



Augmented Agents: Contextual Perception and Planning for BDI architectures

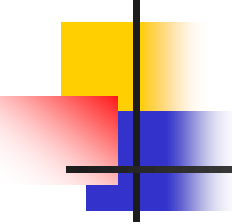
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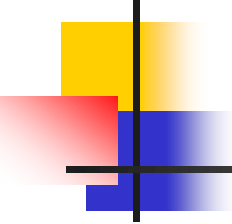
¹ LTI – EP/USP

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Agenda

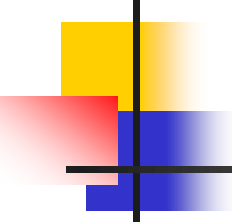
- Context-aware systems
- Multiagent systems
- CPS
- Augmented agent
- Next steps



Context-aware systems

Perceive the environment in which they are situated

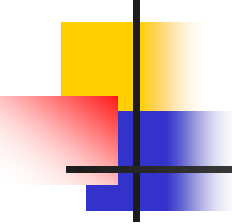
- Context: information on people, objects, or other systems
- Adaptive behavior: influenced by changes in the environment



Context-aware systems

From environment to context:

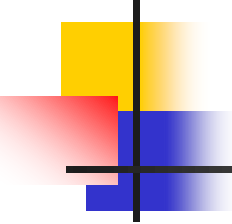
- Gathering
- Aggregation
- Representation
- Transmission



Context-aware systems

Context-aware system architectures:

- Use context information
- Possess adaptive behavior
 - *Multiagent systems*



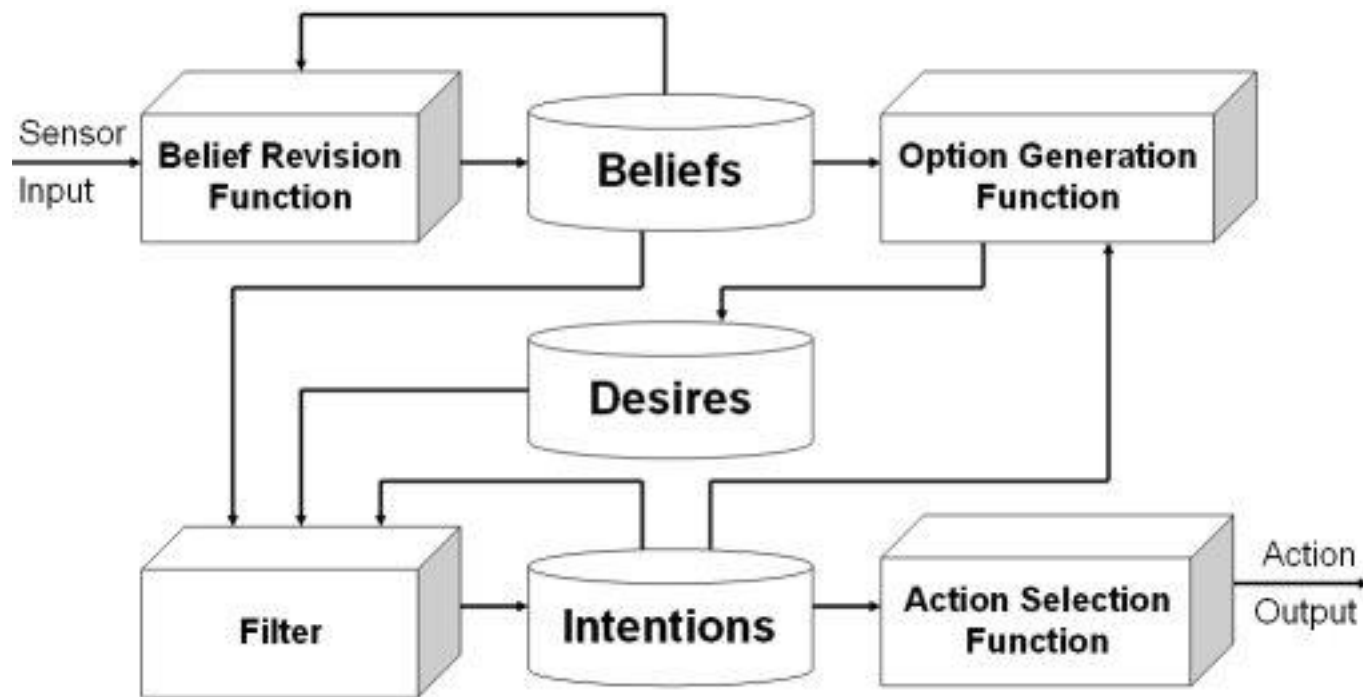
Multiagent systems

BDI model: intelligent agents

- Beliefs: information about the environment
- Desires: motivational state
- Intentions: deliberative state
 - Plans: actions performed to achieve intentions (recipe for success)
 - *Plans can be composed of other plans*

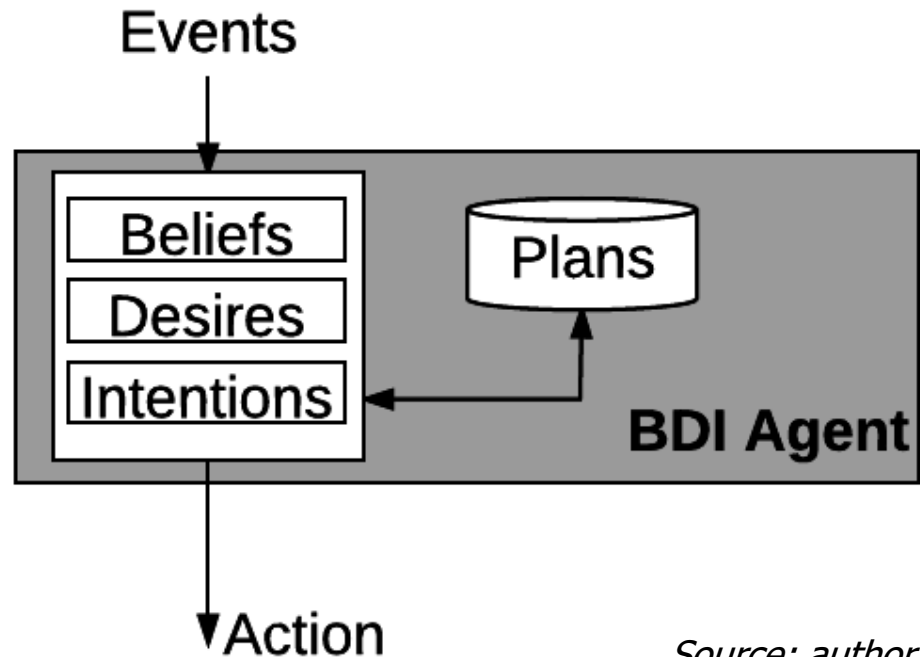
Multiagent systems

BDI architecture



Multiagent systems

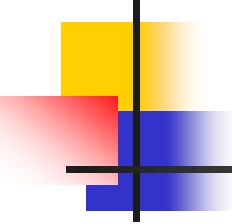
Simplified BDI model



Source: author

Agent extension: using context to aid the BDI planning process [Caouche et al]

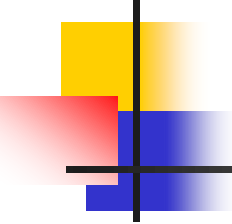
- Predictive guidance
 - Verifies *feasibility* of plans based on context
- Built on top of BDI reasoning
- Experience-based learning mechanism



Augmented agent

Motivation: context-aware agents on different environments

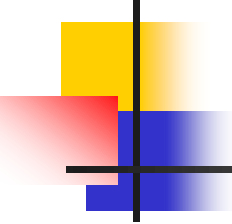
- Different environments, different information sources
 - Agents should process all this information
- Existing agents can become context-aware
 - New functionalities are not necessarily modular



Augmented agent

Not a novel problem

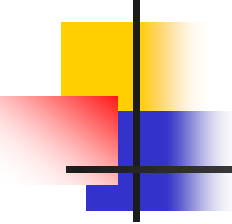
- Frameworks to provide context awareness: JCAF, CoBrA
- Artifacts for reuse of information and functionalities: CArtAgO
 - Environment-oriented programming



Augmented agent

Taking an agent-oriented approach

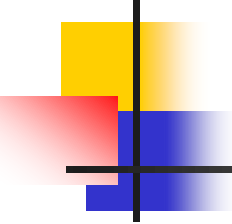
- Multiple information sources
 - Different contexts translated into beliefs
 - Information may be discretized
- New functionalities
 - Modular architecture



Augmented agent

Why is it good?

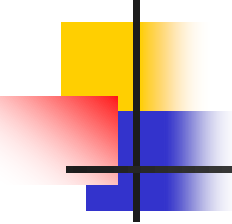
- Minimize dependency from environment
- Augment autonomous capabilities
- Reuse existing implementations



Augmented agent

Translating context:

- Different environments, different structures
 - Context should be identified: information domains
 - Grammar-based translation mechanism



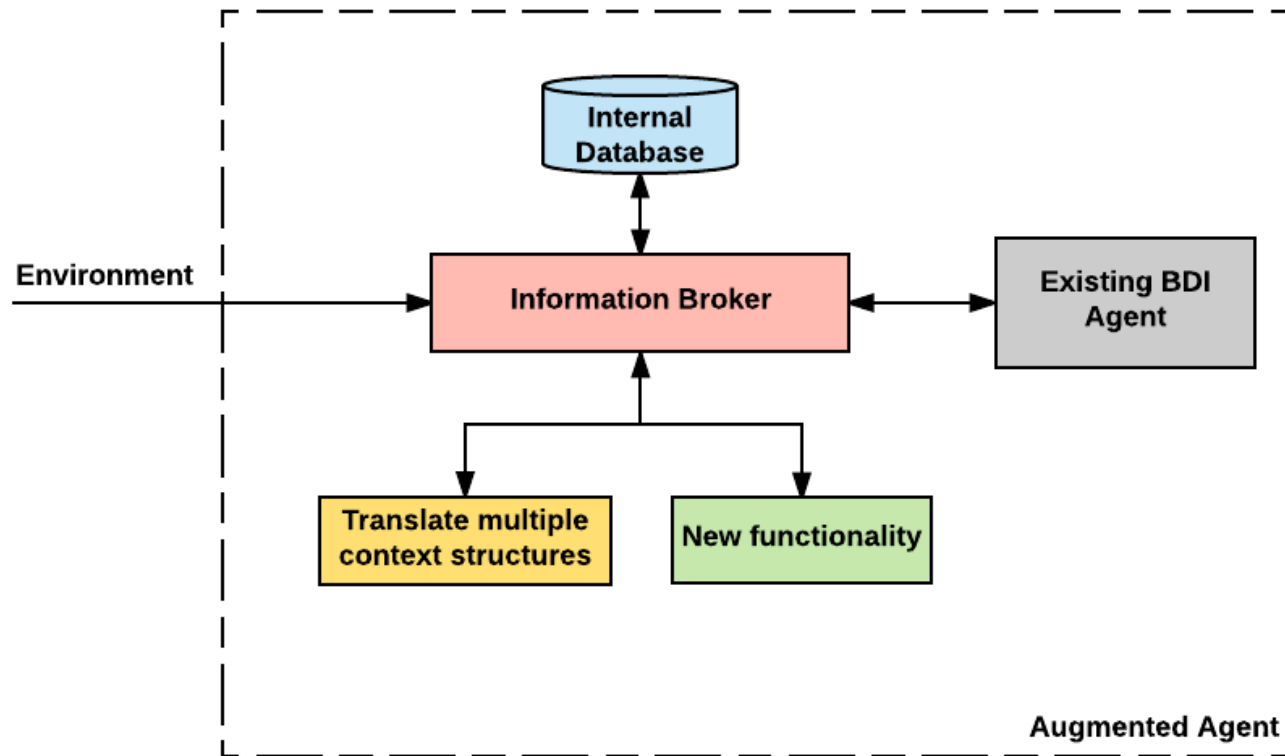
Augmented agent

Modular architecture:

- Loose-coupled components
- Simplified module orchestration
- Support for multiple information sources
- Internal database

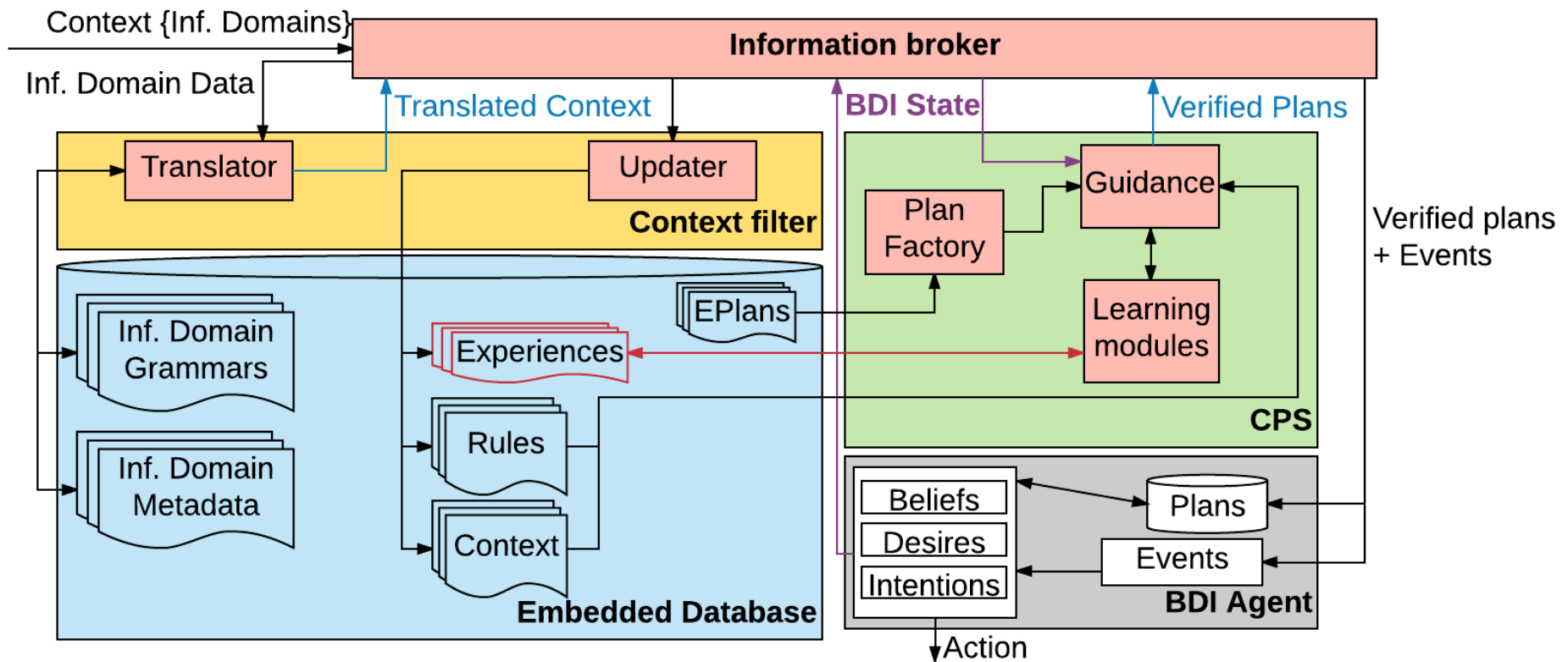
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Using existing agents



Source: author

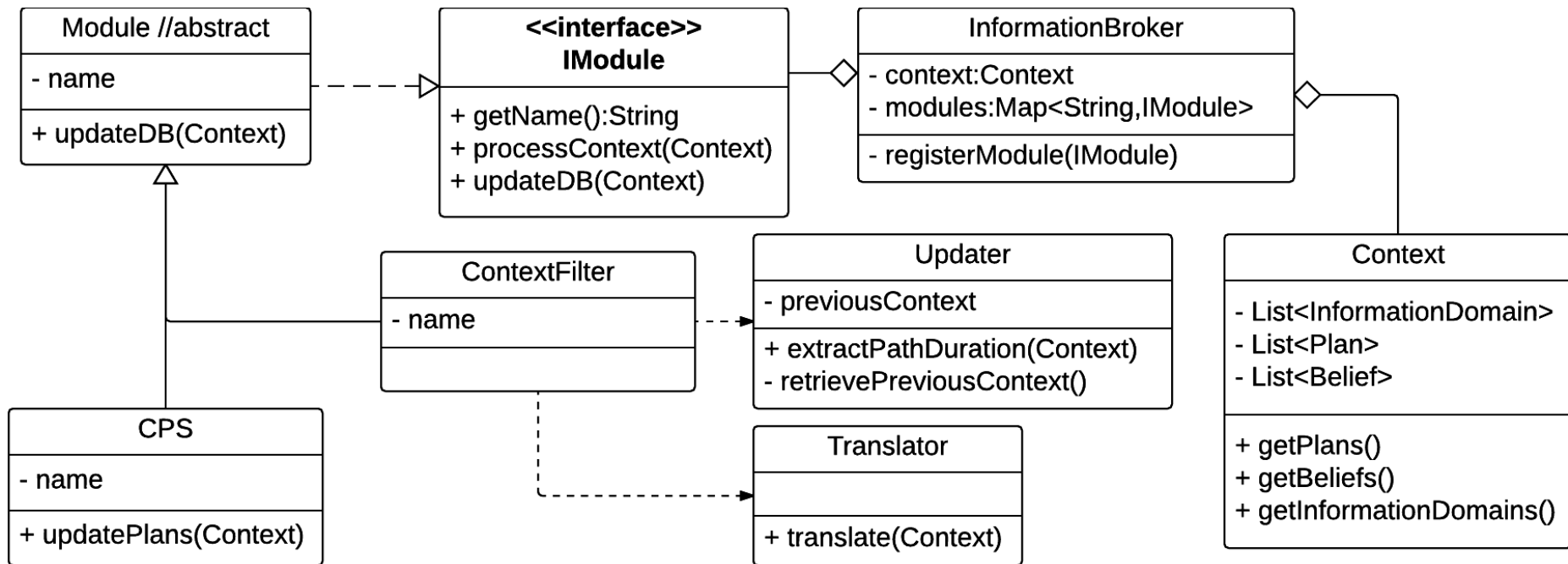
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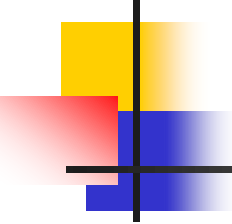
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Augmented agent

Proof-of-concept



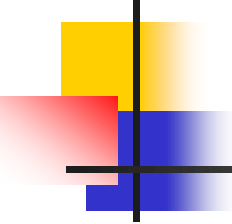
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Augmented agent

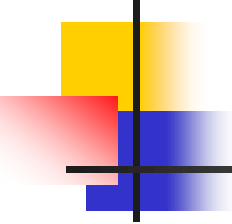
Application scenario

- Two different information structures
- Adapted CPS
- Two output formats
 - JASON, BDI4JADE object



Next steps

- Experimentation with different BDI agents
- New functionality modules
- Communication



Thank you!

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