Agents: Nomads, Migrants or Globetrotters?

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Examples of agents

- Human agents
  - police agents
  - real estate agents
  - insurance agents
  - secret service agents
  - Representatives?
  - Intermediaries?
  - Organisations?

- Robots

- Software agents:
  - personal digital agents
  - trading agents at auctions
  - information agents

Examples of tasks agents can perform

- Search the internet and intranets for information
- Process the information
- Combine different types of knowledge: e.g. build profiles
- Manage distributed knowledge: e.g. version control
- Plan, schedule and monitor (distributed) processes
- Plan, schedule and monitor (distributed) projects
- Perform (n-party) transactions

In the field of law ....

- Knowledge retrieval is essential (if you could have known something ….)
- Knowledge management can not be ignored
- Legal ontologies are available (categorisation)
- Profiles of groups, companies, and individuals can be built on the basis of retrieval, analysis and synthesis
- Document management (e.g. version control) can be automated
- Planning, scheduling and monitoring support can improve efficiency

Agent characteristics

- are autonomous and pro-active
- are often intelligent
  - can learn
  - have knowledge, can be experts in a domain
  - can reason
- manage their own resources: planning, scheduling,
- communicate with other agents
- interact with the “world” and
- may be mobile

Agent concepts

- autonomous and pro-active
- reasoning & learning
- protocols & negotiation
- co-operation

in a physical environment/network
Reasoning and learning

- reliability of
  - information,
  - informants,
  - information sources,
  - network
- incompleteness and uncertainty of information
- experience: e.g. to be able to build profiles
- strategic knowledge
- importance of deviations from norms

Protocols & Negotiation

- norms and values, beliefs, trust
- contracts, agreed procedures, law,
- language
- reliability, trusted third parties
- delegation
- security
- privacy

Co-operation

- delegation of control
  - traceability
  - anonymity
  - accountability
- negotiation / competition
- strategies
- common “language”
- common goals

Generic model of a co-operative agent*

Agent Mobility

There are three main reasons for agent mobility in a distributed environments:
- resource management: bandwidth, co-ordination
- security: data access
- nature of the devices involved

Categorisation

- Migrants: prefer to live elsewhere for one reason or another on a semi-permanent basis
- Nomads: perform different tasks at different locations depending on the availability of resources
- Globetrotters: hop around the world acquiring new knowledge and adapting on the way …..
Examples of mobile agents

- Human agents
  - police agents: nomads
  - real estate agents: nomads
  - insurance agents: nomads
  - secret service agents: globetrotters
- Robots: nomads
- Software agents:
  - personal digital agents: globetrotters
  - trading agents at auctions: migrants
  - information agents: nomads and/or globetrotters

Implication

Globetrotters are the most demanding …
increasing the need for scalable technology.

An example of a globetrotter:
A mobile embedded system

Dynamic creation of mobile information agents

PA has information request

Agent factory

Dynamic agent creation may be problematic

- can be recursive …
- identity & ownership
  - who controls
    - creation
    - deletion
- who is legally responsible
  - audit trails
  - mutation
  - contractual obligations
- security & anonymity & privacy
Scalable directory services - “yellow” pages

- by location → location server
- by name → name server
- by property → attribute server
- by type → directory server

Another option: replication of auction halls

New technology required

Agentscape* is a framework for
- scalable,
- interactive,
- secure,
- robust,
- distributed agent systems.

* Currently being designed and implemented by the IDES Group together with Tanenbaum and van Steen (both Computer Systems Group), VU

Agentscape Framework

Includes:
- a distributed agent operating system (AOS)
- services
  - agent management
  - matchmaking
  - directory services
  - agent modification (e.g. agent factory, cloning),

Design to support large scale distributed agent applications.

New legal frame of reference required

- Are migrants, nomads and globetrotters full-fledged citizens of today’s society?
- What rights do they have?
- Obligations?
- What is their legal status?
- Are all transactions in which they are involved legal? Valid?

Discussion

Thank you for your attention

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