

# Handling Subjective User Feedback for Reputation Computation in Virtual Reality

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# PhD Research

- Topic: Design a reputation mechanism for virtual marketplaces
  - Feedback provision
  - Reputation computation (Today's topic)
  - 3D visualization for reputation representation
  - Automatic decision making

# Research Progress

- Published papers

- [1] Hui Fang, Jie Zhang, Murat Sensoy and Nadia Magnenat Thalmann, "Aligning Subjective User Feedback for Reputation Computation in Virtual Reality", *In Proceedings of UMAP (poster)*, 2011
- [2] Hui Fang, Murat Sensoy, Jie Zhang and Nadia Magnenat Thalmann, "Handling Subjective User Feedback for Reputation Computation in Virtual Reality", *In Proceedings of the UMAP Workshop on Trust, Reputation and User Modeling*, 2011
- [3] Hui Fang, Jie Zhang, Murat Sensoy and Nadia Magnenat Thalmann, "Design of a Reputation Mechanism for Virtual Reality: A Case for E-Commerce", *In Proceedings of AAMAS Workshop on Trust in Agent Societies*, 2011

# Today's Agenda

- Motivation and Objectives
- Related Work
- Feedback Alignment in Reputation Computation
  - Subjectivity Alignment
  - Reputation Computation
- Conclusion and Future Work

# Motivation & Objectives

- Emergence of virtual marketplaces (VMs)
  - Buyers use virtual reality to virtually experience products with their five senses
  - From the behavior perspective, previous research just validate that VMs can better induce trust

# Motivation & Objectives

- The inherited trust problem in VMs
  - Users may be dishonest
  - Users may have different competency
  - Five-sense oriented feedback provision approach [1]
    - Address the trust problem
    - Overlook the user subjectivity problem in feedback

# Motivation & Objectives

- User subjectivity problem involved in feedback
  - Due to subjective terms used in feedback
    - E.g., a simple concept like “soft” has different semantics for different users
      - E.g., the object can be perceived as “adequately soft” by a user A but “inadequately soft” by another user B

# Motivation & Objectives

- The necessity of feedback alignment (i.e., align subjectivity terms)
  - To accurately model sellers' reputation
- In this research
  - Propose a subjectivity alignment approach by adopting virtual reality
  - Model reputation based on the aligned feedback

# Related Work

- Approaches to address the subjectivity problem in trust and reputation mechanisms
  - Collaborative filtering
  - Trust alignment
  - Reputation mechanism based on detailed reviews

# Related Work

- Collaborative filtering
  - Suffer from the risk of losing or discounting some important information
  - Noorian et. al [1]
    - Propose a two layered cognitive approach to filter or discount the ratings provided by other buyers
    - According to the similarity between the ratings provided by a buyer and those of an advisor

# Related Work

- Trust alignment
  - Have addressed the information loss problem
  - Regan et al. [1] use Bayesian learning tools to model sellers' properties and correlation between sellers' properties and the advisor's ratings
  - Koster et al. [2] use clustering and inductive logic programming to align the subjective trust evaluation
- Limitations of collaborative filtering and existed trust alignment approaches
  - Shared interactions are needed
  - Offer limited flexibility for users to deal with the dynamic behavior of sellers and dynamic subjectivity of advisors

[1] K. Regan, P. Poupart, and R. Cohen. Bayesian reputation modeling in e-marketplaces sensitive to subjectivity, deception and change. *International Conference on Machine Learning*, 2006.

[2] A. Koster, J. Sabater-Mir, and M. Schorlemmer. Inductively generated trust alignments based on shared interactions. *In Proceedings of 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2010)*, 2010.

# Related Work

- Reputation mechanism based on detailed reviews
  - Ontology-based approach
  - Feedback in the form of detailed reviews that elaborate various attributes of the transaction
  - Compute trust/reputation based on feedback
  - Limitation:
    - May fail if some concepts in the ontology or reviews are subjective

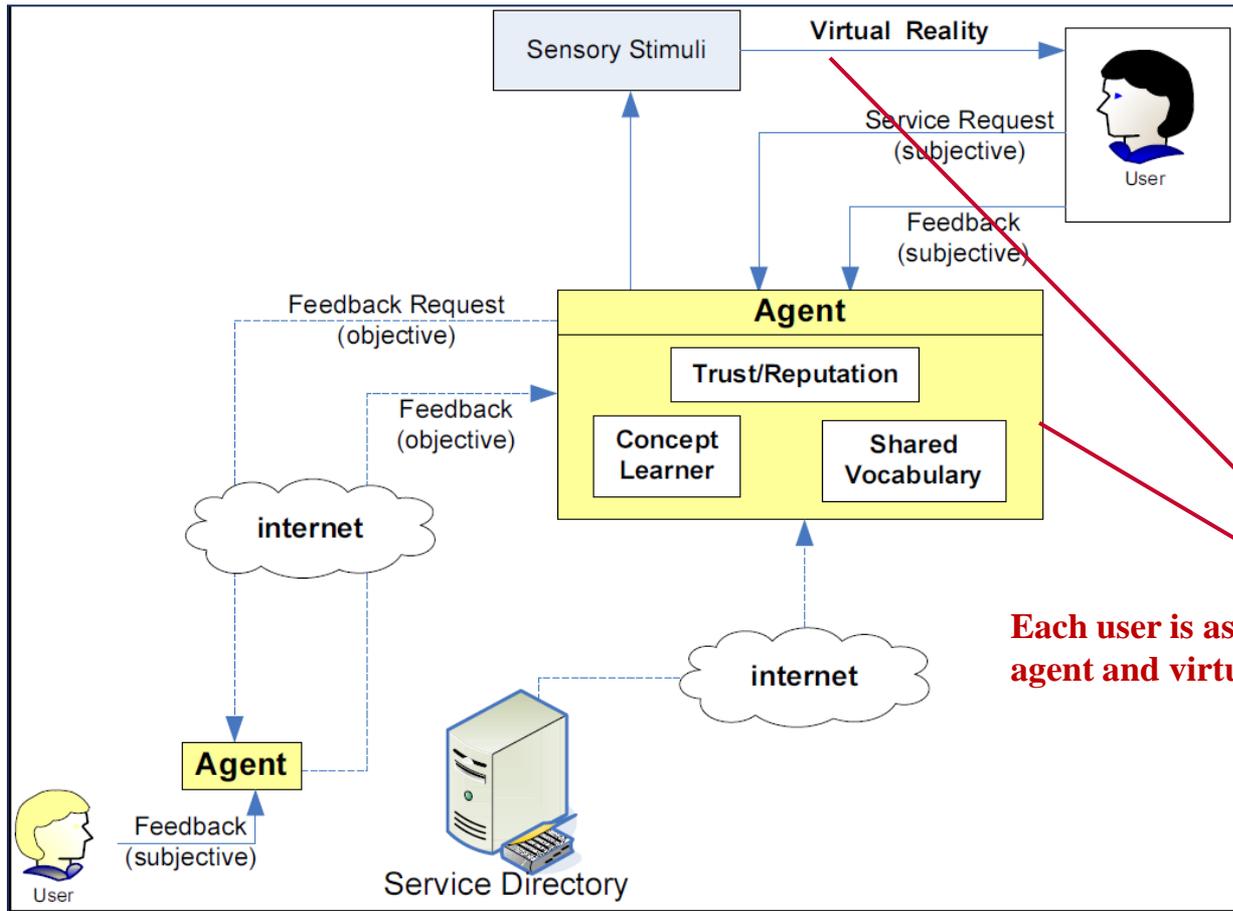
# Related Work

- Our approach
  - Based on the detailed reviews
  - Agents learn users' subjectivity based on the users' own experience with the sellers
    - No shared interactions are needed
  - Align advisors' feedback about each interaction with sellers
    - Be able to deal with the dynamic behavior of sellers

# Feedback Alignment

- User coupled with agent and virtual simulators
- Concept Learner Engine
  - To learn semantic metrics
- Semantic Metrics Aligned
- Reputation Computation
  - Based on the aligned feedback

# Feedback Alignment



Each user is assisted with a software agent and virtual reality simulators

Fig. 1. The approach overview

# Feedback Alignment

- Concept learner engine
  - An iterative and continuous process
    - Learn the semantic metric of each subjective term in its user's vocabulary
      - Map onto objective sensory data
  - Semantic metrics in the form of trapezoidal membership functions

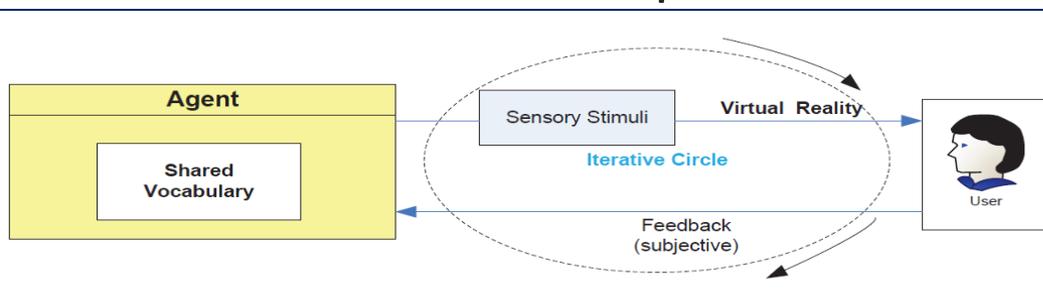


Fig. 2. Concept Learner Engine

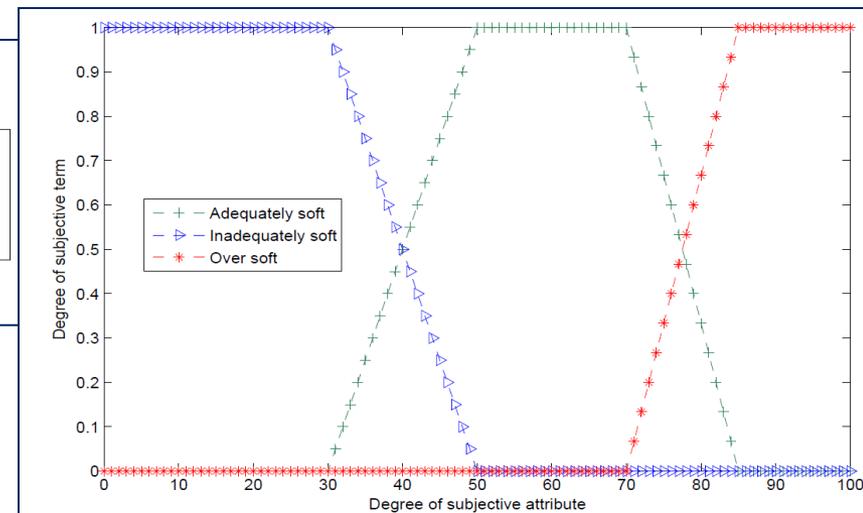


Fig. 3. Example of semantic metrics

# Feedback Alignment

- Semantic metrics aligned
  - Agent shares the semantic metrics with the agents of other users
  - Agent aligns the advisor's feedback based on these shared semantic metrics and its user's own semantic metrics
    - Two scenario
      - Scenario I: Objective sensory data available in the advisor's feedback
        - » The agent of the buyer directly maps the objective sensory data to corresponding subjective term
        - » The subjective term **with the highest truth degree** is chosen as the buyer's perception

# Feedback Alignment

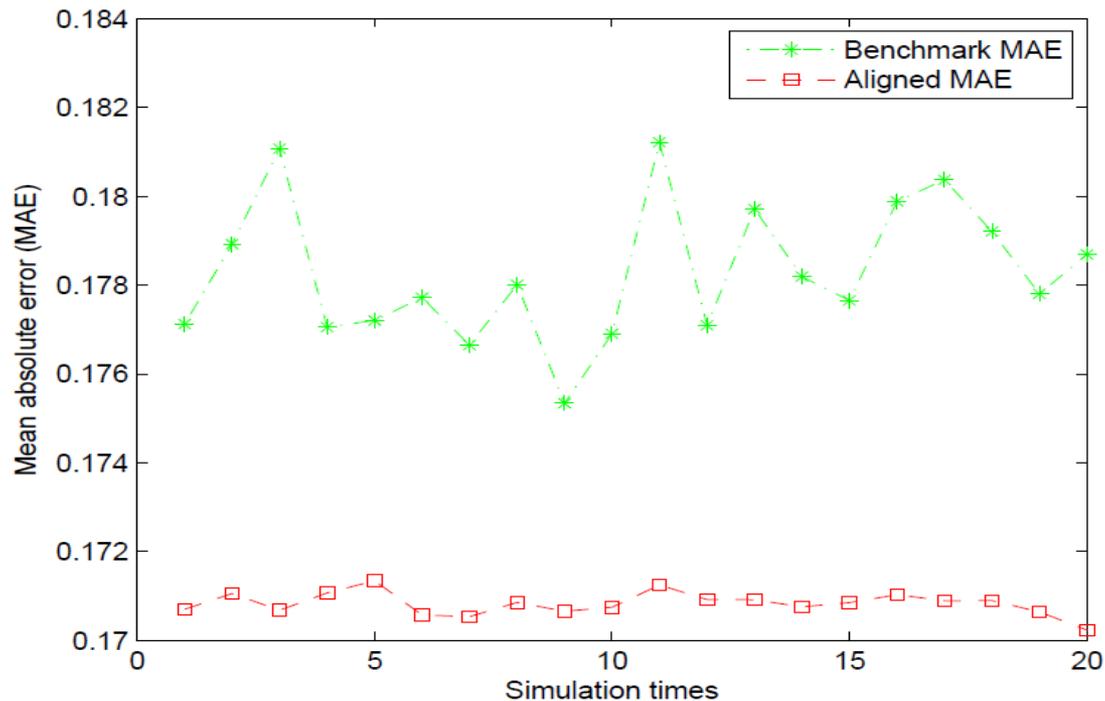
- Semantic metrics aligned
  - Scenario II: Only subjective terms available in the advisor's feedback
    - Agent of the buyer computes the **similarity** between the corresponding semantic metrics of its buyer and the advisor's semantic metric of the subjective term in the feedback
      - Similarity metric between trapezoidal membership functions [1]
      - The subjective term **with the highest similarity** degree is chosen as the buyer's perception

# Feedback Alignment

- Reputation Computation
  - Collect the set of feedback toward the target seller
  - Align the collected feedback
  - Based on the buyer's own preference toward each attribute, compute the satisfactory degree of each feedback
  - Compute the average degree of satisfaction

# Experiments

- Comparison with Benchmark approach
  - Our approach can more **accurately and stably** model sellers' reputation



# Conclusion and Future work

- Conclusion
  - Take advantages of various virtual reality simulators for human users' five senses to align subjectivity in advisors' feedback
  - Experiments verifies that buyers can more accurately model the reputation of sellers, and also **improve the efficiency and robustness** of existing trust and reputation mechanisms
- Future work
  - Design a demo to present our reputation mechanism

# Q & A

**Thanks!**  
**Any questions?**