Patterns of Life in the Foreground and Background: Practical Approaches to Enhancing Simulation-Based Interaction Skills Training

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Abstract:

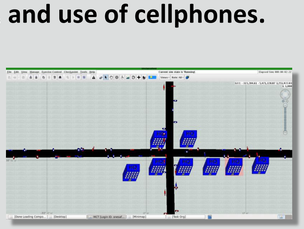
Intelligent agents are used to train interaction skills in simulated environments. Their use demands that the agents exhibit proper – realistic, appropriate – behaviors. We are interested in methods to portray natural activity, influenced by sociocultural context. In some cases we present a high-level perspective of agent activity; in other cases we show a ground-level view of individual agents with social networks who demonstrate patterns of life (PoL). We employ different tools to achieve agent realism, from fuzzy state models to simple behavior algorithms to more complex cognitive reasoning. Additional parameters control for sociocultural elements.

Three directives have driven our work:

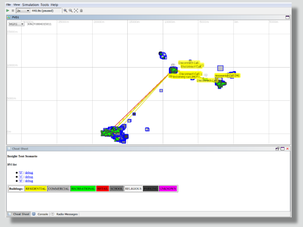
- ***Background at Scale***. **There is a need for simulation of many (thousands) of characters with intelligent profiles, that is, each character having a kind of life story that drives its behavior.**

  Example: **Background entities behaving in accordance with culturally-relevant daily activities such as shopping, driving, and use of cellphones.**

Regular Market Activity



Vehicular Activity



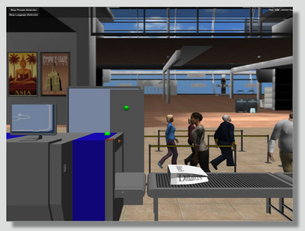
Phone Usage

- ***Variation***. **There is a need for variability in characters' behaviors based on facets underlying their intelligence such as culture, and a demand to avoid predetermined, scripted actions.**

  Example: **Ground-level interactions such as random greetings; regular background movement**

Street Interactions

Normal Activity behind a Central Character



Normal Activity behind a Central Focus

- ***Anomaly and Normalcy***. **Characters should have additional intelligence, either to act differently when not blending into the general population, or to act realistically in response to abnormal situations.**

  Example: **Background entities responding to an IED detonation; deceptive techniques exhibited by insurgents and other opposing forces.**

Fuzzy Logic:

We use a fuzzy state machine to generate activity schedules, mainly for 'clutter' (background) characters. Characters' actions are planned before a scenario is run, but not completely specified, enabling us to repair from unexpected situations. We use parameters to influence the schedule.

Algorithmic Control:

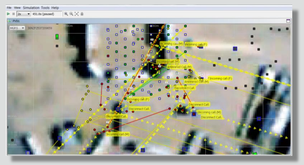
Subroutines guide what, where, and with whom characters' activities occur. Parameters can also influence these activities. The intent is to mimic real-world sights and sounds.

Parameter:	*Sample Values:*
Marketplace	In/Outdoor
Family Life	Nuclear/Extended
Passing	On Left/Right
Personality	Outgoing/Reserved
Religion	Secular/Traditional
Street Activity	Congested/Light
Traffic Patterns	Chaotic/Orderly

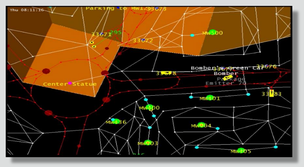
PoL & Cultural Parameters

Cognitive Agents:

We use a reasoning architecture for emulating central characters that intermingle seamlessly with clutter characters. These characters are designed to understand PoL and reason about behaviors to fit in appropriately—or disguise intentional behavioral deviations. Cultural parameters affect the execution of production rules within our cognitive architecture.



Market Dispersal



Agent as Insurgent

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