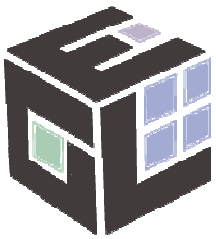
Interactive Storytelling Architecture for Training (ISAT)

Brian Magerko, Lisa Holt, & Brian Stensrud



games for entertainment & learning lab

Soar Technology
Thinking *inside* the box.

Project Team

- Michigan State GEL Lab
  - Brian Magerko, Ph.D. (co-PI)
  - Ben Medler (RA)
- Soar Technology
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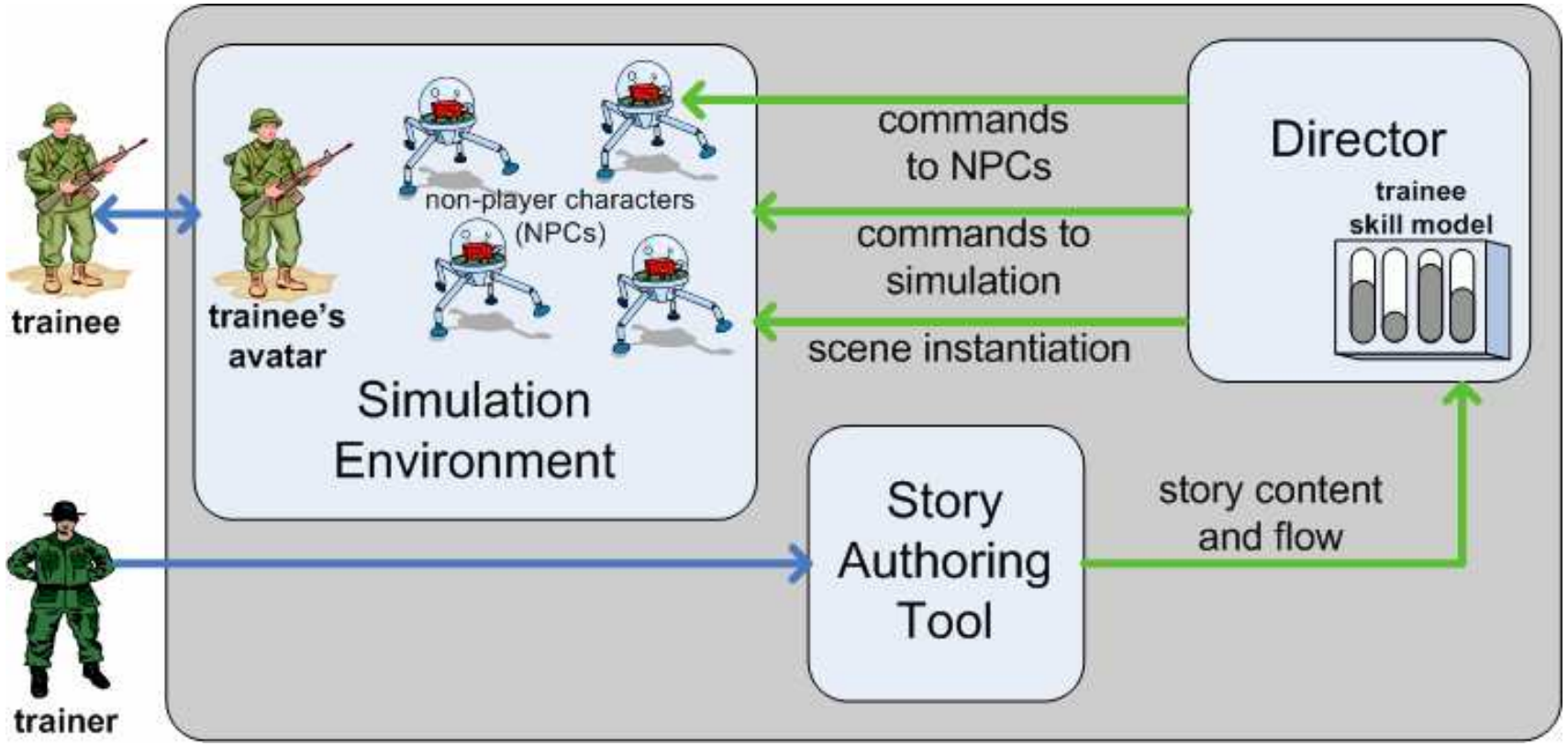
- ECS
  - Larry Kayne (PM)
  - Howard Mall (technical lead)
  - Seth Frolich (art & modeling)
  - Ben Quintaro (software engineer)

ISAT Overview

- Combines interactive storytelling and intelligent tutoring for effective training
- Benefits of interactive storytelling via simulation & game-based training
  - Distributable (any time, any duty station)
  - Readily available (as opposed to human instructor)
  - Engaging & realistic
- Benefits of intelligent tutoring
  - Direct connection to training goals
  - Individualized training
  - Guidance and feedback based on assessment of performance

High-Level ISAT Architecture



ISAT Progress to Date

- Director
  - Implementation of various types of Director actions
  - Implementation of skill model
- Enhancements to TC3 Simulation
  - Character spawning
  - Lua scripting
  - Navigation mesh
- Authoring tool prototype
  - Development & evaluation
  - Defined XML format for map input

ISAT Progress to Date (cont.)

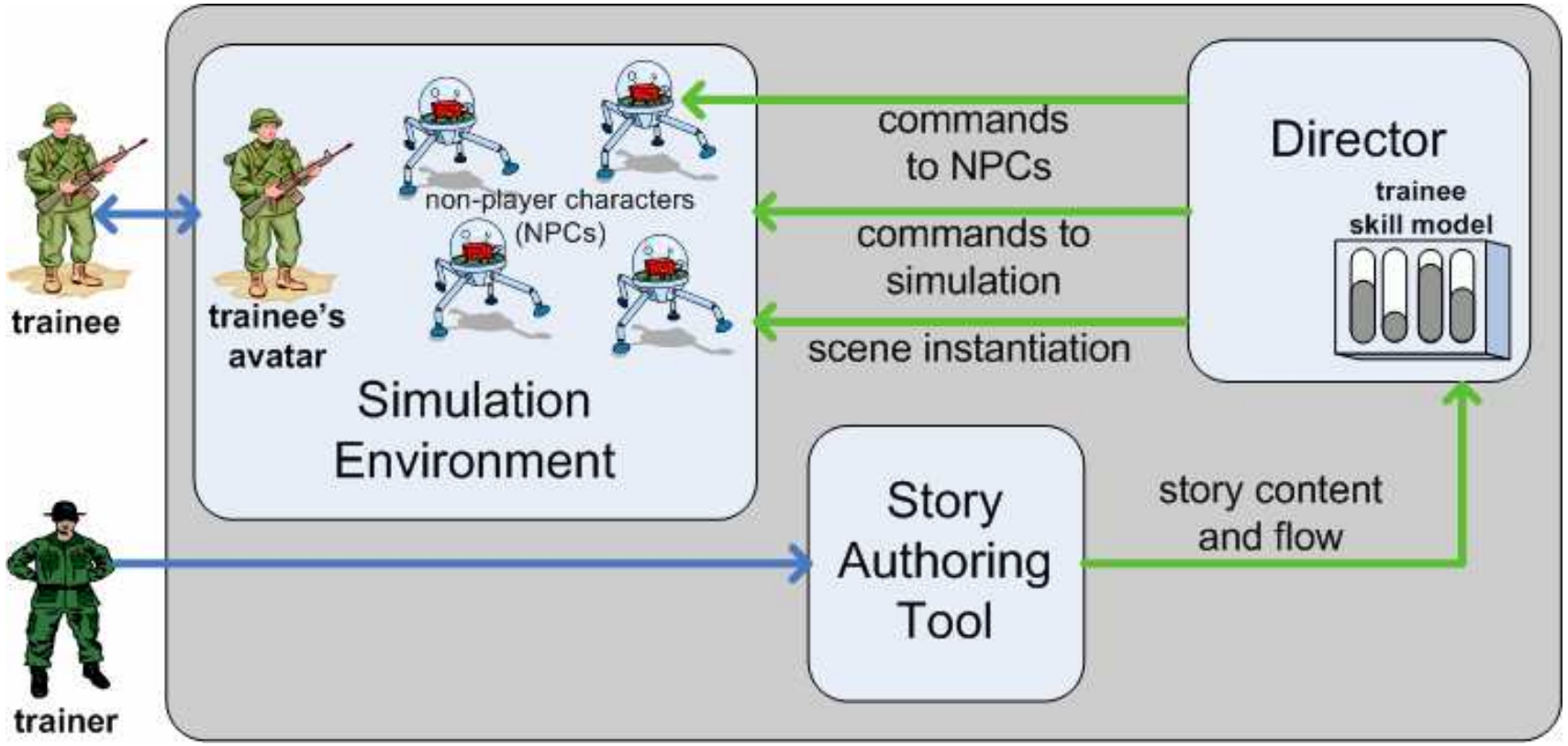
- Integration
  - Director agent & TC3 simulation
  - Director agent & authoring tool
- General
  - Documentation of correct treatment procedures
  - Mapping of simulation actions to skills

Tactical Combat Casualty Care (TC3)

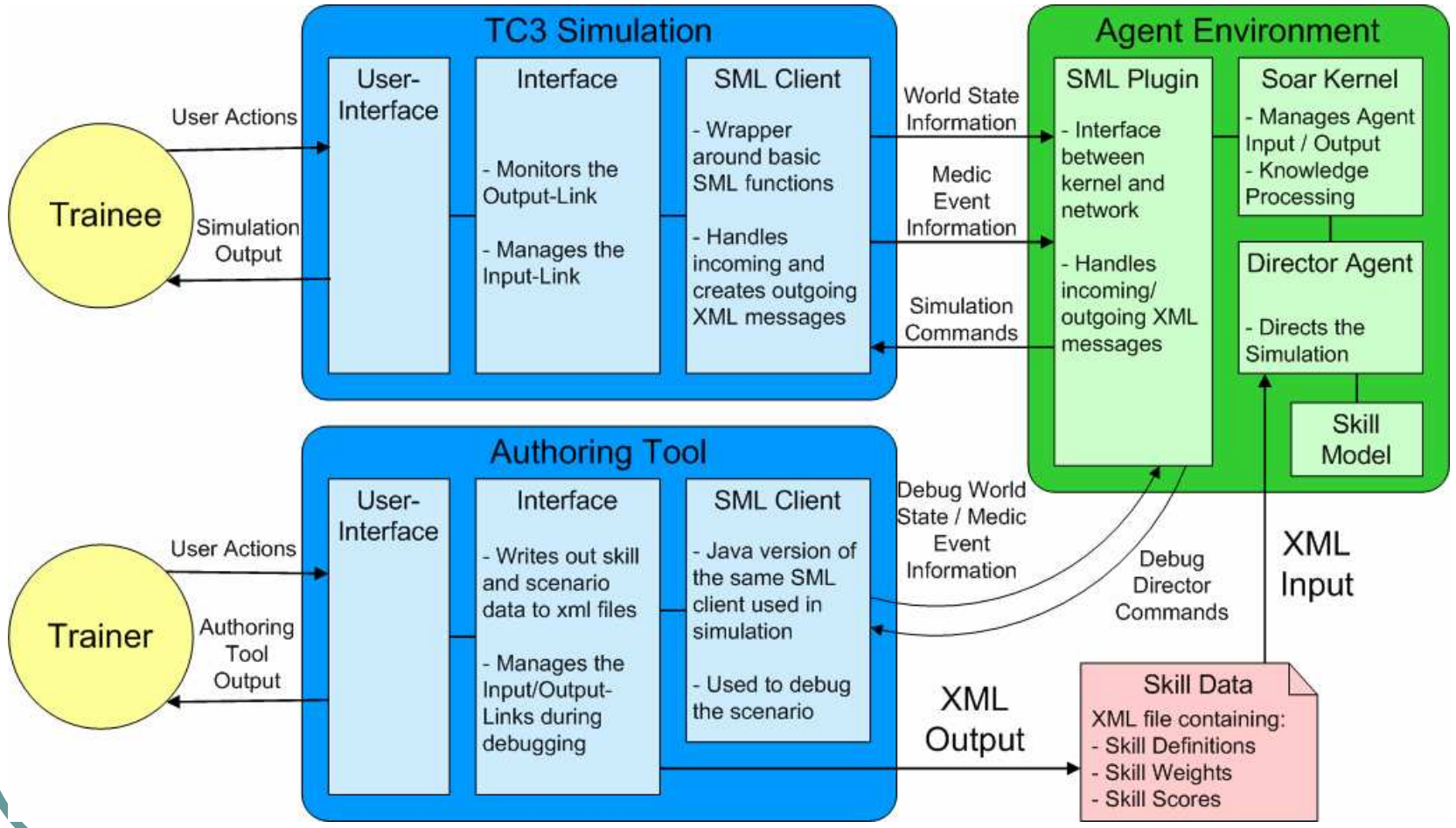
- Baseline simulation developed by ECS, Inc. through RDECOM-STTC funding
- Combat medic simulation using computer game technology
- First person 3-D environment

- Training for triage and treatment procedures
- Focuses on casualty care

High-Level ISAT Architecture



ISAT Architecture Details



The ISAT Director

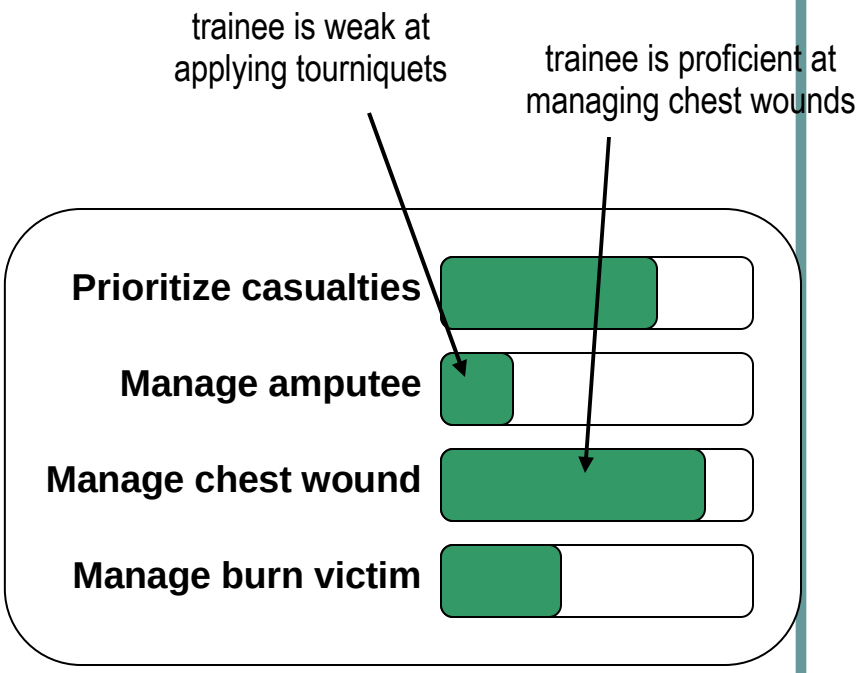
- Directs content and flow of training scenario
  - Selects and instantiates each scene
  - Generates required events and objects within each scene
  - Manages non-trainee characters and their actions
- Identifies trainee skill-proficiency
  - Maintains skill model to actively measures trainee's proficiency at each skill
  - Skill model values can be imported to or exported from the Director agent

The ISAT Director (cont.)

- Actively responds to trainee errors within the scenario
  - Calls attention to the error or strongly guide trainee to correct behavior
  - Highlights or corrects errors when trainee take actions that move him outside the training experience (e.g. wanders off the map)
- Director actions are often dependent on state of trainee skill model

The Skill Model

- Real-time scoring system for individual skills
- Continuously updated by the Director
- Used to evaluate trainee performance and adapt Director actions to trainee needs
- Not visible to trainee
- Individual trainee scores can be maintained and used as input to Director at execution-time



State of Skill Model

Updating algorithms not yet fully developed. Strawman implementation of skill model for purposes of research

Error Types

- Different error types will affect the skill model in various ways
  - Omission
  - Commission
  - Out-of-order
  - Inappropriate action
- Director considers the type of error when assigning scores for each step
  - Omitting a step, for instance, may be more harmful than simply executing it out of order

Direction Types

- Reactive Direction (from IDA)
- Story Direction (from IDA)
- Skill-based Direction (new)
  - Responds to trainee skill errors by executing actions within the environment
  - Direction selection based on both the nature of the error and state of the skill model
  - Scaffolding & fading
    - Can be indirect, e.g., changing the state of an object/NPC to affect future events
    - Can be direct, e.g., having the squad leader yell at the trainee that he has made a mistake

Demo Preview

- Setting
  - a courtyard after a suicide bomb attempt
  - 4 casualties: one motionless (dead), one amputee, one burn victim (screaming) and one chest wound
- Primitive reactive direction
  - If trainee is inactive for a period of time, squad leader prompts trainee to “wake up & start treating casualties”

Demo Preview

- Primitive scaffolding
  - Direction will vary depending on trainee skill level
  - If trainee is relatively proficient at prioritization of casualties and makes an error, cue will be subtle
    e.g., Amputee will begin screaming in agony "Aahhh! My arm!"
  - If trainee is not proficient at prioritization of casualties, cue will be very direct
    e.g., squad leader yells "There's a man over there who's lost his arm. He'll die if you don't tend to him soon."

Demo Preview

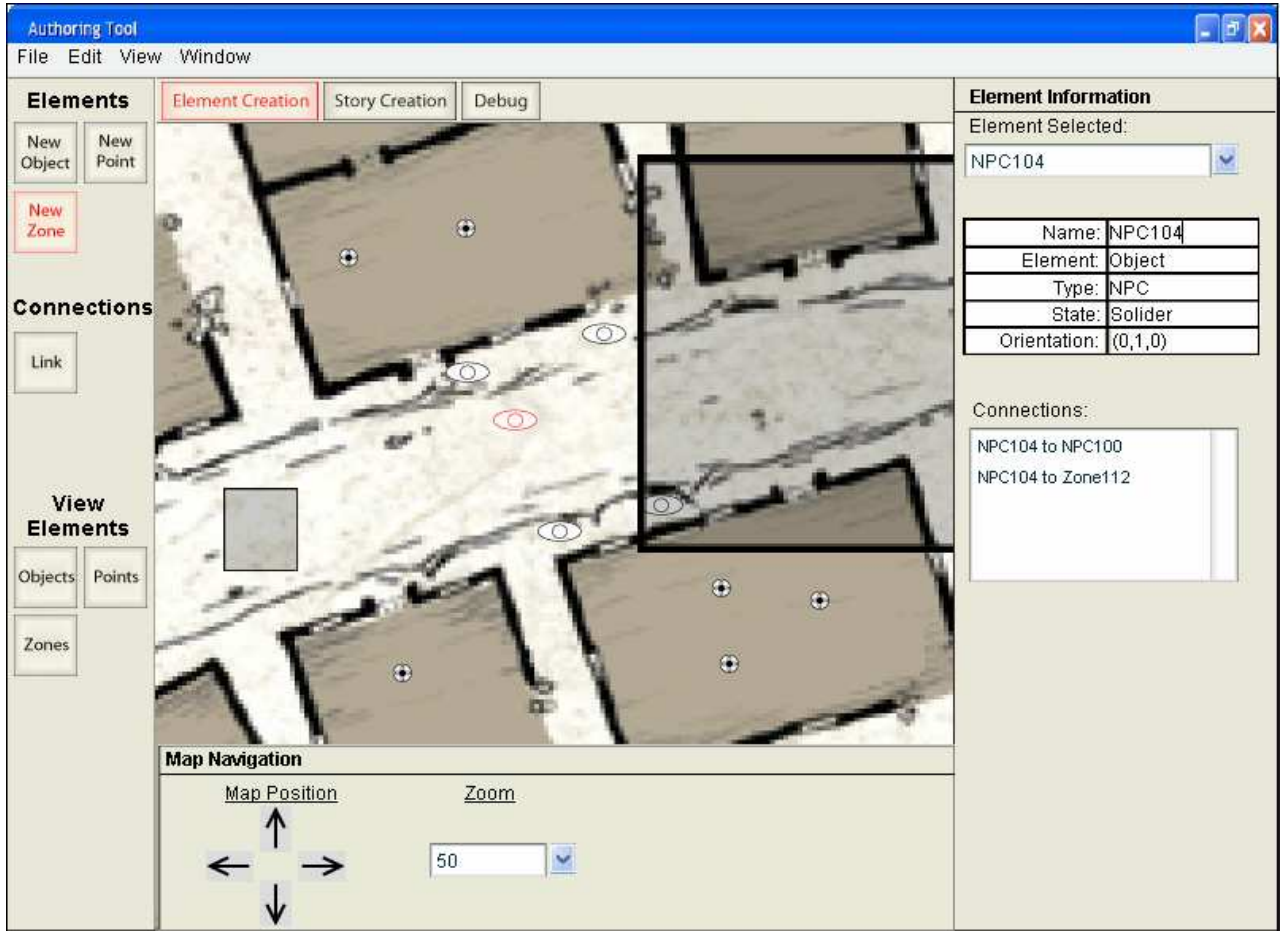
- Skill-based direction
  - Treating casualties out of order
    e.g., “I know that soldier is hurt but there are more serious casualties you need to deal with.”
  - Implementing tourniquet treatment steps out of order
    e.g., “Cut away that man’s sleeve before you apply the tourniquet.”
- Ultimately the Director will be able to take action in ways other than verbal cues

ISAT Demo

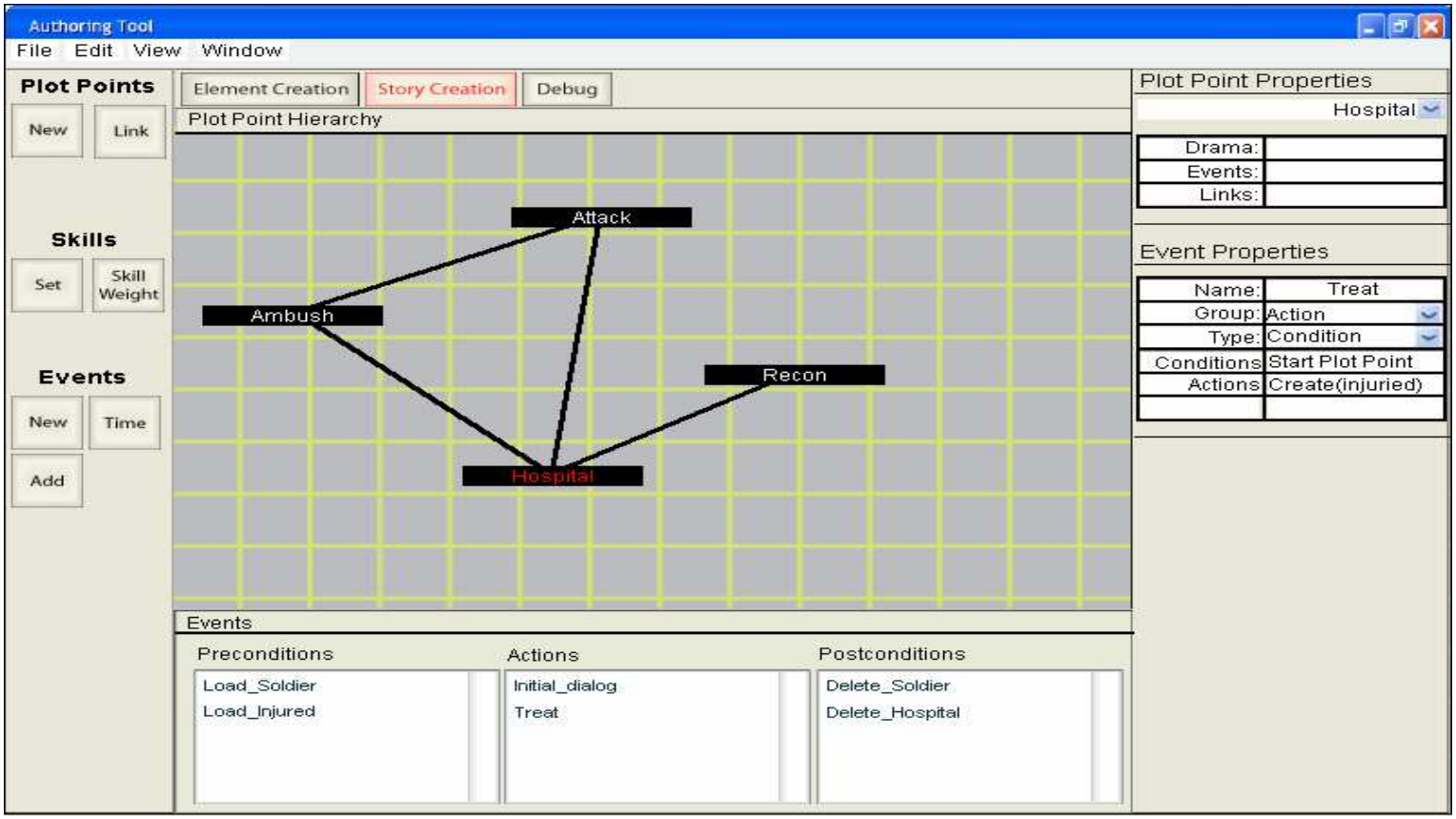
Story Authoring tool

- Difficult for non-programmer to encode & edit training content
- Graphical story editor & debugger
- Use: Non-programmer SME or Trainer
- Modes
  - Element placement
  - Story creation
  - Debugging

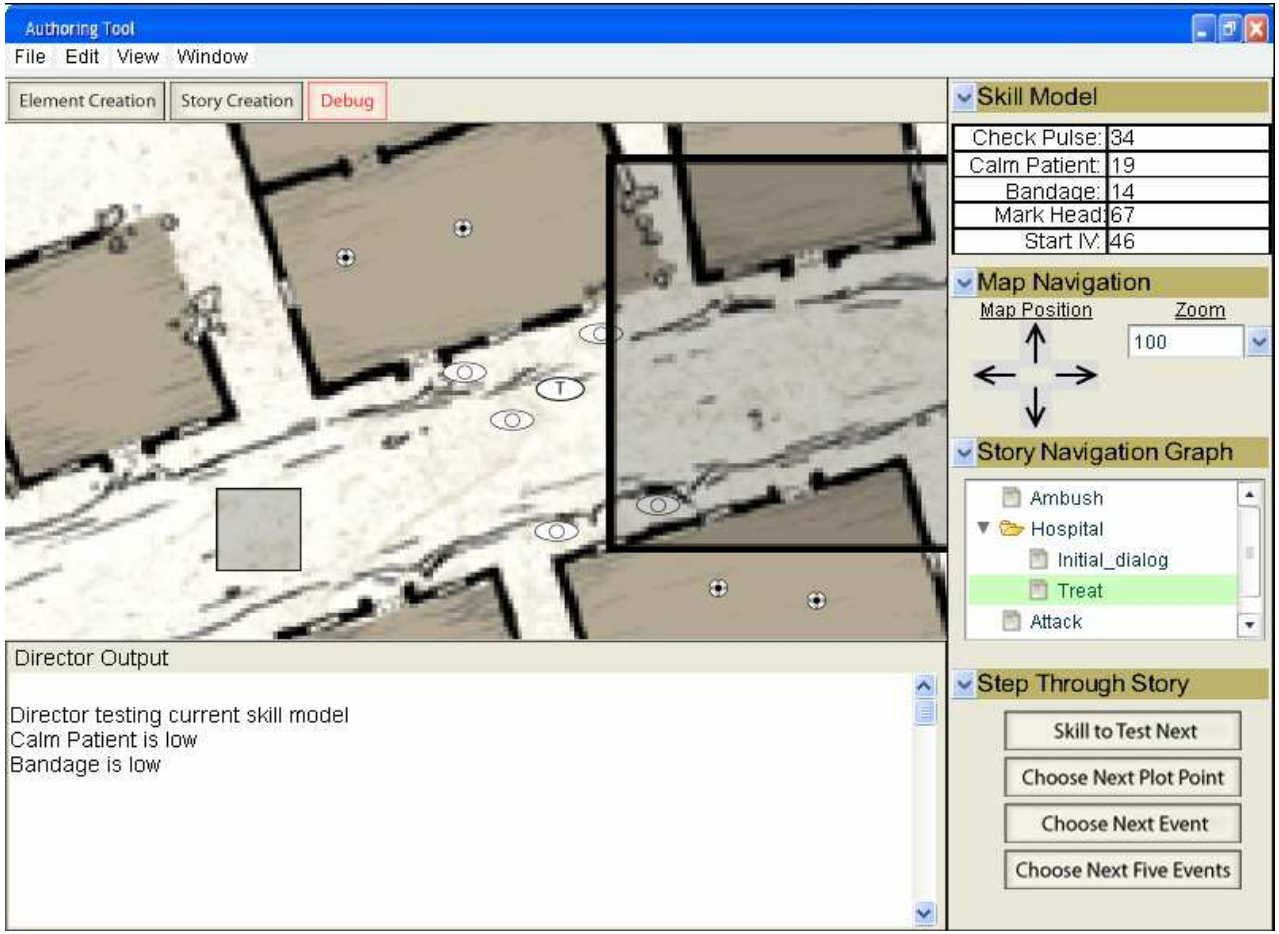
Element Placement (Prototype)



Story Creation (Prototype)



Debugging (Prototype)



Next Steps

- Director
  - Story Direction & Scene instantiation
  - More complex director actions
  - Refinement of skill model updating functions
    - Recency
    - Decay
- Authoring Tool
  - Integration with director
  - Import XML maps
  - Java implementation
- Evaluation

Nuggets

- Expands interactive drama concepts from IDA for education
- Significant progress in development
- Authoring tool prototype developed and informally evaluated
- Skills more rigorously defined
- New TC3 environment

Coal

- Evaluation subject pool still unclear
- Authoring tool implementation just beginning
- Strawman model updating
- No access to SME
- “S” in ISAT not yet visible
- Instantiation of plot content not yet clearly defined