Agent-based E-travel Agency

Agent Systems Laboratory
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http://www.agentlab.net
E-commerce System – Structure

Galant, Jakubczyc, Paprzycki, Karpacz, 2002

E-COMMERCE SYSTEM

WEB

Supply System (SS)

communication channel

environment

WEB

Customer System (CS)

environment
Agents

“Existence” since 1970’s

Rapid growth of interest in past decade

Basic intuitions

- based on human agents
  - travel agent
  - insurance agent
  - real-estate agent
  - personal assistant (aka secretary)

- have specialized knowledge
- represent our interests
- find / filter / customize information
Characteristics of software agents

- Reactiveness
- Ability to communicate
- Capacity for cooperation
- Reasoning based on collected knowledge
- Capacity for reasoning
- Intelligence
- Adaptivity
- Interactiviveness
- Learning ability
- Proactiveness
- Goal orientation
- Friendliness and reliability
- Mobility
- Autonomy
Why use agents?

- response to the rapid growth of information on the Internet → need for information personalization / filtering
- framework for bringing together AI techniques to build adaptive intelligent systems
- methodology for engineering complex distributed systems (Jennings):
  - decomposition
  - abstraction
  - organization
- mobile software for mobile world (context-aware computing)
Client-Server vs. Mobile Agents

Mobile agent → agent that:
- can move from one computer to another
- user-directed / autonomous / mixed

Traditional

Mobile Agent-Based
Advantages of Mobile Agents

- Operate where data and/or computer resources are
  - use resources of multiple machines
    - improve load balancing
    - possible approach to GRID computing

-Disconnected operations and autonomy
  - short “on-line” times
    - low-power requirement devices
    - “immune” to network outages
  - redundancy / fail-safe behavior
    - “ensured” transfer across network
    - multiple agents can “back-up” each other

- Natural support for mobile systems
  - travel system support → agents follow travelers
Expert Criticisms


- **Information discovery problem**
  - where the relevant information is and how to keep up with the dynamics of the Internet?

- **Communication problem**
  - how to make different systems to communicate with each other?

- **Ontology problem**
  - how to make different systems understand each other?

- **Legacy software problem**
  - how to make agents interact with legacy systems?

- **Reasoning and coordination problem**
  - how to reason about the retrieved data?

- **Monitoring problem**
  - travel specific problem of post-sale monitoring
Travel Support System

Geographical Information + Business Information

- travel support core → map (geospatial data; G/S)
- travelers demand geographical information combined with information about services (broad definition)
  - restaurants / pubs
  - movie theaters / museums
  - historical information
  - national parks, etc.
- information about services should match personal interests
Proposed System Features

- Decomposition of functionality → agents
  - everything is an agent
  - if something is not an agent (i.e. an expert system, data mining system) it will be wrapped in an agent

- Data indexed according to
  - ontological classification
  - geospatial extent

- Content derived from trusted sources and supplemented by Internet-based information

- Content personalization as an overarching concern during development (Angryk, Galant, Gordon, Paprzycki, 2002)
General System Architecture

content management

travel-related data

- Federation Poland
- Federation Mazowieckie
- Federation Pomorskie
- Federation Wielkopolskie
- Federation Warszawa
- Federation Pruszków
- Federation Wolomin

content delivery

agents

channel

INTERNET

Verified content providers (VCP) vs. unstructured information (IBI)

clients
Content Management

travel-related data

Federation Poland
Federation Mazowieckie
Federation Pruszków
Federation Wielkopolskie

GIS

indexing agent

INTERNET

verified content providers (VCP)

unstructured information (IBI)
Content Delivery

verified content providers (VCP)

INTERNET
unstructured information (IBI)

content delivery

personal agent

client
Experts in the System

Domain-specific expert systems
- Post-sale agent
- User profile initialization expert system
- Travel expert system
- Advertising expert system

Meta-experts
- responsible for mining the data available in the user behavior database
Personalization Infrastructure

- Human-system interface (e.g., personal agent)
- User profile database
- User behavior database
- Expert system agents
Knowledge Acquisition

Knowledge about:
- individuals
- groups
- population
- trends (time-oriented analysis)
- profiles pertinent to new features
- all of the above interact with each other

Knowledge acquisition → source of **adaptivity** in a dynamical web-based system
The System

We are implementing a demonstrator system
- JADE as the agent environment
- JESS as the expert system framework
- OTA – “ontology with verbs”
- heterogeneous databases
- heterogeneous network of computers

Initial results
- agent infrastructure
- client–agent interaction
- available in December
Client – Agent Communication

INTERNET

Web browsers
Java applets
WAP devices

HTTP listener
application listener
WAP listener
message broker
listening framework

TRAVEL SUPPORT SYSTEM

personal agents