

# Novamente Intelligent Virtual Agents Server (NIVA)

Launch early 2008

## OVERVIEW

NIVA Agents server has been developed by Novamente LLC, the pioneer of Artificial General Intelligence technology.

Powered by the Novamente Cognition Engine, NIVA provides virtual agents in simulated worlds with an unprecedented level of intelligence, including memory, reasoning and learning capability.

- Agents learn from experience
- Reasoning and learning, not just perception and pathfinding
- Agent behavior and goals may be partially scripted, and partially left up to learning and adaptation
- A collection of pre-packaged modules is provided, containing scripts corresponding to commonly used agent types
- Agent configuration user interface allows users to customize behaviors of agents defined using pre-packaged modules
- Available via managed hosting on remote server, or for co-location with simulation world servers
- Communicates with simulation server via simple network API
- Multiple platforms

## FEATURES

### Scripting

Using the simple, intuitive NovaScript language, agents may be supplied scripts describing

- **goals**, possibly weighted or prioritized
- **suggested subgoals**, which the agent is encouraged to consider may possibly be subgoals of one or more of the goals
- **hard rules**, which the agent is absolutely constrained to follow (insofar as the rules are logically consistent and pragmatically possible to follow)
- **fuzzy rules**, which the agent is encouraged to follow but is allowed to violate if this seems appropriate

## APPLICATIONS

- **Virtual worlds**
- **MMOG**
- **Serious games**
- **Training simulations**

Features: Scripting (continued)

- **suggested rules**, which the agent is encouraged to follow initially, but is allowed to discard entirely if it finds better ways to achieve its specified goals

### Modules

Modules are provided corresponding to common agent types. Each module consists of a set of coordinated scripts. Initially supplied modules are:

- Dog
- Rabbit
- Soldier
- Guerilla Fighter
- Urban Gangster
- Monster
- Everyday Person

Additional modules may be developed on a contract basis, according to customer request.

### Agent Configuration User Interface

There is an Agent Configuration interface that allows the customization of agents that are controlled by modules. To enable this, each module in its definition specifies certain parameters that are to be configurable via the interface. As an example, in the pre-packaged modules,

- An agent's initial goal system may be configured via adjusting the weightings assigned to the different in-built goals
- Agents may be given levels of affinity toward various particular agents and locations
- It can be specified which behaviors an agent is supposed to display when confronted with a particular

situation (both the behaviors and situations are selected from drop-down menus, the elements of which are defined as part of the module)

- Users may configure linguistic communication by specifying linguistic responses to particular linguistic statements. These will be enacted by the agents using linguistically savvy fuzzy matching
- Affinities, behaviors and linguistic responses may be encoded as rigid or flexible. Flexible means that the agent may vary from the encoded information based on its adaptive learning.

## Perception

- Agents may process auditory, olfactory and haptic as well as visual data
- Intelligent image segmentation techniques used for object recognition
- Rapid perception of paths to various interesting destinations, biased by prior experience regarding usefulness of different types of paths

## Body Movement

- If simulation world possesses a vocabulary of high-level motions for agents (e.g. walk, run, sit) then NIVA will send high-level signals
- Otherwise, NIVA possess a built-in library of physical motion types (running, walking, sitting, etc.) customized for common skeleton types
- Capability of learning new physical motion types via experience

## Pathfinding

- Efficient path-finding algorithms, capable of handling complex environments
- Intelligent adaptation of path-finding behavior to deal with unexpected dangers, complex terrains, etc.

## Reasoning

- Probabilistic inference via Probabilistic Logic Networks formalism, allows agents to figure out novel ways to achieve goals
- Deductive, inductive and abductive inference
- Certain and speculative inference

## Learning

- Suite of learning algorithms:
  - Probabilistic logic networks

- Probabilistic evolutionary learning via the MOSES algorithm
- Statistical pattern mining

- Supervised learning: Agents may be configured to respond to “rewards” offered by other agents, and will then apply their learning ability to figure out how to get rewards
- Unsupervised learning: Agents will spontaneously seek to learn how to better achieve their goals, and to generally gather information about their environment

## Teamwork

- Agents may operate independently or as part of a team
- Scripts define the type and amount of information shared among team members
- Agents may use text messages to send information to human team members
- Teams may be defined in advance or may assemble themselves spontaneously

## Documentation

- Thorough documentation of all agent functions
- Agent scripting tutorial
- Examples of all varieties of agent control scripts

## KEY BENEFITS

- NPCs with genuinely **interesting, inventive, adaptive behaviors**
- Provides a level of intelligence not feasibly achievable via in-house development projects
- Minimizes development risks via utilizing pre-developed agents technology

## CONTACTS

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