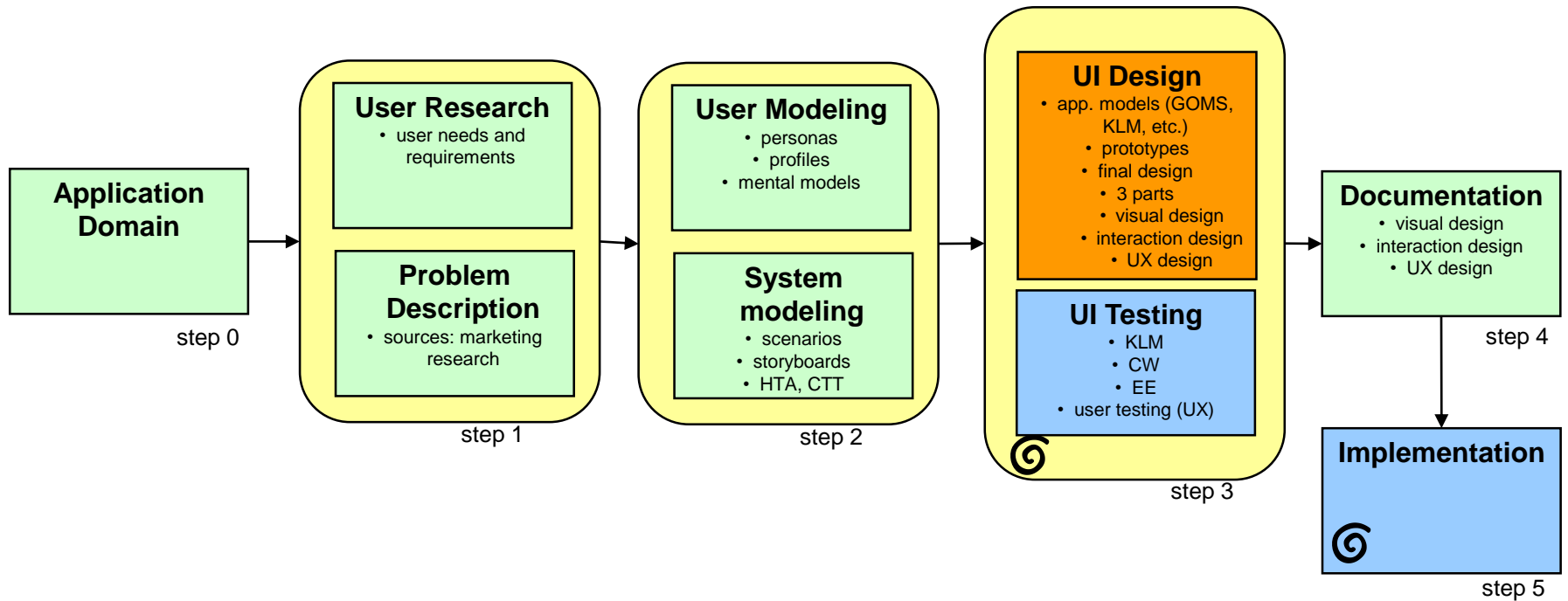

NUR Intelligent UI

User interface design - big picture



Intelligent system

- Reasoning
- Learning
- Adaptability



Intelligent system - reasoning

- Derivation of a new knowledge
 - not previously contained in the system

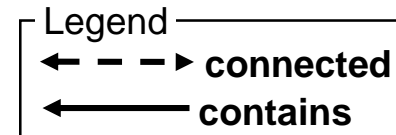
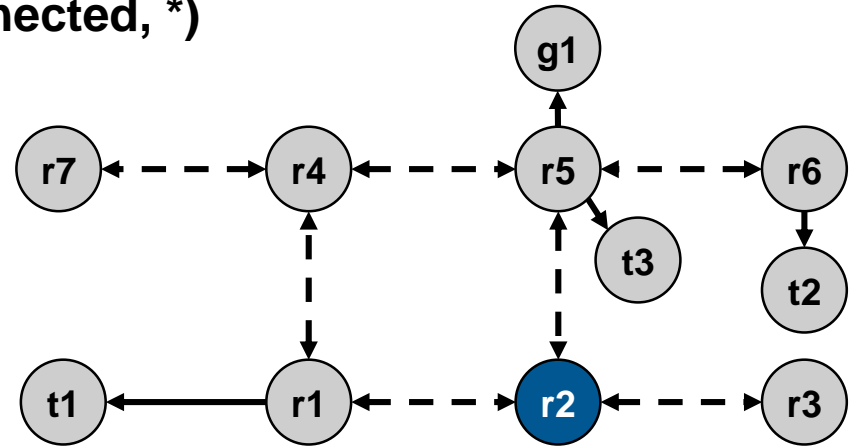
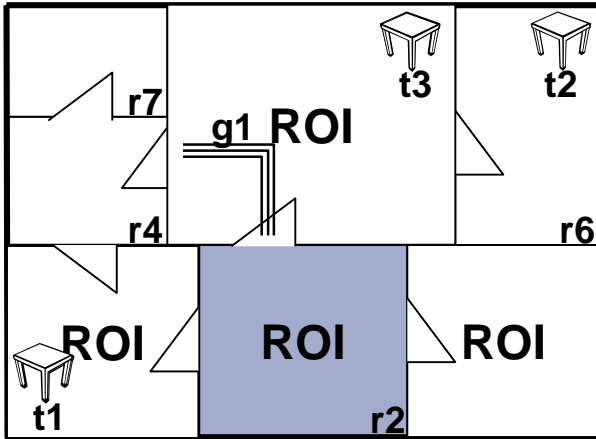
- New knowledge is based on the existing knowledge



Reasoning Example

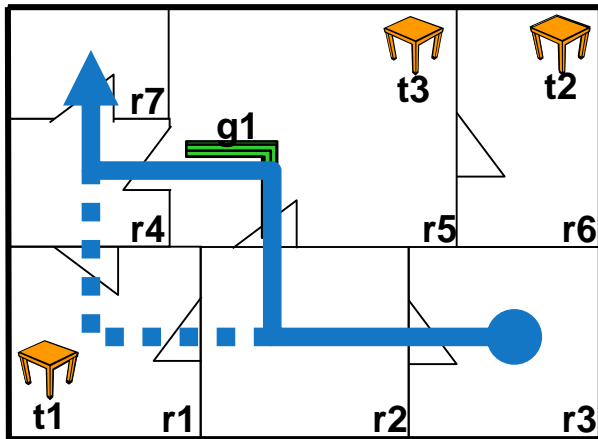
ROI definition: (object₁ , semantic_relation, object₂)

ROI: (r2 , connected, *)



Reasoning Example

ROI: (r3 , safeconn, r7)



rule template:

saferoom(**X**) \leftarrow room(**X**), safe(**X**).

safe(**X**) \leftarrow contains(**X**,g).

safe(**X**) \leftarrow not:dangerous(**X**).

dangerous(**X**) \leftarrow contains(**X**,t).

safeconn(**X**,**Y**) \leftarrow saferoom(**X**), saferoom(**Y**),
connected: contains(**X**,**Y**).

query:

safepath:safeconn(r3,r7)?

safepath:safeconn(r3,r7,**P**)?



Intelligent Interactive System

- Systems that provide interactive support based on embedded AI mechanisms
- Provides interface to AI functionality and knowledge representations

Examples

- Cooperative problem-solving systems
- Operation center of autonomous system



Intelligent User Interfaces (IUI)

- A bridge between user and intelligent interactive system



Reasons for introduction of IUI

- Make the communication more natural
 - natural language conversation
 - talking head
- Lower cognitive load
 - personalization of UI and the content to user needs
 - efficient UI control and content presentation
- Accessibility
 - adaptation of UI and content to user capabilities
- Increase the flexibility
 - automatic UI generation based on the context (tasks, environment, user model)
- Allow autonomous work



Intelligent versus Intuitive Interfaces

- Intuitive - having immediate mental perception or understanding (natural, no training)
- Intelligent - capable of communicating and reasoning (user, task, dialogue, information, media)
- Interface - a device that bridges different systems, people, ideas, etc. (interpretation and generation)

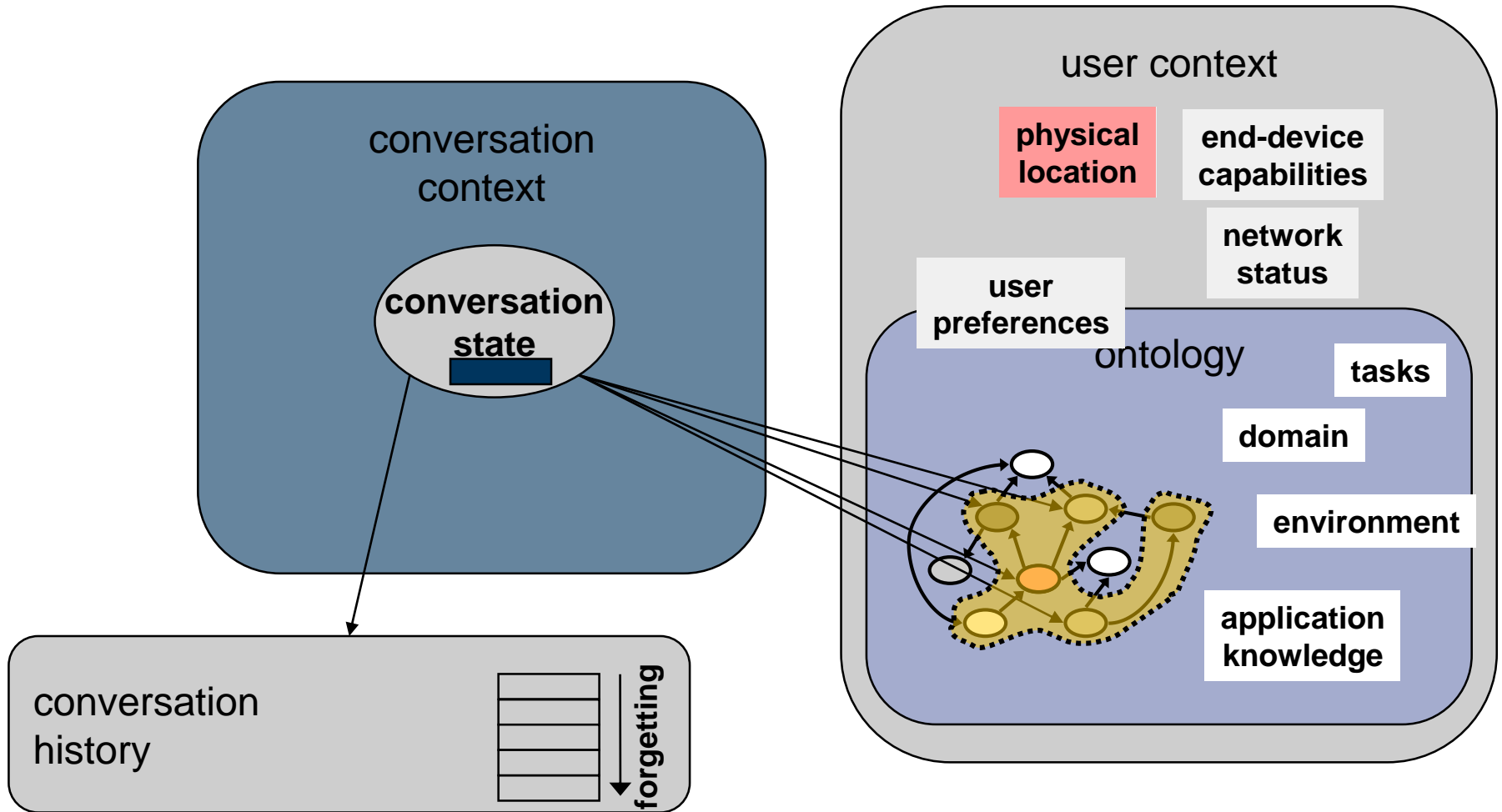


Models used in IUI design

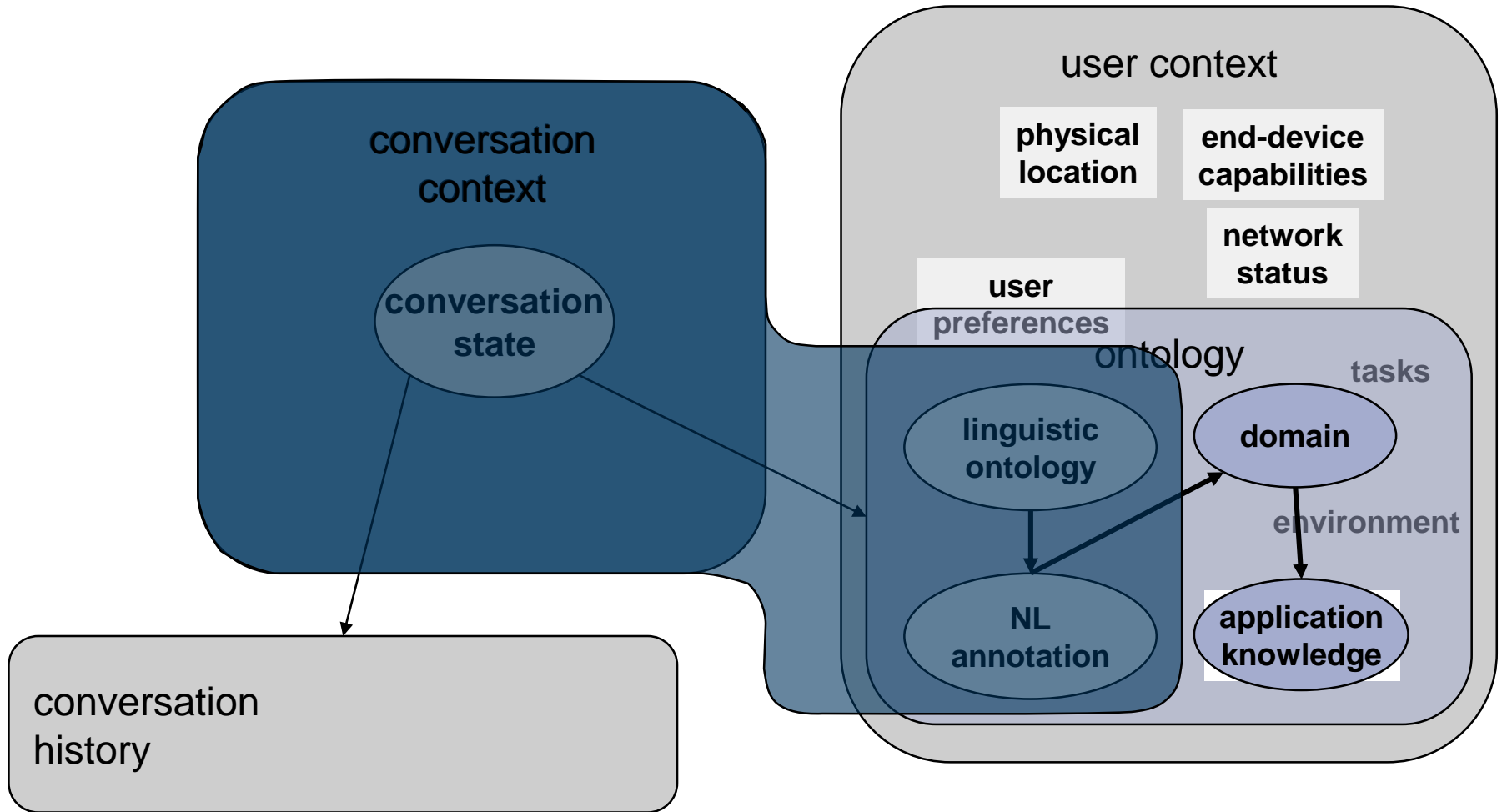
- Environment model
- Conversation model
- Domain model
- User model
- Behavior model
- Physical model



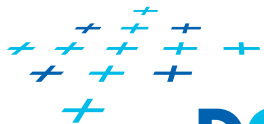
Example: Conversation system



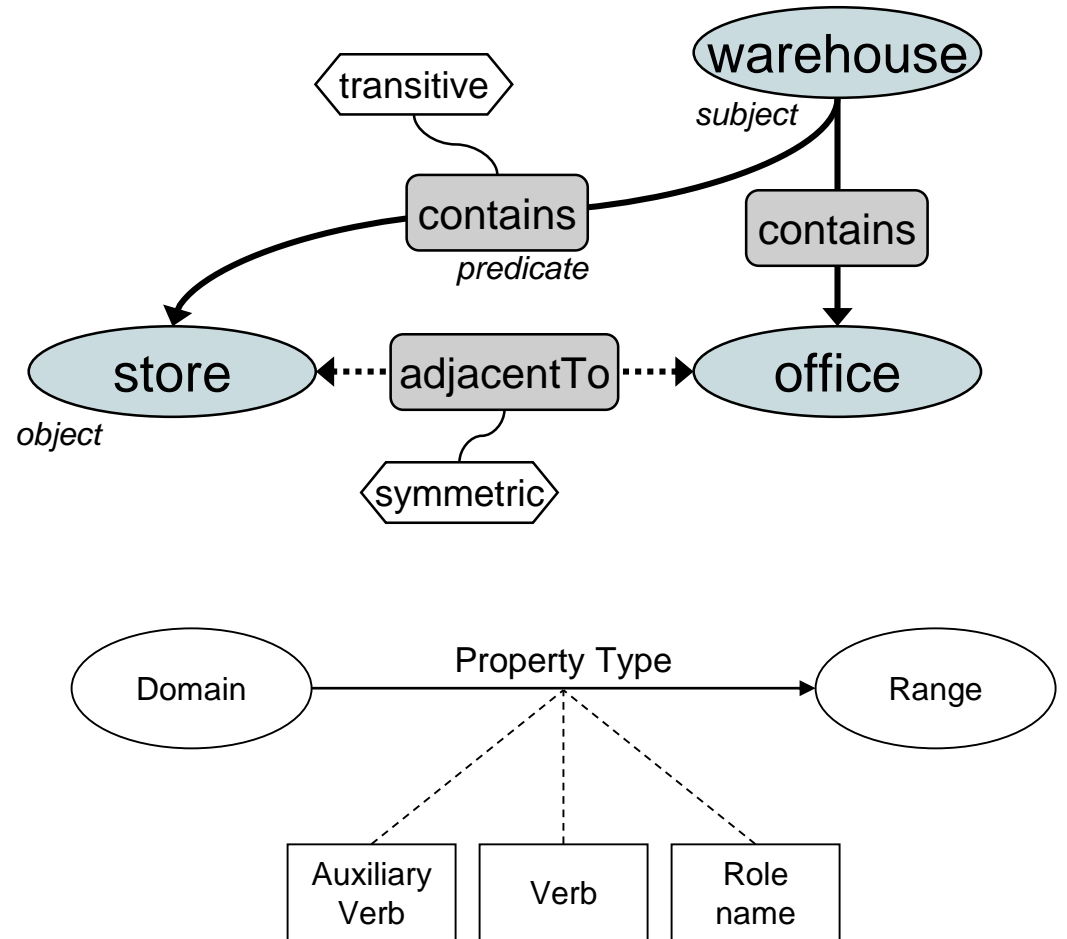
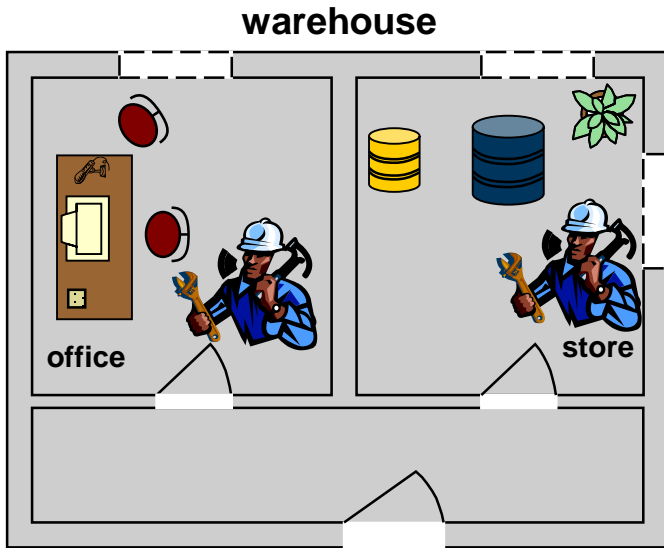
Example: Conversation system



Example: Conversation system



Example: Domain model enriched by NL



Natural language attributes of a property type

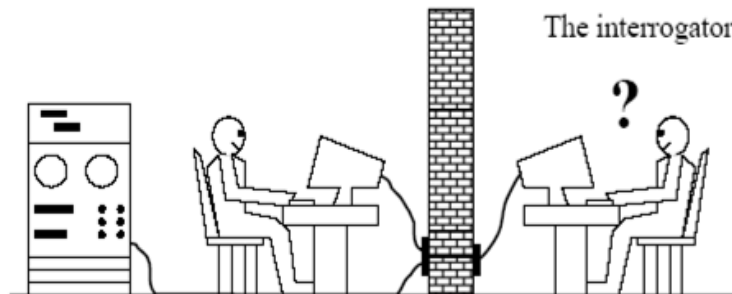


How to discover Intelligence in an interactive system



Turing test

- Test whether we discover that our partner is a computer
- Behavioral view of intelligence
 - A behavior capable of fooling a human interrogator
- Acting humanly is sufficient to pass the test
 - Is it necessary the AI system also thinks humanly?

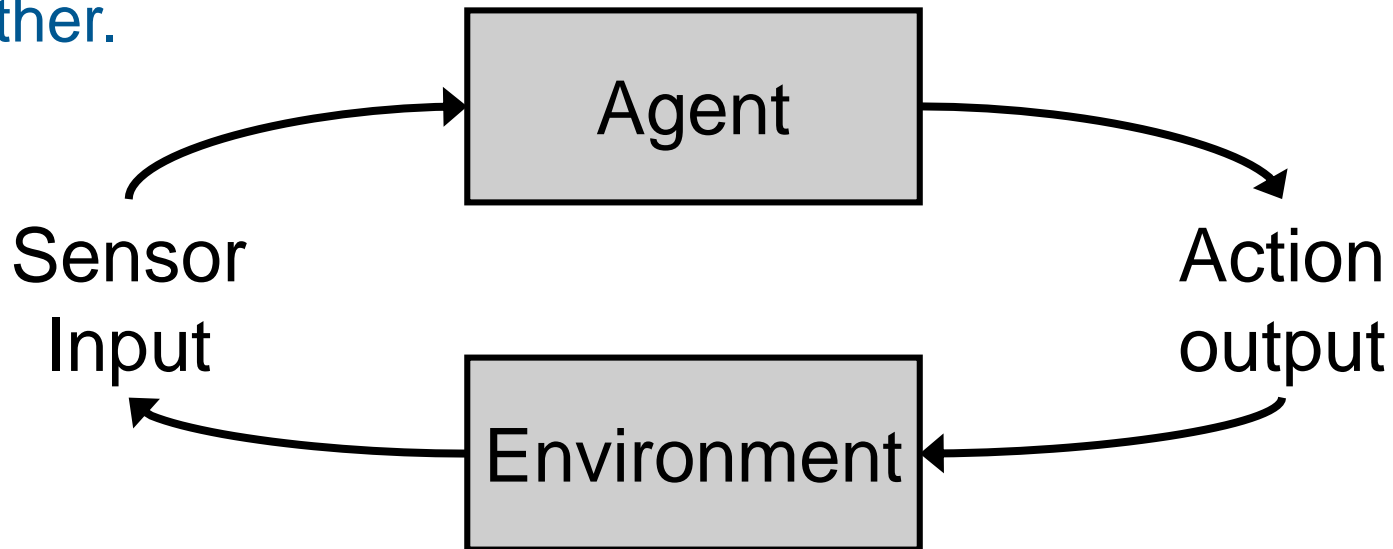


Agents and intelligence in user interfaces



Agent definition

- Agent is a theoretical concept from AI
- There is no single universal definition of an agent
- Agent in Webster's New World Dictionary: A person or thing that acts or is capable of acting or is empowered to act, for another.

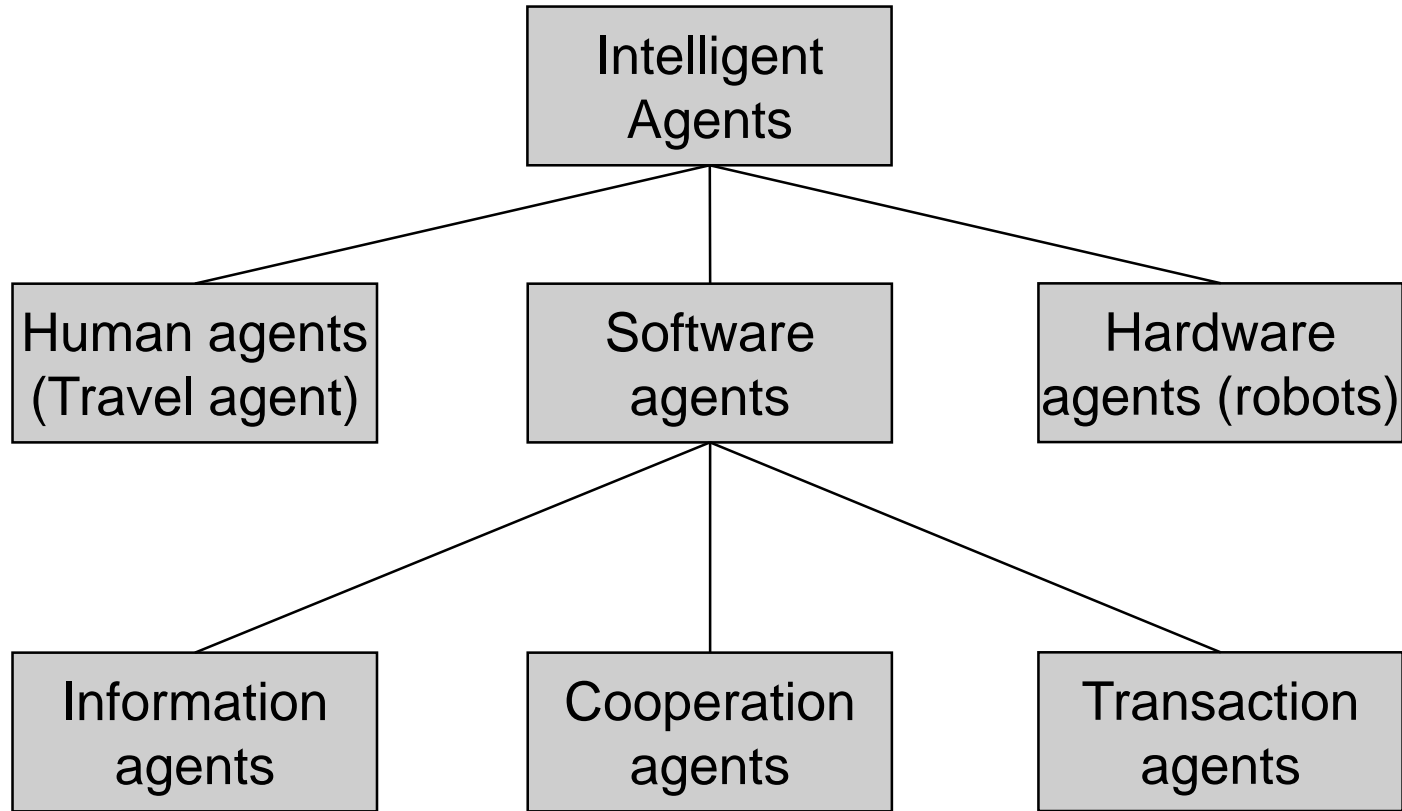


What is an intelligent agent?

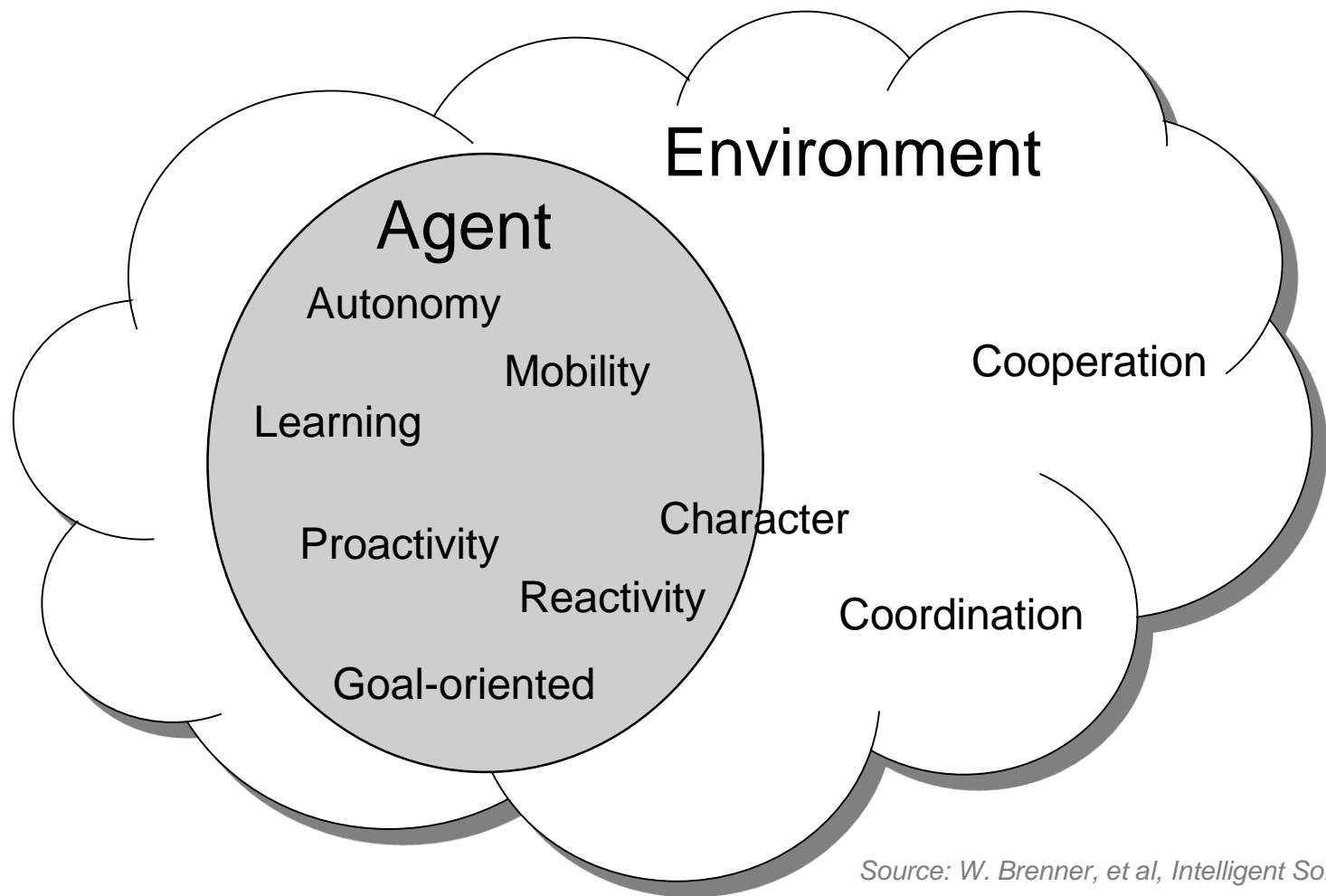
- Intelligent agent is a computer system located in certain environment and is capable to react in a flexible way on events in its environment



Intelligent Agent Types



Characteristics of SW agents



Source: W. Brenner, et al, *Intelligent Software Agents*



Software Agents

- One view:

Software processes that have non-trivial tasks delegated to them which require independent action and a report on the results.



SW Agents: Autonomy

- Agent's activities are autonomous (no statements from the user)
- Properties of an agent: autonomy, mobility, ability to communicate, ability to learn, ...



SW Agents: Intelligence (necessary attributes)

- Reasoning: agent monitors environment and takes decisions (based on changes in the environment)
- Learning: agent's behavior is improving (based on previous experience)
- Adaptability: agent is able of adaptation to changes in its environment (robustness)



SW Agents: Mobility

- Agent mobility = “traveling” from one computer to another one



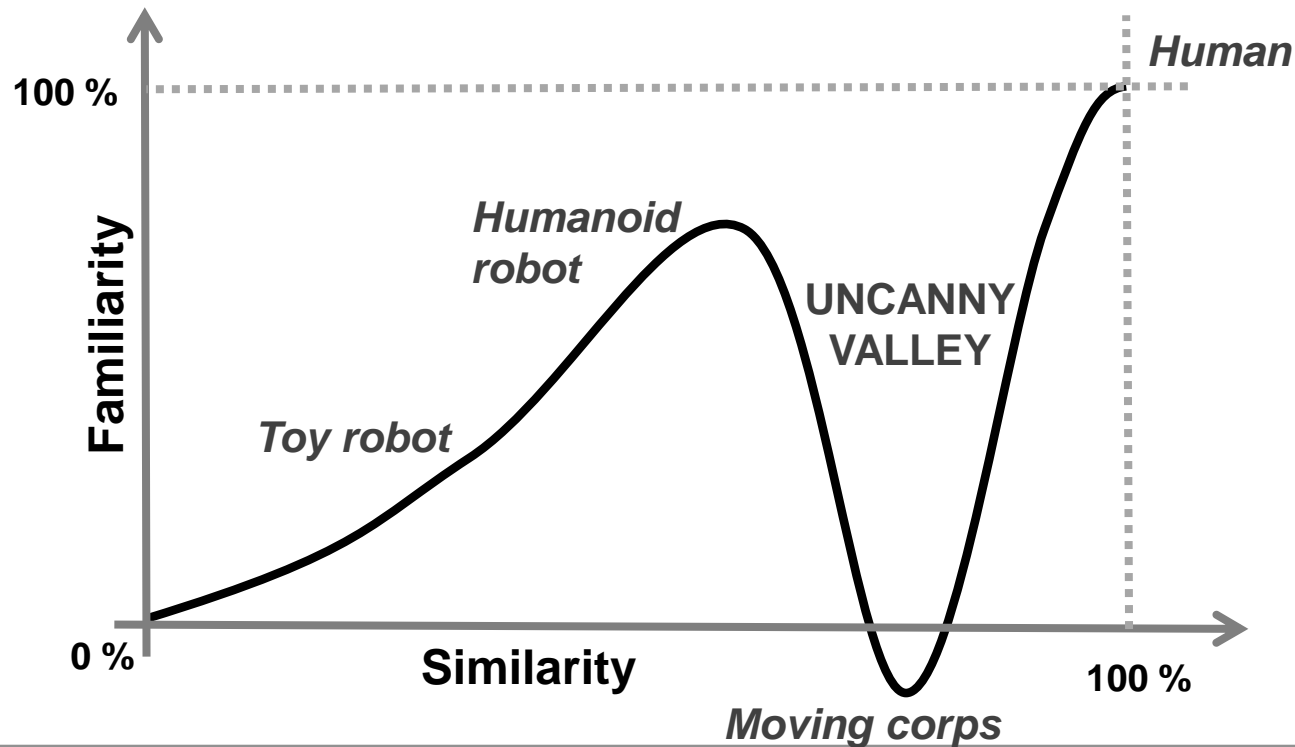
SW Agents: Cooperation with other agents

- Cooperation between agents makes possible to solve the problems much faster (usually the solution is better)
- Language for cooperation description
- This is **NOT** an essential attribute of SW Agent



SW Agents: Emotions

- It may be desirable to humanize the agents
- Problem with so called “uncanny valley” effect



Issues for Software Agents

■ Personification

- Should agents be represented as a living or animated character?
- Does it improve adoption of software?
- Does it create inflated expectations?
- Is it just too annoying?



Talking Head: Real-time generation



Talking Head: Interpolation between expressions



Surprised

Actual



Sad

Actual



Worried

Interpolated



Issues for Software Agents

■ Trust and Competence

- How does user develop an informed level of trust?
- Can agent give self-assessment on likely outcome of task?

■ Delegation

- How can user delegate tasks?
- How can user check on status of delegated tasks?



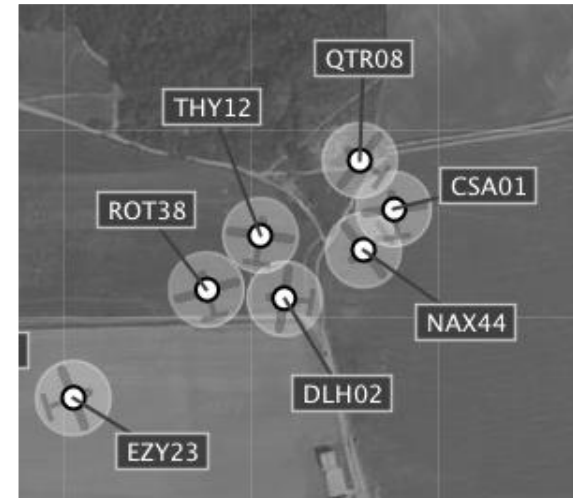
Issues for Software Agents

■ Control

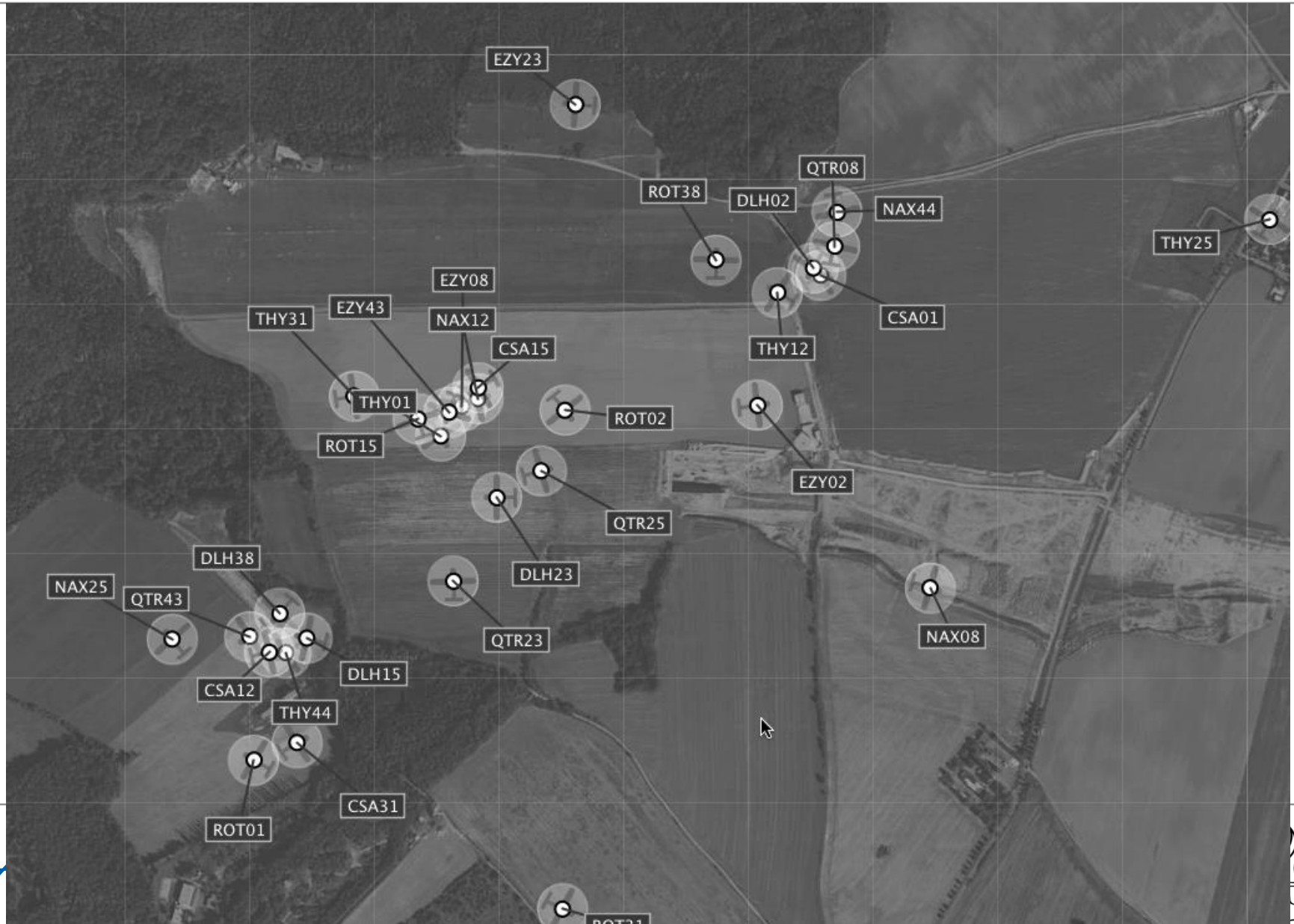
- How does user set limits on the agent's activity?
- When does the agent get to interrupt the user (mixed-initiative dialog)?

■ Dealing with multiple agents

- How can the user manage many agents?
- How can interactions between agents be predicted?



Issues for Software Agents: Multiple agents



Automation and human control

- Users can avoid:
 - Routine, tedious, and error prone tasks

- Users can concentrate on:
 - Making critical decisions, coping with unexpected situations, and planning future actions



Agents in user interfaces

- Agents learn
 - monitoring user's behavior (and they use behavioral patterns)
 - feedback from the user
 - question to other agents

- Example
 - e-mail filter
 - purchase of a ticket



Thank you for attention

