

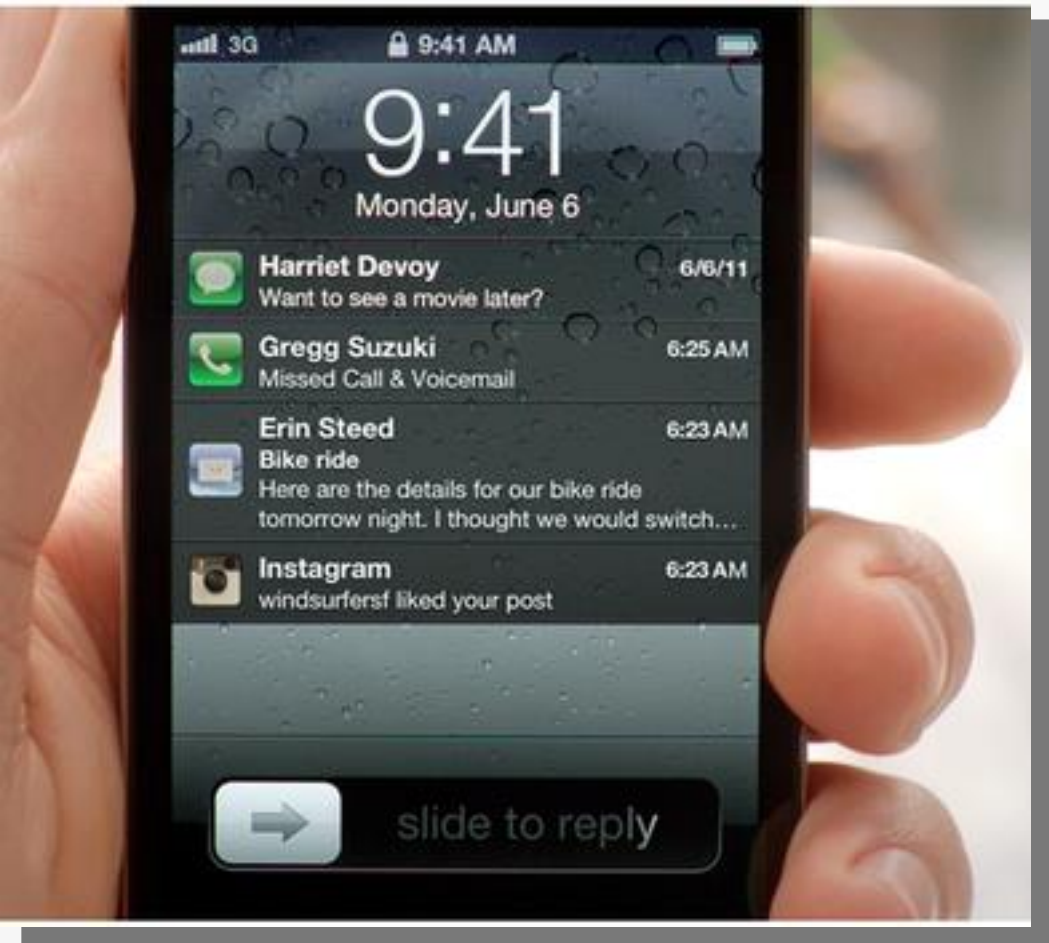
A Personalised Ontology and Rule-based Approach to Managing Message Overload

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Motivation & State of the art

Motivation

Users are bombarded with an ever increasing number of messages and notifications. This research examines ways to manage them in a context-sensitive manner.

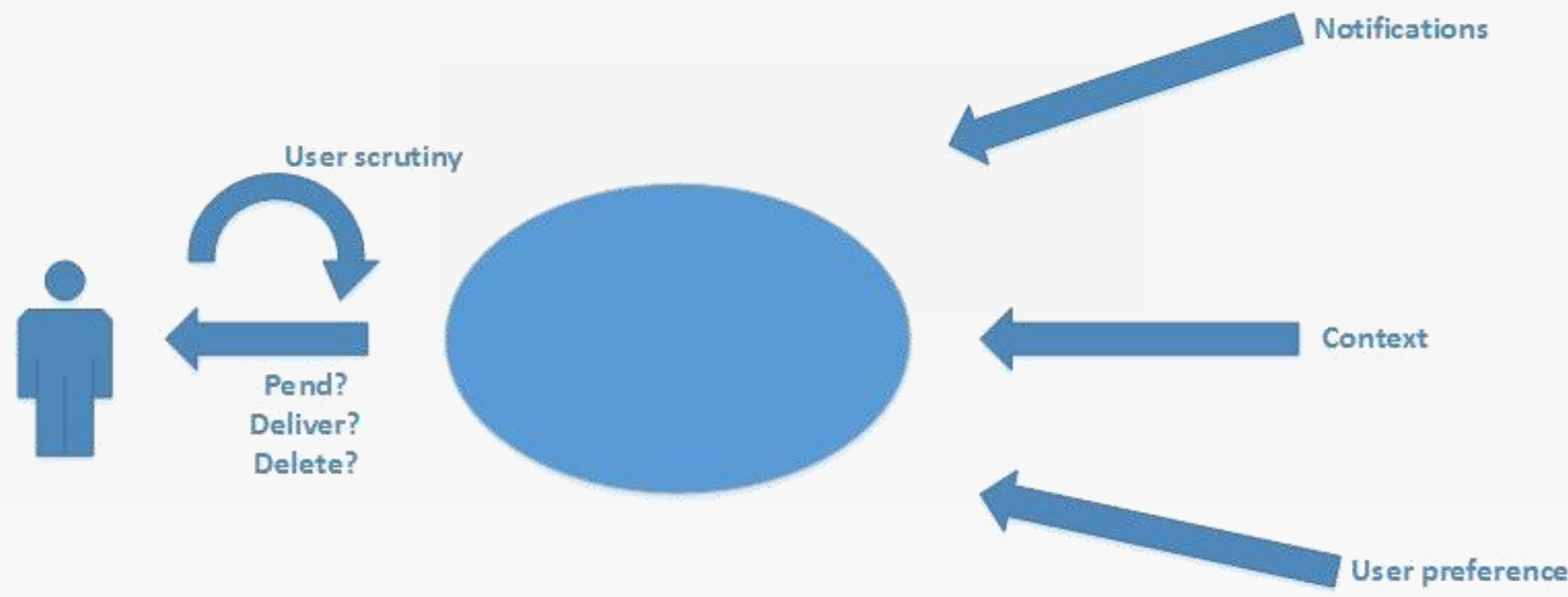


State of the art

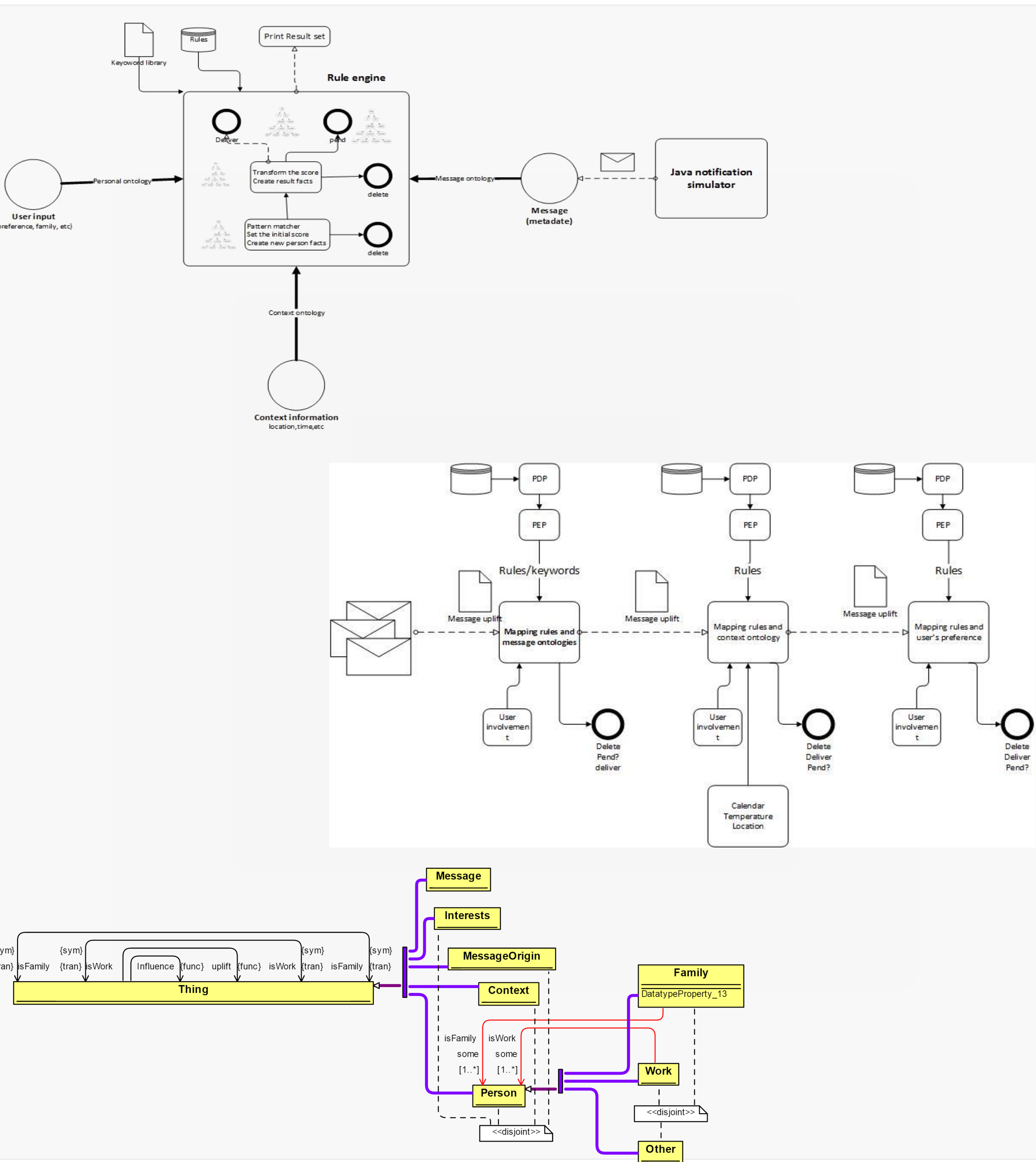
- Current research and applications of rule-based approaches
- Research on information representation
- Comparison on rule engines vs rule languages
- Context awareness
- Personalisation and scrutability
- Rule-based system VS. heuristic-based system

Research Question

- To what extent can a rule-based approach that also integrates a context model and personal ontologies be leveraged to manage incoming messages.
- Evaluate this high-level framework.



Design



Objectives & Challenges

Objectives:

- Compare technologies in information representation.
- Compare rule languages, rule engines and rule-based systems.
- Analyse architectures to handle large numbers of messages and increasing numbers of rules.
- Explore the effectiveness of rules, especially combining complex context, and dynamic user interests.
- Evaluate rule-based applications to explore the feasibility and flexibility of rules, especially when there is limited knowledge base. Use iterative method in development and control-variable method in experimentation.

Challenges:

- Effective languages to represent information.
- Integrate dynamic user profile, context and messages using rule reasoning.
- Complex rules:
 - Identify the importance of messages
 - Upgrade similar messages
 - Categorise messages.

Implementation & Evaluation

Implementation

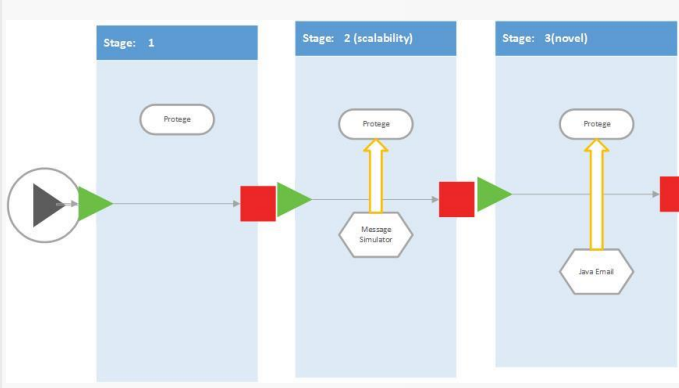
- Ontology modelling
 - Message Origin ontology; Message ontology; Person ontology;
 - Context ontology; Interests ontology;
 - Library base; Importance base.
- Rule implementation
 - Rules for message uplift; message categorization; upgrade similar messages;
 - Rules for context initial; someone approaching; upgrade interested messages; new person, New message.
- Message simulator- generating large numbers of messages
- Message generator-generating novel messages

Three-stage evaluation

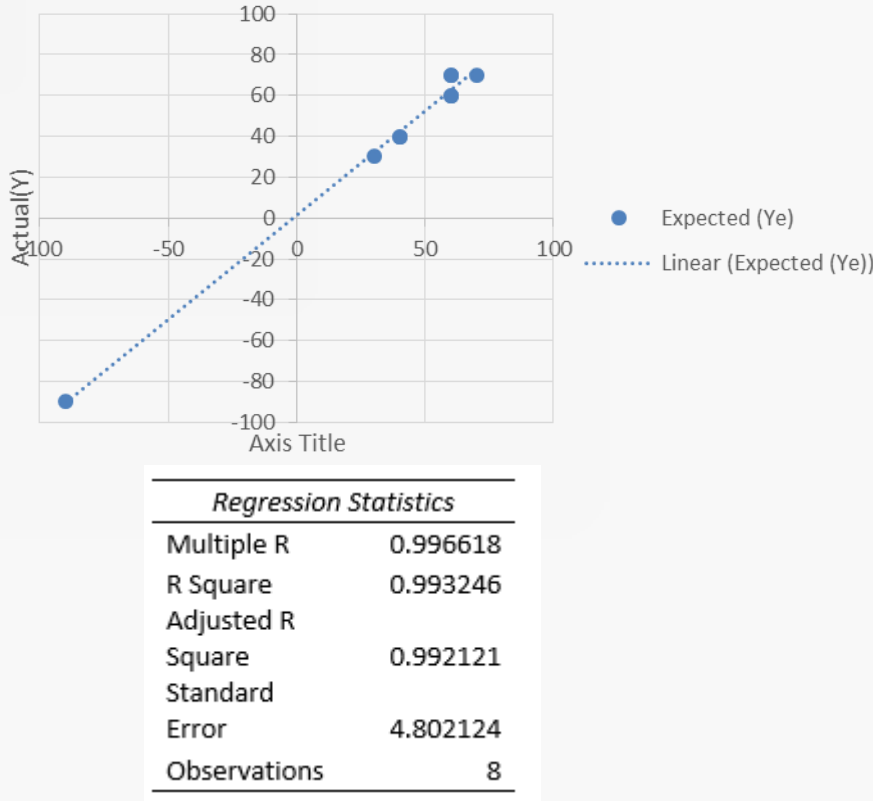
- Iterative experimentation
 - Stage 1: focus on use case, evaluating functionality,
 - Stage 2: focus on large numbers of messages, evaluating scalability,
 - Stage 3: focus on novel messages, evaluating flexibility and fault tolerance.

Finding

This system based on rule-based approach met requirements. This approach is efficient and accurate. However, once a rule is fired, nearly all facts in working memories are searched to match the rule, which leads to a waste of expensive system resource.



	Wo rk	sender	cont e	urgen t?	Similar	Inter est	Act ual	Expect ed (Ye)
m 1	Y	family	norm al	N	N	N	4000	4000
m 2	Y	work	work	N	N	N	6001	7001
m 3	Y	work	urge nt	Y	N	N	6001	7001
m 4	Y	friend	norm al	N	N	N	3000	3000
m 5	Y	work	work	N	N	N	6001	6001
m 6	Y	family	norm al	N	Y	N	6001	6001



Contributions & Discussion

Contributions

- Design and implement a novel, efficient approach: A Rule-based approach combining context and user interests.
- Propose a scalable architecture.
- Explore and evaluate feasibility, efficiency, scalability, and flexibility of the rule-based system.

Discussion

Rule-based approach exerts advantages in operating messages in a flexible, efficient, easy-to-transplant way. However, the performance is less ideal because rules are fired randomly and nearly all facts in working memory are searched, even though the proposed architecture distributes working memory.

Future work

- Apply visual scrutiny techniques;
- Increase complexity of message and context ontologies, enlarge knowledge base;
- Replace protégé class with RDF/OWL;
- Apply machine-learning technologies and increase adaptivity.

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