

Agents



e-Business



and

Frank Dignum

Utrecht University

Overview

1. Developments in e-Business
2. What are software agents?
3. Where can/are agents used?
4. Barriers and opportunities
5. Conclusions

Developments in Business

From



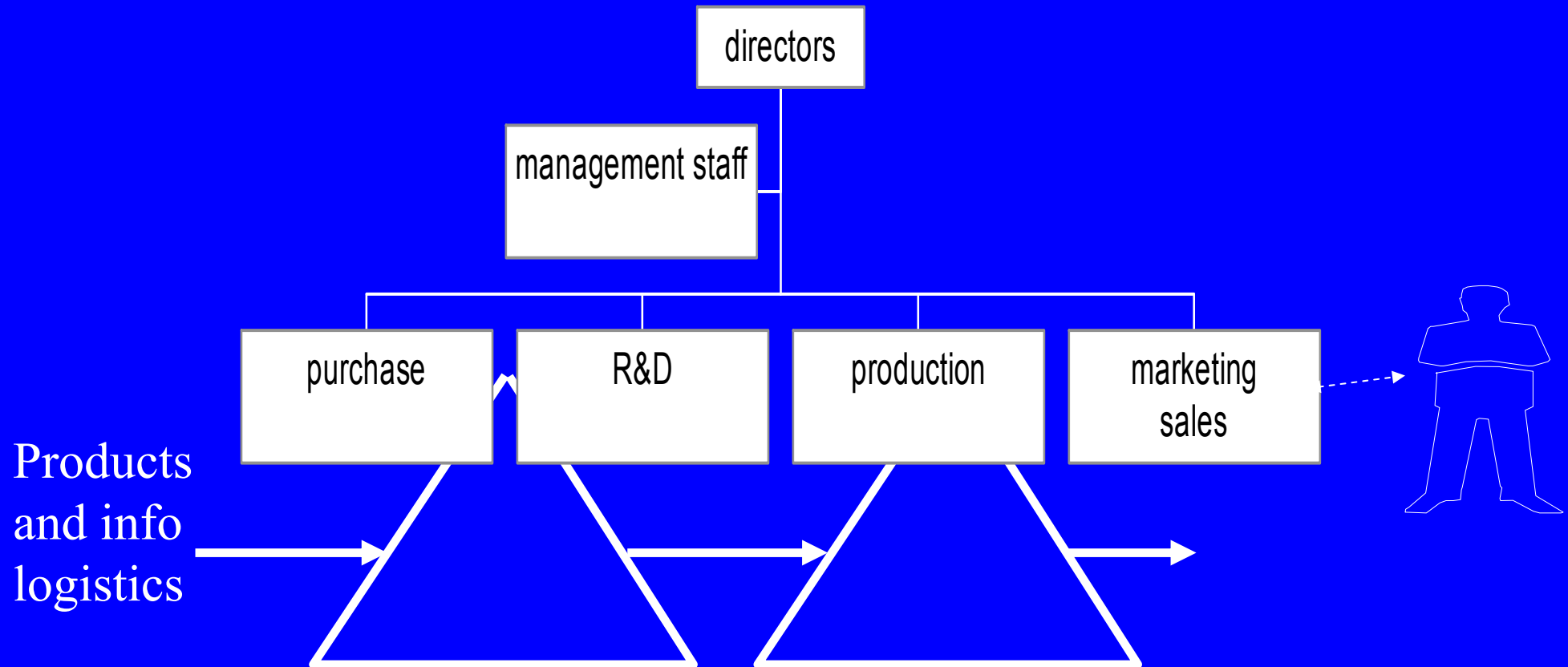
operational excellence

To

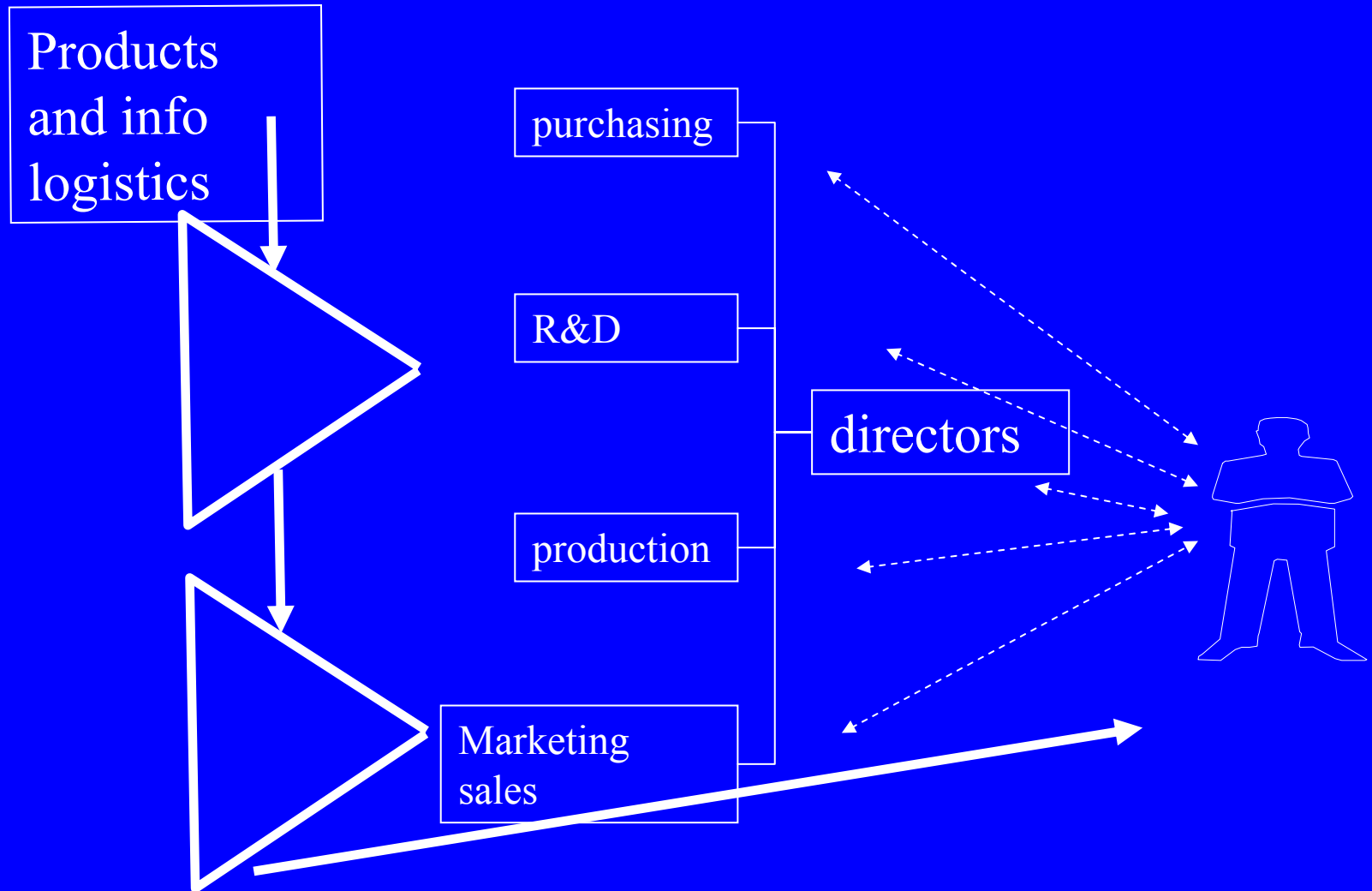


relational excellence

operational excellence

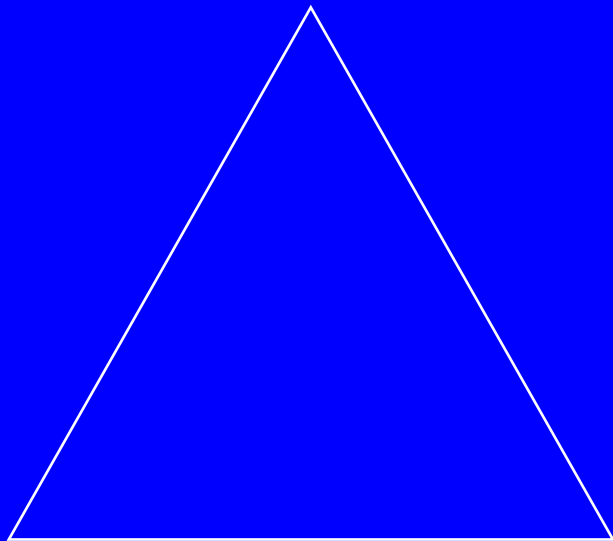


Relational oriented



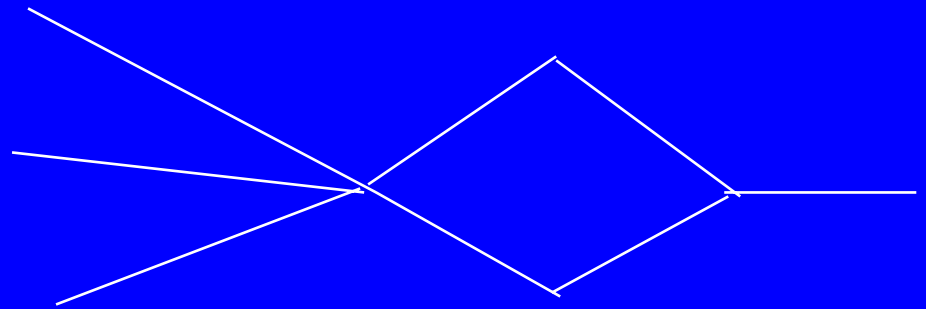
Developments in Business

From



hierarchy

To



Market
Network
Peer-to-peer

Developments in e-Business

- Systems have an ever shorter time-to-market period
- Systems get more and more complex, due to the integration of different aspects of EC
- The environments for EC are getting more “open”
- Contacts between systems are more “peer-to-peer” than “hierarchical”.
- Applications get more distributed (outsourcing of tasks becomes common)
- Systems have to be personalized, thus adaptive

“intuitive” features of Agents

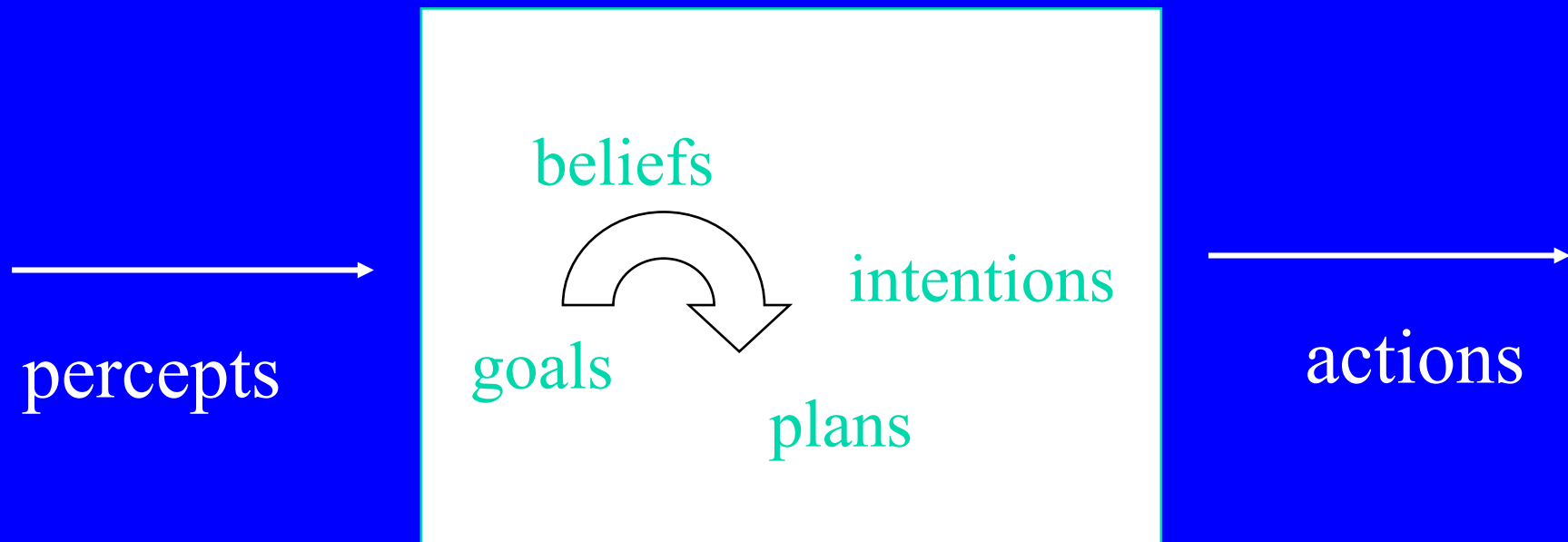
- **Autonomous**
- **Pro-active**
- **Reactive**
- **Social able**

- *Intelligent*
- *Mobile*
- *Adaptable*

BDI Agents

- Agents can be coherently seen as having mental states such as **B**eliefs, **D**esires and **I**ntentions.
- BDI theories provide a conceptual model of the knowledge, goals and plans of the agent.
- BDI agents have some representation of the mental attitudes (possibly very simple with a database).

BDI deliberation cycle



Agents

- For large scale, complex systems
- For distributed systems
- For heterogeneous systems
- In open environment
- Adaptable systems

Agents for EC?

- Electronic commerce is about connecting complex, dynamic systems in a changing, uncertain and/or unknown environment.
- Agents are tools that are developed to take into account exactly (some of) the above conditions in their working environment.

Benefits of agents for EC

- Autonomous → can perform long-term transactions without user attention
- Multi-Agent Systems →
 - modularize complexity in a natural way
 - Inherently distributed nature
- Reactive → can adapt to changing/open environment
- Learning → can adapt to the user/organization
- Social ability → can communicate “peer-to-peer”

Where can agents be used?

- User assistance
- Need identification
- Vendor and product brokering
- Negotiation
- Purchase and delivery
- Service and feedback

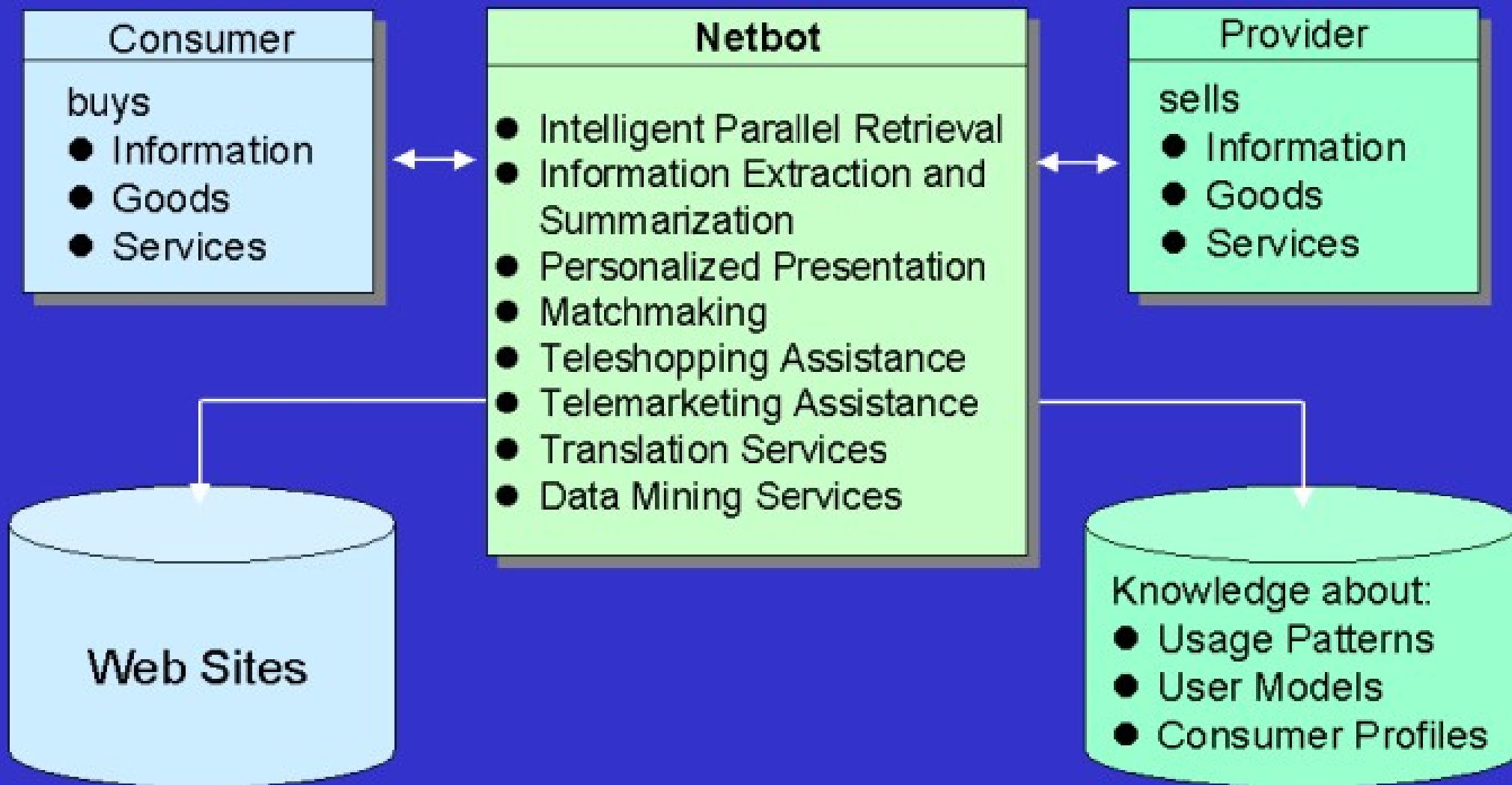
User assistance

- Intelligent support for gathering information
- Monitoring and supporting the transaction process
- Learning the user preferences in order to perform standard portions of the transaction

Examples

- Human like assistants
 - Virtual robots (verbots:
<http://www.vperson.com/>)
 - Agent based user interfaces (dfki)
- Auction monitors
 - E-bay

Intelligent Web Services



AiA: Information Integration for Virtual Webpages

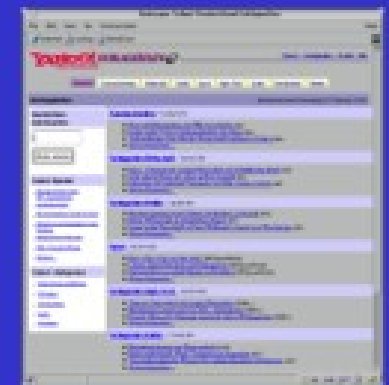
PAN Travel Agent Andi



Car Route Planner



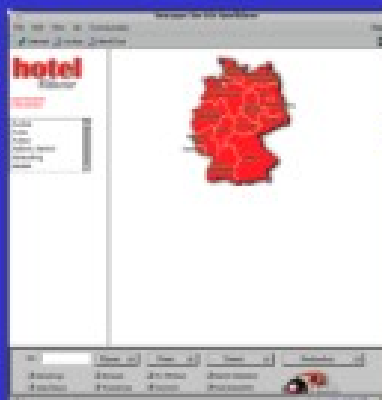
Yahoo News Server



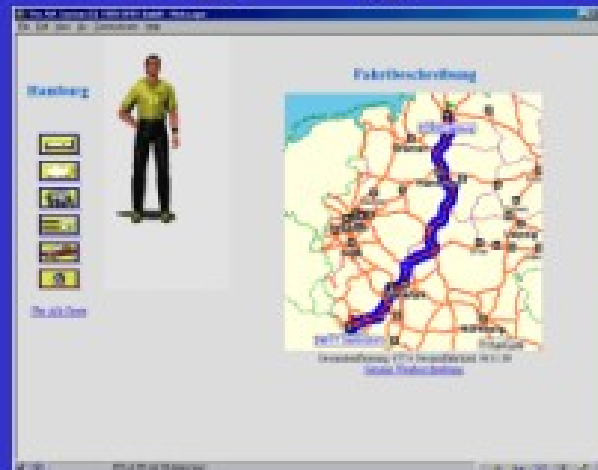
Yahoo Weather Server



Hotel Guide



Gault Millau Restaurant Guide

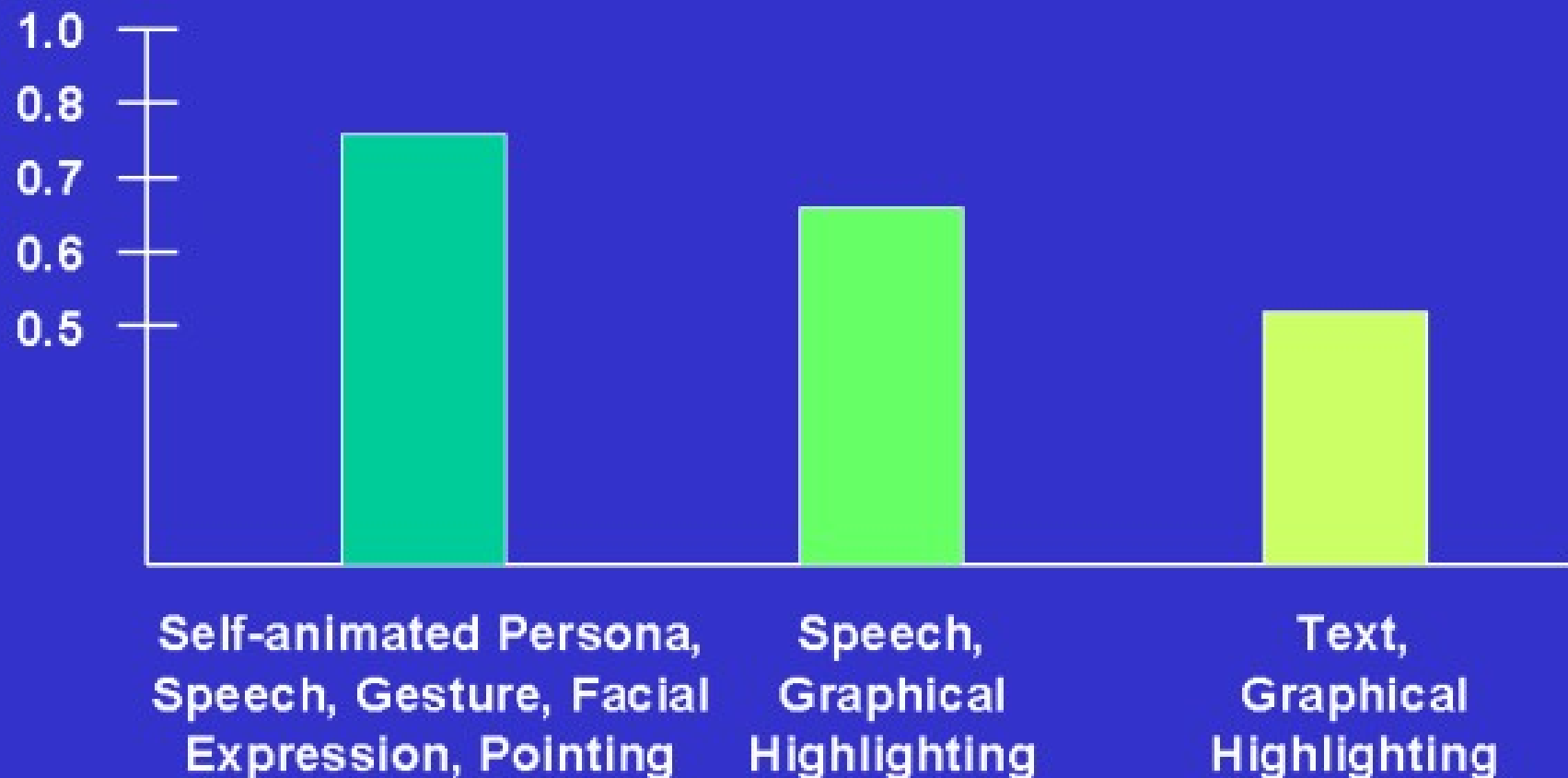


Use of a Life-like Character for Electronic Commerce



Personified Agents Increase the User's Trust in the System's Presentation

Experimental evidence for effects of modality on the user's trust (van Mulken, 1999)
The system gives recommendations, which turn out to be wrong in some cases.
How much does a user trust the system's advice depending on the modality of a presentation?

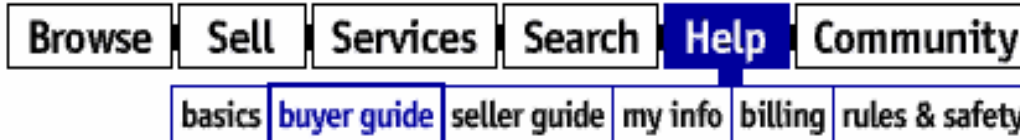


Item watching at e-bay now

Unregistered HyperCam



[home](#) | [my eBay](#) | [site map](#) | [sign out](#)



What is item watching?

Sometimes you find an item that you're not quite ready to bid on yet, but you want to keep track of it so that you can easily bid on it when you're ready. You can use eBay's item watching feature to do just that.

How does it work?

On every item page, there is a "Watch this Item" link on the right hand side of the page. When you click on the link, you can mark the item to be watched in your [My eBay](#) page. Whenever you want to see the items you're watching, just look at the Watching section of your My eBay page. You'll see a list of all the items you're watching. If you've never used My eBay before, give it a try. In addition to the items you're watching, it lets you view your favorite categories, your recent feedback, your account balance, the items you're selling, and the items you're bidding on, all in one convenient place.

Item watching with agents

- Agent watches auctions in which you are interested
- Agent warns when your bid is overturned
- Agent warns when it gets interesting to start bidding
- Agent bid (strategically) up till a predefined level

Vendor and product brokering

- Search agents that compare:
 - www.MySimon.com
 - www.activeresearch.com
 - www.dealtime.com
 - www.egg.com
 - www.jango.com

Agents for C-2-C

- Mobile agents can take your advertisement to either sell or buy an item
- They move to a marketplace
- They try to match your request with the requests of the other agents that are present (or that left a message)
- They report back on the result
- Example based on Tryllian's gossip agents

Agents for negotiation

- Limited use due to complexity, but
- Very useful for e.g. auctions with:
 - “Simple” world model
 - Predetermined interactions
 - Fixed rules
 - One shot relations
 - centralised infrastructure

Agents for negotiation

Fully automated AMEC first in situations where:

1. Interactions are fast
2. Interactions are repeated
3. Trade is of relative small value
4. Process is repeated over long periods
5. Products are easy to specify

Examples: stock trade, power trade and telecom

Agents for logistics

Agent based Work Flow Management:

(From SAP to ASAP)

An agent becomes responsible for delivery of an order

The agent “negotiates” with agents about production/purchase and transport.

When the planning is finished the agent checks and monitors the plan

Deviations of the plan are solved locally

Agents for logistics

Advantages:

- decentralised control,
- modularisation,
- reactive planning possible

Disadvantage:

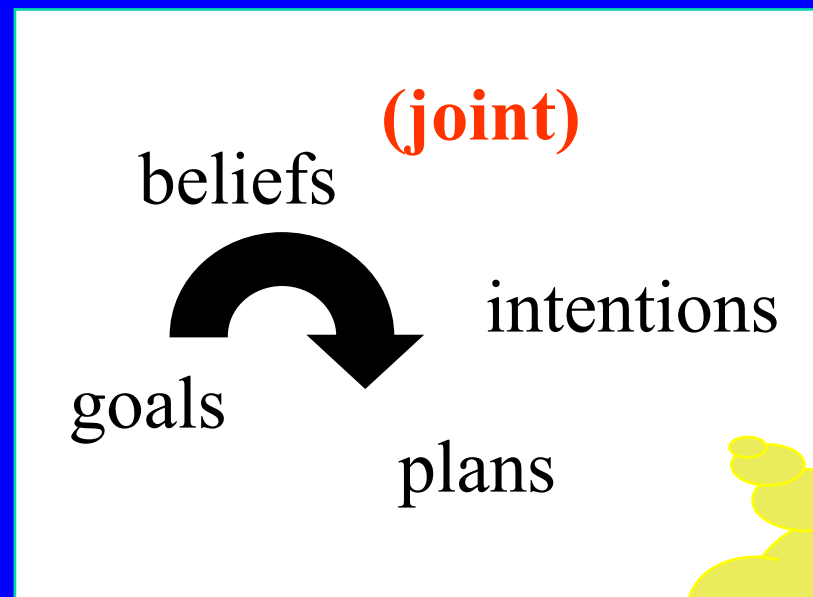
- Difficult to reach global optimum

Research issues

1. Internal for agents

- Solid integrated theory for agents that deliberate, plan, act, react and communicate
- Social concepts (obligations, commitments, trust,...)
- More business intelligence
- Learning (user preferences, adaptation,...)

BDI deliberation cycle with social influences



**norms,
obligations &
commitments**



Strategies for markets/auctions

- Multiple parallel auction strategies (how to bid on eBay)
- Combinatorial auctions
- Interrelated auctions
 - organize a trip with flight, hotel, etc.
 - Fish market, flower market, power market
- New forms of auctions?

Research issues

2. Design and implementation

- Development methodology for multi-agent systems (connected to multi-agent theory)
- Implementation tool kit
- Agent components library

Research issues

3. Coordination between agents

- Agent communication
- Negotiation
- Institutions

Agent Communication/coordination

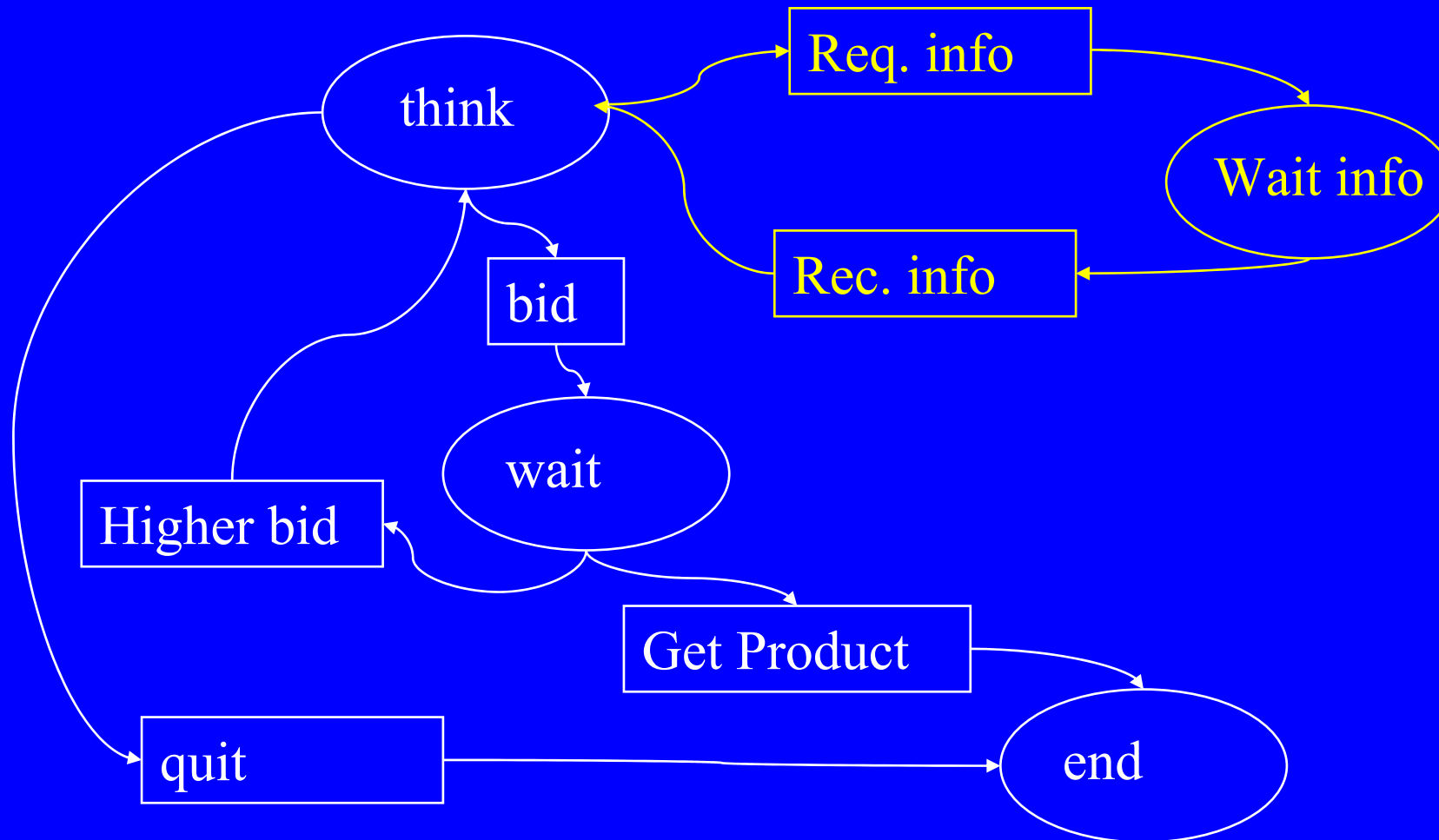
- From fixed protocols to conversations
- Ontologies for semantics of messages
- Integration of conversation plans and other plans
- Checking the adherence to a protocol

Constructing conversations

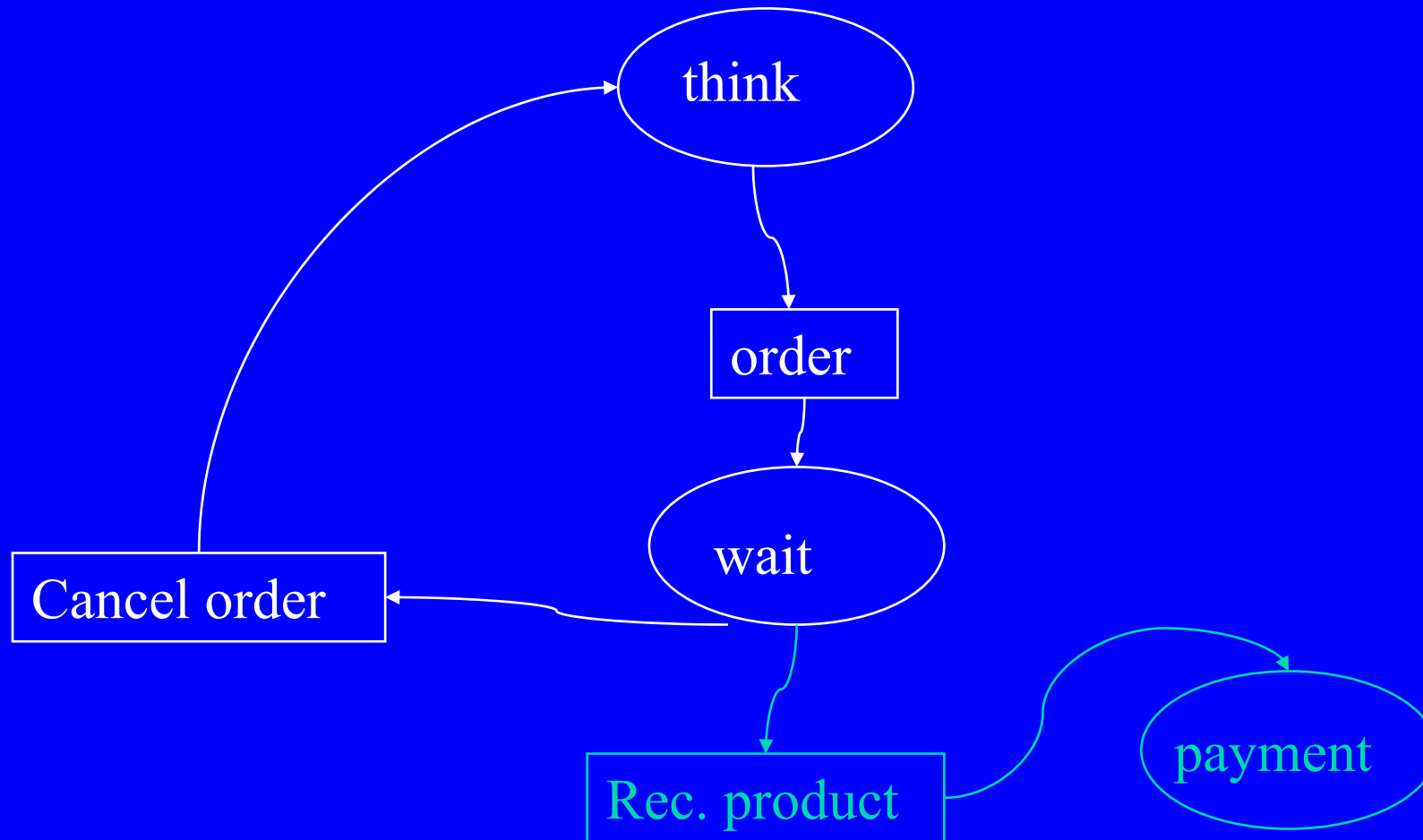
- Speech acts have to be planned as a means to reach a goal
- Therefore it should be possible to reason about consequences of conversations
- These should be combined with other agent tasks
- Thus conversations can be seen as joint tasks/intentions/goals!

Compliance to a protocol?

I. implement all possible sequences?



II. Implement subset



Negotiation

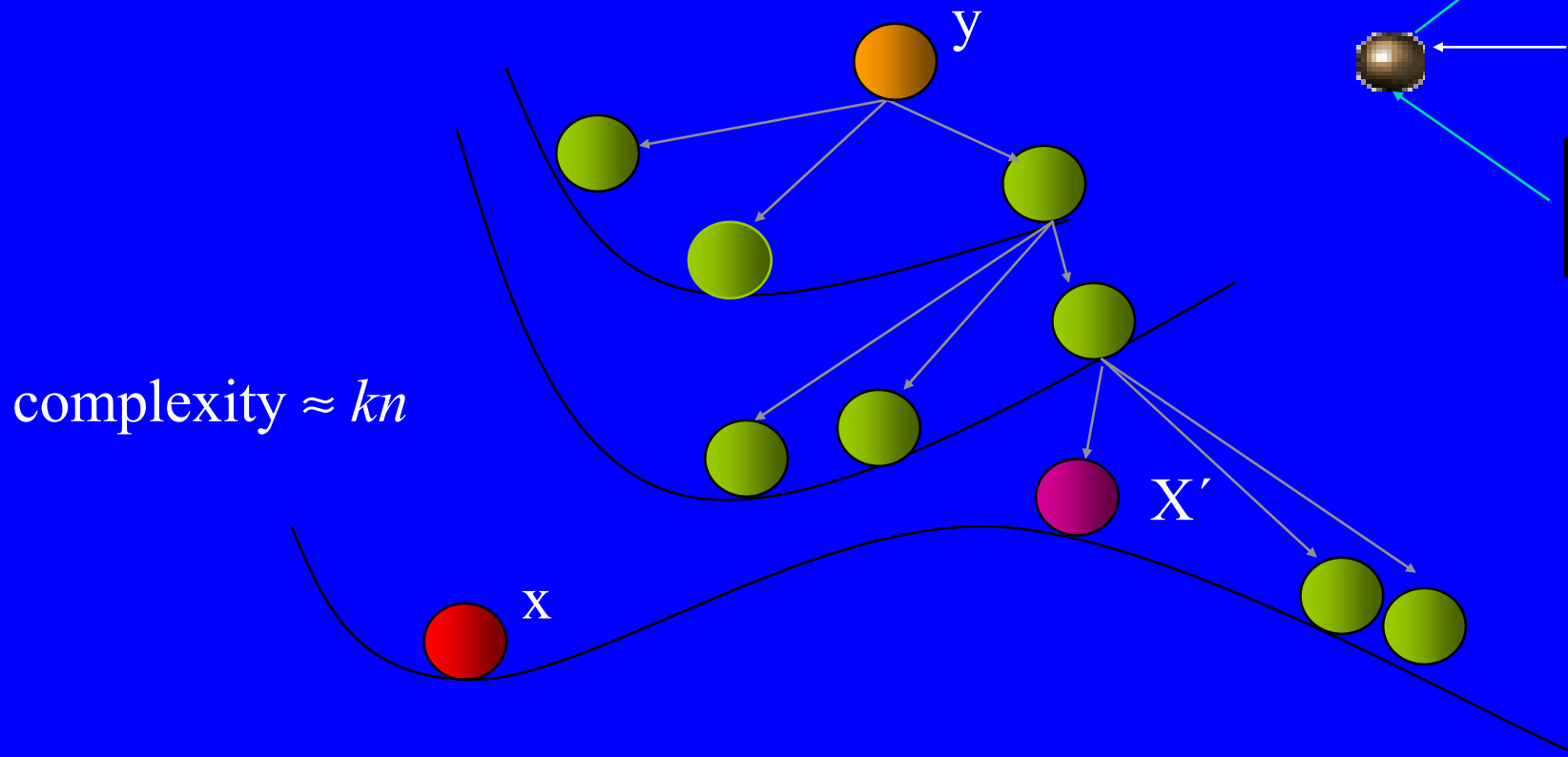
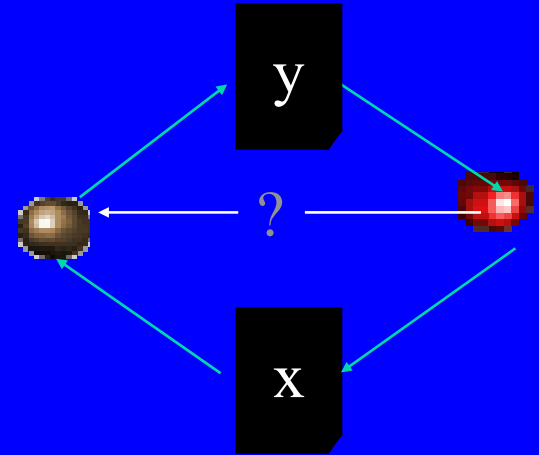
From auctions and Contract Net to argumentation

- Fix protocol and discover optimal strategy
 - Bargaining
 - Multi-attribute bargaining
- No protocol but next move based on context (argumentation)

The Trade-off Algorithm

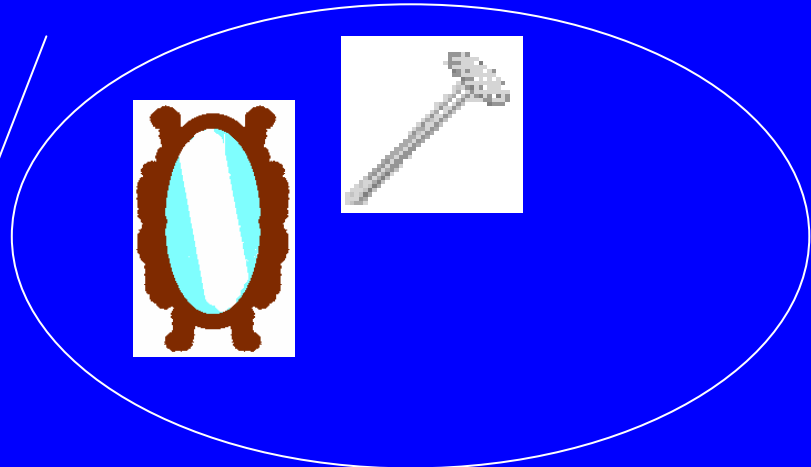
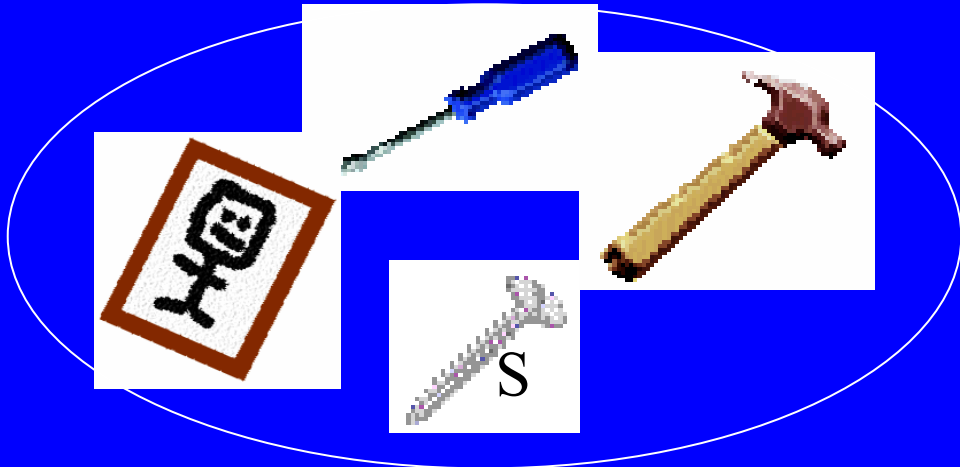
To be beneficial to the other the preference of the other must match the similarity function

$$\text{trade-off}_a(x,y) = \arg \max_{z \in \text{iso}_a(\theta)} \{\text{Sim}(z,y)\}$$






Argumentation

- Autonomy leads to negotiation and to argumentation.
- Many problems cannot be solved by a simple offer/counter offer negotiation protocol.
- When arguing, agent offers may include knowledge, information, explanations.
- The dialogue includes critiques on each others proposals.
- Agents must be able to generate arguments as well as rebutting and undercutting other agents' arguments.
- Which argument to prefer may depend on logical criteria or on social considerations.
- A logically-based approach to building agents seems natural.



 +  +  → Hang Mirror

 +  +  → Hang Picture

 +  +  → Hang Mirror

Hang Picture

A

Hang Mirror

B

Institutions

- Institutions are the places where the agents interact
- They should be described formally and define:
 - Scenes of interaction (e.g. register, buy, pay)
 - Interaction protocols (e.g. English auction)
 - Rules for non-compliance

Institutions

- A market should be “fair” to all its stakeholders. I.e. take the interests of all stakeholders into account when designing market mechanism
- How can this be checked?
- E.g.
 - English electricity market place
 - UMTS auctions
 - Radio frequency auction

Conclusions

- e-Business is business
- From operational excellence to relational excellence
- Agents fit very well in this development of (e-) business
- Time has come to fulfill promises:
 - Theory has to be fleshed out
 - Implementation industrialised