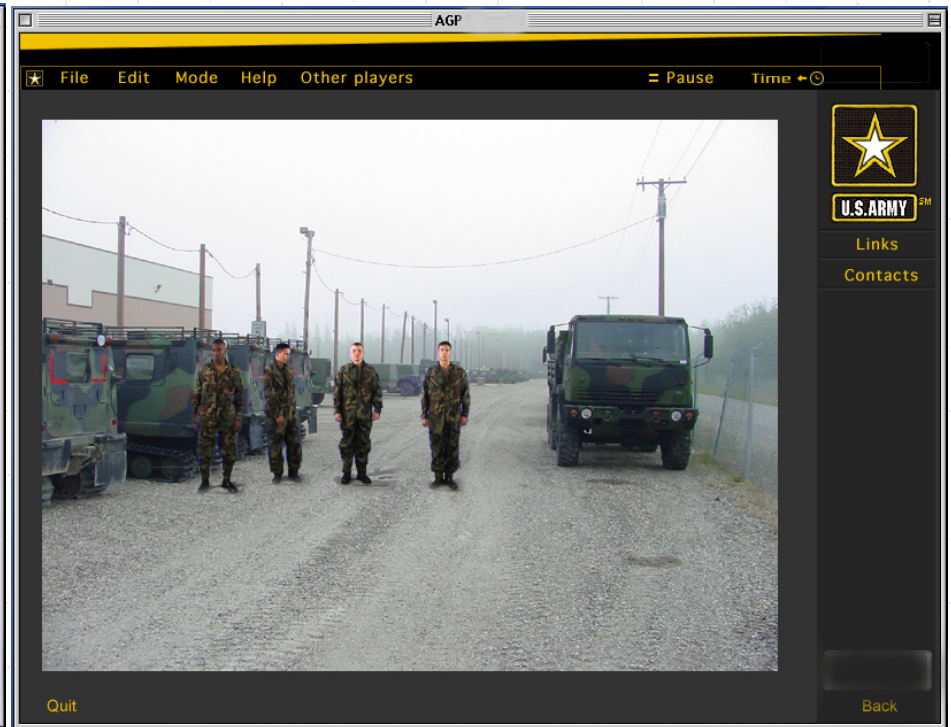
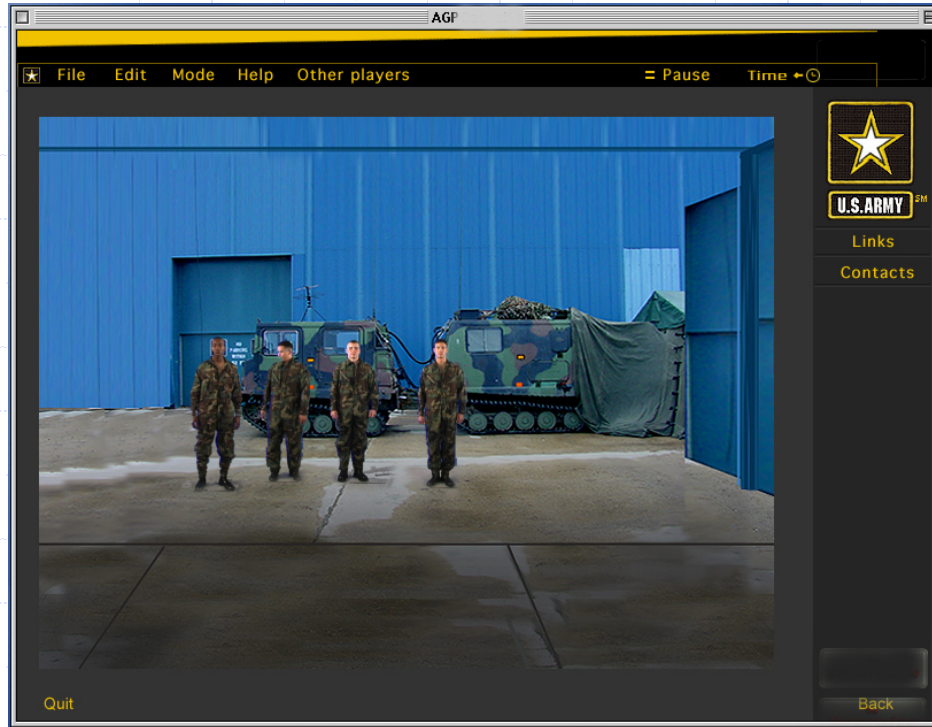
Strategy for scene selection

STORY
 Introduction
 Complication
 Development
 Resolution



Organization A crushes organization B
 Shaping Budgets (by A)
 Exploitation of vulnerabilities (by B)
 Rapid reorganization of resources (by A)
 A crushes B

Movie Generator Output!



Potential Applications for the Institute Technology



There are many - these are just initial thoughts:

- Force protection
- Information Security
- Airport security
- Power Station Security
- Natural Gas Line Security
 - ◆ Any domain where blind spots or terrorist vulnerabilities need to be explored.

In closing



Additional Details

Projects

3D Visual Simulation

N6/ONR - Project VAST - Virtual At Sea Training

Third Fleet - Tactical Information Visualization

NUWC - Generic Hub: XML-Based Information Interchange for Defense Messaging, Shipboard/Theater Command & Control, and Distributed 3D BattleSpace Visualization

MCCDC - Scenario Authoring and Visualization for Advanced Graphical Environments (SAVAGE): Amphibious Raid at Red Beach, Camp Pendleton California

Networked Virtual Environments

N6 - NPSNET-V - An Architecture for Constructing Scalable, Dynamically Extensible, Networked Virtual Environments & Semantic Interoperability for Large-Scale, Networked Virtual Environments

Computer-Generated Autonomy

ASA M&RA/N6 - Interactive Computer Generated Stories

DMSO/DTRA/CDTEMS - Center for the Study of Potential
Outcomes

N6 - Analytical Decision-Support Using Synthesized Adaptive-
Agent-Based and Mathematical Modeling

Human Performance Engineering

ONR - Virtual Technologies & Environments - Navy & Marine
Corp Expeditionary Warfare

DARPA Augmented Cognition - The Context Machine:
Determining Context from Symbolic Inputs

Technologies for Immersion

N6 & ARO - Hybrid Inertial Motion Tracking for Inserting
Humans into Networked Synthetic Environments
ASA M&RA - Audio Engineering and Sound Design Issues in
VE: Lessons Learned from the Entertainment Industry

Evolving Operational Modeling

N6 - Synthetic Ocean Modeling

N6 - Center for Operational Modeling - Navy Concepts,
Research, & Analysis Network (NCRAN)

N6 - Counterplanning in Simulation of Information Warfare

Defense & Entertainment Collaboration



The MOVES Institute War Game Laboratory - A Videogame
Research & Production Facility

N6 - SimSecurity - A Distance Learning and Virtual
Laboratory for Information Assurance

ASA M&RA - Army Game Project