Interactive Storytelling Architecture for Training

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Motivation

- Training systems often use “pre-canned” exercises
  - Limited interest of student (poor motivation)
  - Limited training value (slow learning curve)

- Hypothesis:
  - Improve both interest (engagement) and training effectiveness by inserting an intelligent controller (director) into virtual training systems

*Intelligent tutoring in unstructured domains*
Based on work done with Interactive Drama Architecture (IDA)
- Director as scenario manager
- Author as trainer
Provides individualized training experience
- Trainee aptitude in skills
- Drama
Explores application of interactive storytelling techniques to training
Scenario representation

- Scenario
  - Partially-ordered abstract scenes
  - Mapping between possible actions and skills

- Scene
  - Explicit list of skills tested
  - Abstract events
Director Actions

- Reactive & Predictive direction
  - Similar to IDA
  - React to trainee actions (provide feedback)
  - Anticipate trainee actions and structure events to ensure desired outcomes

- Skill-based direction
  - Take actions that allow trainee to demonstrate skills

- Heuristic scene choice & instantiation
  - Decisions motivated by skills & narrative arc
Skill-based direction

- Provide indirect environment feedback to trainee during task performance
  - Constraints
    - Maintain engagement: No “instructor popups”
    - Provide guidance (scaffolding) but don’t make it a crutch (fading)
    - Need multiple levels of intercession for the same trainee actions
  - Direction based on $f^n$ of recency, strength, decay, & ?? of skill
- Example
  - Trainee fails to check civilian casualty for booby traps
  - Possible director actions:
    - Blow up trainee, roll out dud grenade, CO yells, NOP
## Skills in 91W TC3

<table>
<thead>
<tr>
<th>Skills</th>
<th>Description</th>
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<tbody>
<tr>
<td>Care Under Fire</td>
<td>In a hot zone situation, return fire and help secure the area before attempting treatment or extraction.</td>
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<tr>
<td>Find Temporary Fighting positions</td>
<td>Minimize exposure to fire by staying low to ground and using objects in the environment.</td>
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<tr>
<td>Prioritize casualties</td>
<td>Decide the order in which patients should receive care.</td>
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<tr>
<td>Secure casualty</td>
<td>Make sure the casualty poses/can pose no threat.</td>
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<tr>
<td>Check vitals</td>
<td>Check casualty’s breathing, heart beat, and skin color.</td>
</tr>
<tr>
<td>Apply tourniquet</td>
<td>Decide when a casualty/situation requires a tourniquet and apply the tourniquet.</td>
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<tr>
<td>Manage airway</td>
<td>Open airway if the patient’s breathing is labored.</td>
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<tr>
<td>Manage chest wound</td>
<td>Take correct steps to treat a casualty with a chest wound.</td>
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<tr>
<td>Monitor</td>
<td>Monitor casualty until evacuation</td>
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<tr>
<td>Extraction</td>
<td>Properly extract a casualty from a hot zone.</td>
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</tbody>
</table>
Heuristic Scene Choice

Scene 5

Current Scene

Trainee is weak at skill D
Trainee is proficient at skill C
Skills tested in scene 5
Skills not tested in scene 5

State of Skill Model

Scene 1
Scene 2
Scene 7

Candidates for Next Scene

Scene 2 Selected as Next Scene
Scene instantiation

- Skill model for content selection & refinement
  - Instantiate scene to test specific skills
  - Transition function from skills & content to complete scene

- E.g. in “the ambush scene:”
  - Trainee is untested in tourniquet skills
    - spawn an enemy on top of building with RPG
Next steps

- Full implementation in 91W TC3
- Research in robust predictive models
- Diagrammatic authoring & debugging tool
- Evaluation of approach & tools
- Implementation in other environments
Nuggets and Coal

- **Nuggets**
  - Extended IDA to training domain
  - New approach to teaching in unstructured, real-time domain
  - Working prototype in 91W TC3 trainer
  - Lots of interest (potential funders/customers!)

- **Coal**
  - Skill model is immature
  - Scene representation & instantiation is immature
  - Lack of other environments to show generalizability
Questions?

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