THE TECHNOLOGY OF INTELLIGENT AGENTS

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Introduction

" An Agent is any entity that can be viewed as perceiving its environment through sensors and acting upon its environment through effectors [Russel and Norvig, 1995]

" Intelligent agents are software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing, employ some knowledge or representation of the user's goals or desires [IBM white paper 1995]
Agents and intelligent Agents

"Agent is a system that is in some environment, and that is capable of autonomous action in this environment to meet its design objectives.

"Intelligent agents, in some environment are capable of flexible autonomous action in order to meet its design objectives.

Flexible autonomous action.

"Reactivity.

"Pro-activeness.

"Social ability.
Flexible autonomous action contd..

" Reactivity: intelligent agents (IA) are able to perceive their environment, and respond in a timely fashion to changes that occur in it in order to satisfy their design objective.

" Pro-activeness: IA are able to exhibit goal directed behaviour by taking the initiative in order to satisfy design objective.

" Social ability: IA are capable of interacting with other agents (and possibly humans) in order to satisfy their design objectives.

Environment Properties

" Accessible vs inaccessible.
" Deterministic vs non-deterministic
" Episodic vs non episodic.
" Static vs dynamic.
" Discreet vs continuous.
Classes of Agents

" Logic based agents
" Reactive agents
" Belief-desire-intention agents
" Layered architecture

Classes of Agents contd....

" Logic based agents: in which decision making is realised through deduction.
" Reactive agents: in which decision making is implemented in some form of direct mapping from situation to action.
" Belief -desire-intentions agents: in which decision making depends upon manipulation of data structures representing the belief, desire and intentions of agents.
Layered architecture: decision making is via various software layers, each layer more or less explicitly reason about the environment at different level of abstraction.
Classes of agent contd....
Layered Architecture

" Horizontal layering: Here the software layers are each directly connected to the sensory input and action output. Each layer acts like an agent, suggesting what action to perform.

" Vertical layering: sensory input and action output are each dealt with by at most one layer each.

" Touring Machines by Innes Ferguson is an example of the horizontal type and INTERRAP Jorg Muller of vertical layering.

INTERRAP

" Vertical layered two pass architecture

" Three logical layers....
- Behaviour based (Lowest layer)
- Local planning (middle layer)
- Cooperative planning (Upper most layer)

" Layer Interaction type....
- Bottom up activation
- Top down execution
INTERARP Contd...

" Function implementation in the layer.
- Situation recognition function
- Goal activation function

" Situation recognition function: maps a knowledge base and current goals to a new set of goals.

" Goal activation function: responsible for planning and scheduling, based on current plans, goals and knowledge base of that layer.

Agent Programming and scripting Languages

" LALO developed at CRIM Canada, to develop multiagent intelligent system.

" Agent building environment, by IBM.

" Phantom, based on modula-3.

" Aglet, a java class library for developing mobile agents, developed by IBM tokyo.

" W-prolog and J-prolog, a subset of prolog.

Cyber agent software development kit by Ftp Software.

" AGENT0, by Yoav Shoham.

" Concurrent METATEM developed by Fisher.
Current Application Area

" Proactive, reactive, and context sensitive information retrieval systems.
" Electronic commerce.
" Decision support using distributed, heterogeneous data and knowledge (e.g., healthcare, defense etc).
" Mobile Computing.
" Mail and messaging system.
" Distributed design and manufacturing in virtual enterprise.
" System monitoring, intrusion detection. Contd........

Current application contd...

" Knowledge discover from heterogeneous distributed data and knowledge source (e.g., genome database, protein databanks).
" Collaborative work environments.
Reference

"Intelligent agents: theory and practice" by Michael Wooldridge and Nicholas Jennings, Knowledge Engineering Review.

"Understanding agent systems" by Mark D’Inverno.

http://www.cs.iastate.edu/~honavar/agent99.pdf, a host of sites and help on this site.

http://www.cs.umbc.edu/www/lait/papers/

"Mobile Agents" by William R. Cockayne, Michael Zyda.

http://agents.umbc.edu/

ANY QUESTIONS PLEASE?