Thinking on its Feet: Using Soar to Model Combatants in Urban Environments

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Soar 22

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Introduction

- ONR **VIR**tual **T**raining & **E**nvironments Program (**VIRTE**)
  - Goal: Build a distributed, virtual environment in order to better train U.S. Marines for urban combat
  - Many components:
    - real-time tracking, head-mounted displays, sound, haptics, intelligent opponents (OPFOR)
- Joint Soar Technology/U. of Michigan effort
  - Soar Technology: Randy Jones, Bob Wray
  - UM: John Laird, Andrew Nuxoll, Soar-RPG group

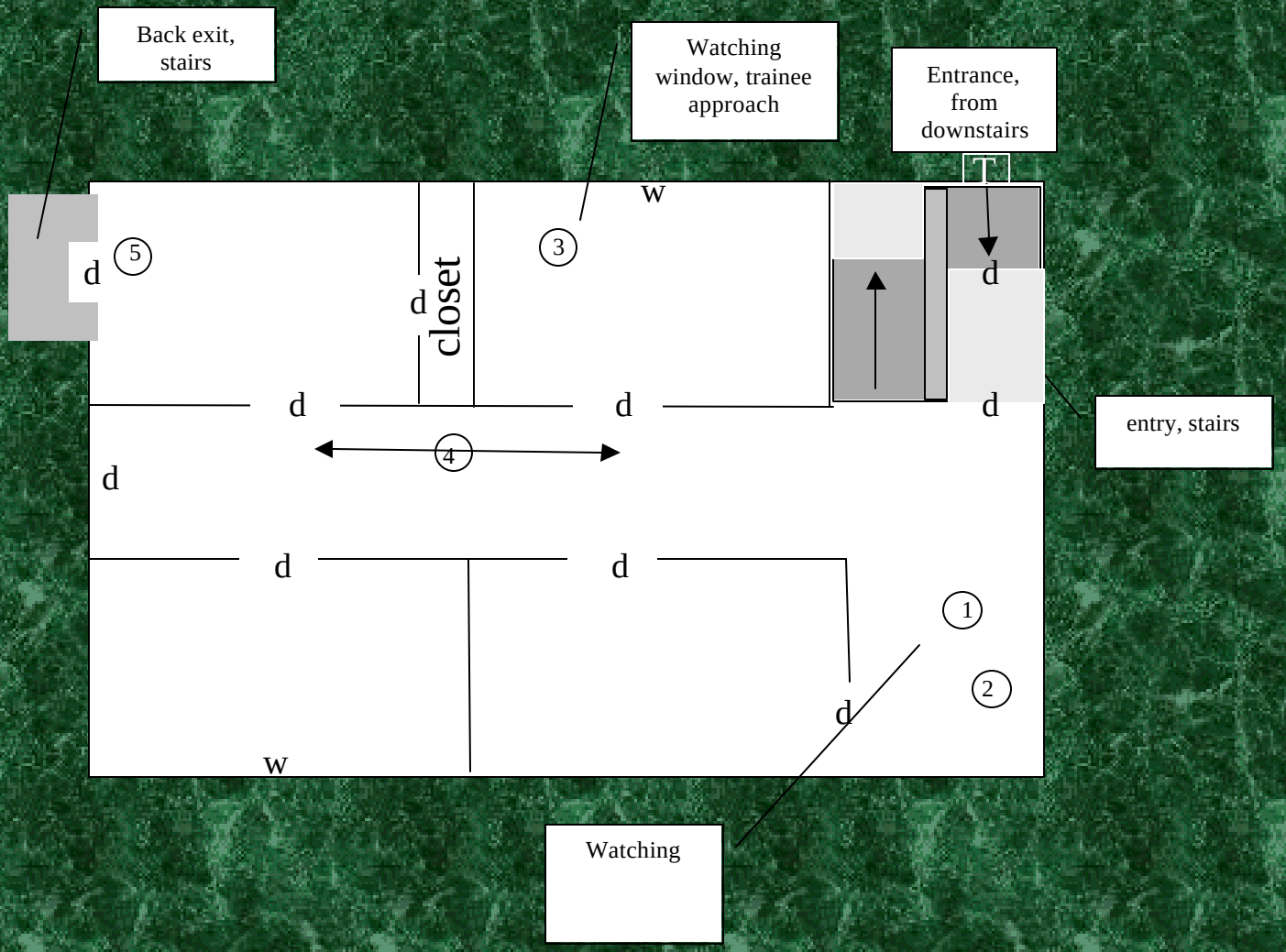
Problem Statement

- Demonstrate feasibility of creating realistic intelligent combatants in urban environments
  - Use Unreal Tournament for simulation
  - Narrow the behavior space: What's important?
  - Implement behaviors in Soar

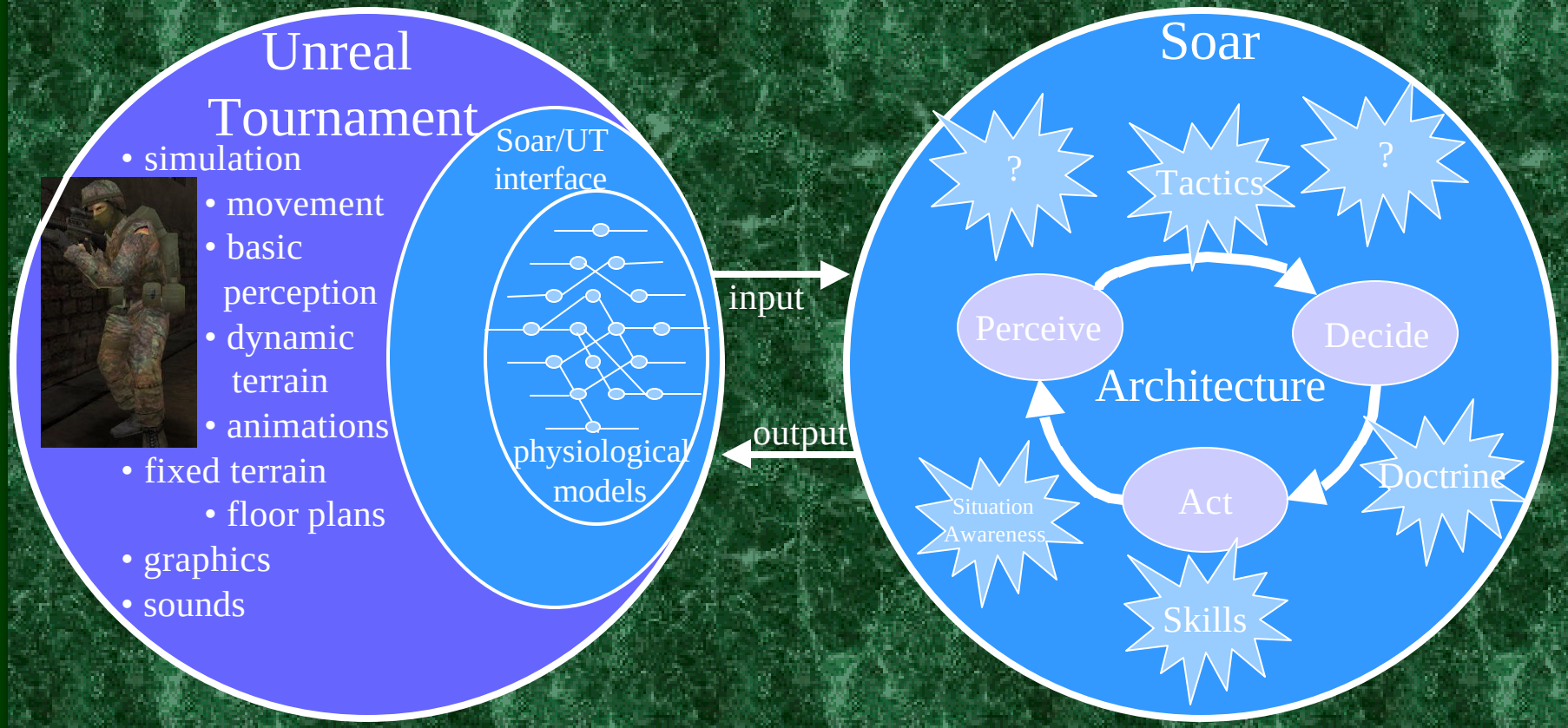
Immediate Challenges

- Unreal Tournament simulator
  - Level of "out-of-box" fidelity not be good enough for this domain in many cases
    - must develop domain specific animations or stubs
- Where is it critical to be veridical?
    - Tactical behavior? Gestures? Reactions? → SME: "All of it"
      - Current focus: tactical behaviors for a single scenario
- Implement behaviors in Soar
    - "Non-cognitive" behavior elements are likely necessary
      - Emotion , sense of momentum, reaction to sound/light, …
      - How do we do encode this in a principled way?
        - Use in Soar? Avoid productions with: (<io> ^fear < 50)
    - Need lots of variability in executed behaviors

Scenario 1: First Floor



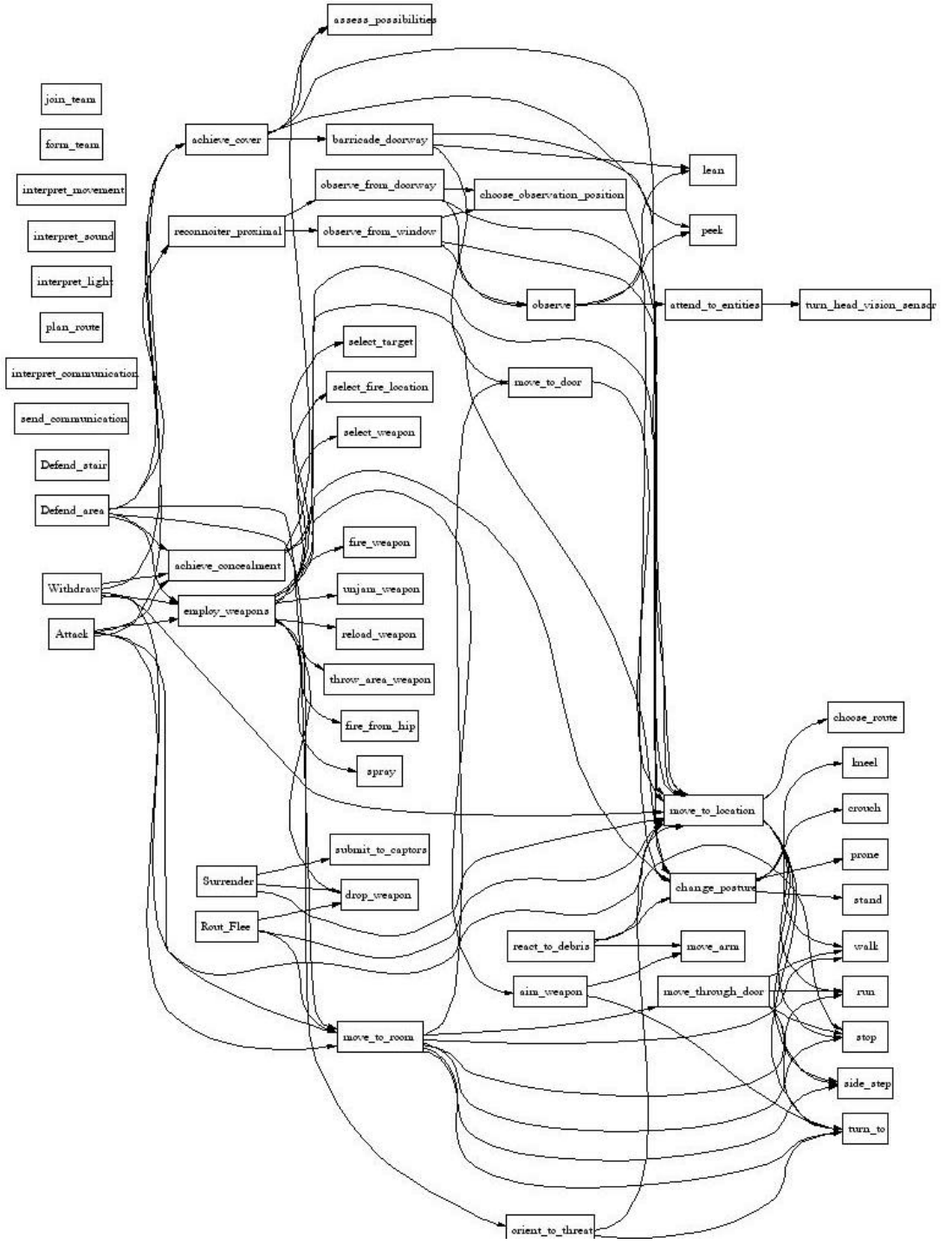
System Architecture



Initial Analysis

- Tactical Knowledge
  - Not many goals
  - Not many actions
  - Branchy, recursive goal structure

Where will behavior variability come from?



Soar Technology/U of MichiganModelin
Combatants in Urban Combat

Longer-term Questions

- Spatial/temporal reasoning
  - Agents that can recognize how to use the terrain & time to their advantage
- Dynamic teaming & coordination
  - Agents that can dynamically form/re-form teams and create low-bandwidth mutually understood team goals (and change them)
- Training
  - OPFOR goals perhaps should **not** be the same as real humans (maximize experience for training soldiers)
  - Automate not just the OPFOR but the trainer

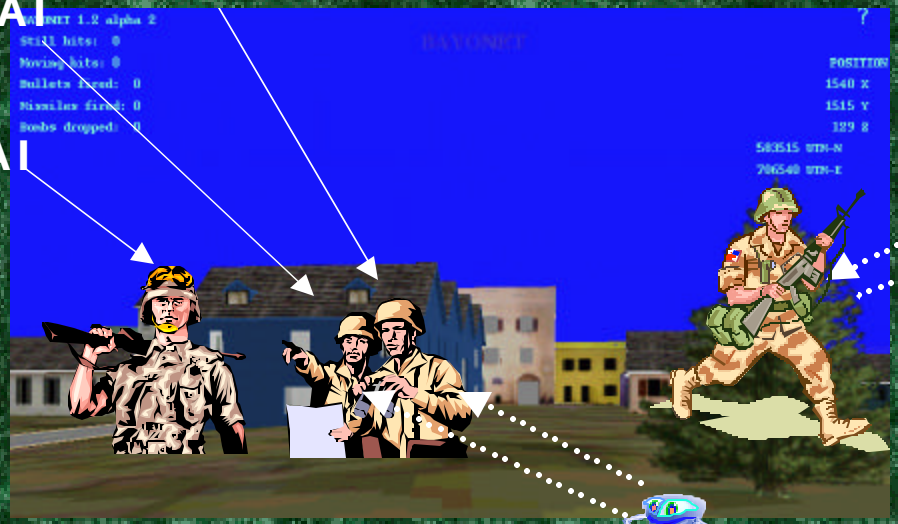
Dynamic Training

User

AI

AI

AI



Environment

user actions

percepts

Training script and goals

Director

software side

Trainers

Summary

- ✓ Attacking a cutting edge domain. Push:
  - Architecture (performance)
  - Modeling techniques
    - branchy, recursive goal hierarchies
    - Physiology and variability
  - Theory? (PSCM & multiple, parallel goals)
- Lots of preparatory work before we get to the research questions
  - Some unanticipated, possibly interesting questions in getting there
- Not clear what's critical to represent and if cognitive architectures will provide leverage for those elements