Outlook/Mica

January 18

Evaluation of Adaptive IUI

- For performance and user satisfaction
  - Wizard of Oz Studies
  - Simulations using data from a non-adaptive system
  - Controlled studies
  - Field Studies

LookOut

LookOut

Functions

- Support System Usage
- Support Info Acquisition/ Decision Making
- Support Learning
- Support Collaboration
- Support Entertainment

Forms of Adaptation

- Take Over Routine Tasks
- Adapt the Interface
- Advice on System Usage
- Retrieve Info/ Recommend Objects
- Tailor Info Presentation
- Advice on task

Horvitz Mixed-Initiative principles

1. Significant value-added automation
2. Consider uncertainty about user goals
3. Consider status of user attention in timing services
4. Infer ideal action in light of costs, benefits and uncertainties
5. Use dialogue to resolve uncertainty
6. Allow direct invocation and termination
7. Minimize cost of poor guesses
8. Match precision of services with goal uncertainty
9. Mechanisms for user-system collaboration to refine results
10. Socially appropriate behaviors for agent-user interaction
11. Maintaining working memory of recent interactions
12. Continuous learning via observation

Acting Rationally

- AI as study and design of intelligent agents that act rationally in their environment
  - Their actions are appropriate for their goals and circumstances
  - They are flexible to changing environments and goals
  - They learn from experience
  - They make appropriate choices given perceptual limitations and limited resources
- This definition drops the constraint of *cognitive plausibility*
  - Same as building flying machines by understanding general principles of flying (aerodynamic) vs. by reproducing how birds fly

Taking over routine tasks: Microsoft Lookout

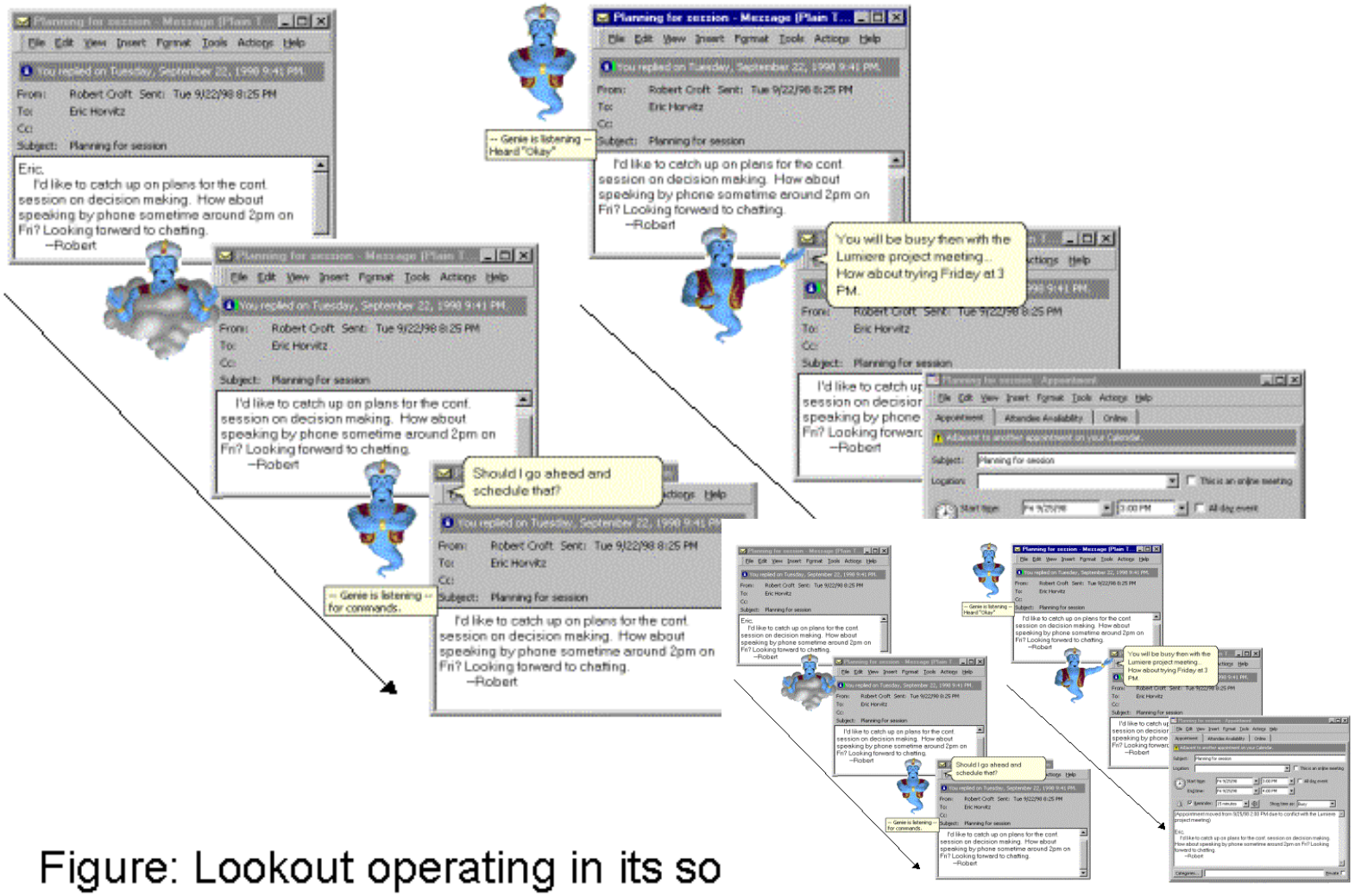

Figure: Lookout operating in its so

Figure: Lookout operating in its social user-interface modality.

Forms of adaptation

Inference/Learning

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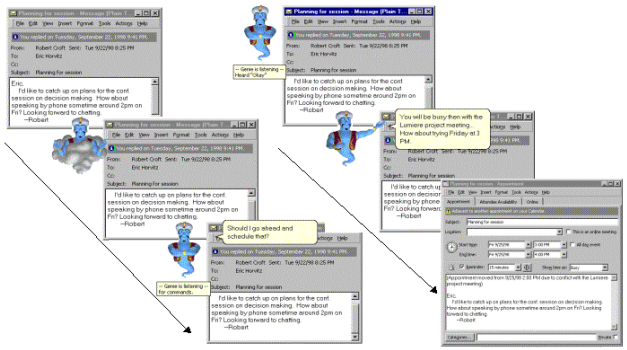

Figure: Lookout operating in its social user-interface modality.

User Model

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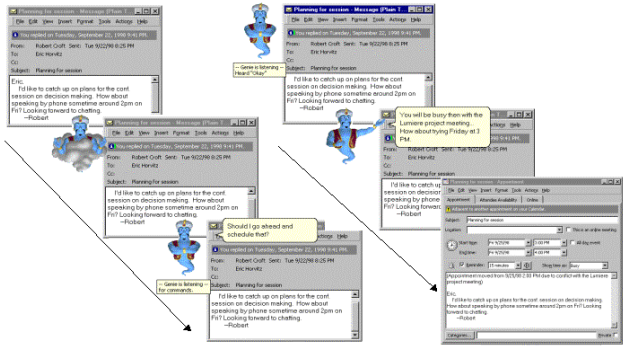
Inference/Learning:



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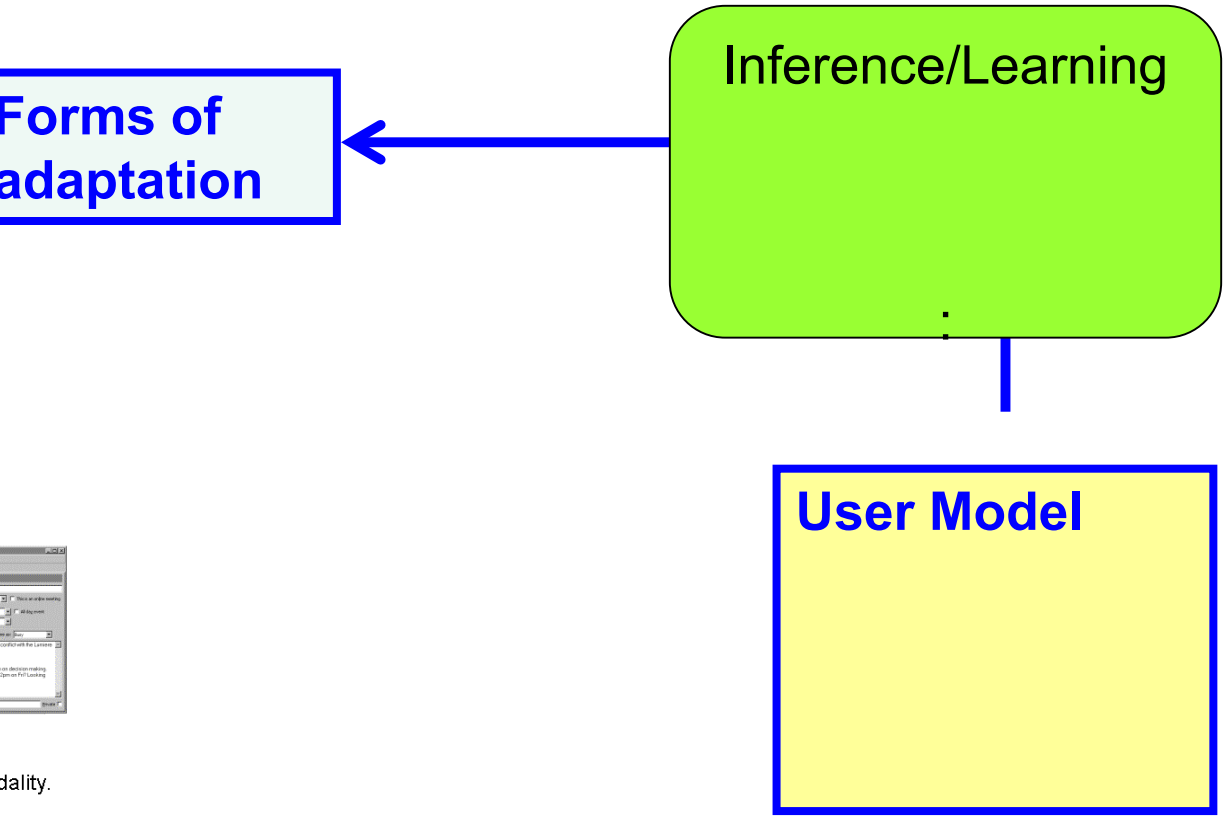


Let's start from Inference/learning
from user model to adaptation

Inference from User Model to Adaptation

- Based on Utility Theory

	Goal	No Goal
Action	*U(A,G)*	*U(A,noG)*
No action	*U(noA,G)*	*U(noA,noG)*

$$eu(A|E) = p(G|E)u(A,G) + p(\neg G|E)\,u(A,\neg G) =$$

$$p(G|E)u(A,G) + [1-p(G|E)]\,u(A,\neg G)$$

$$p(\neg G|E) = 1 - p(G|E)$$

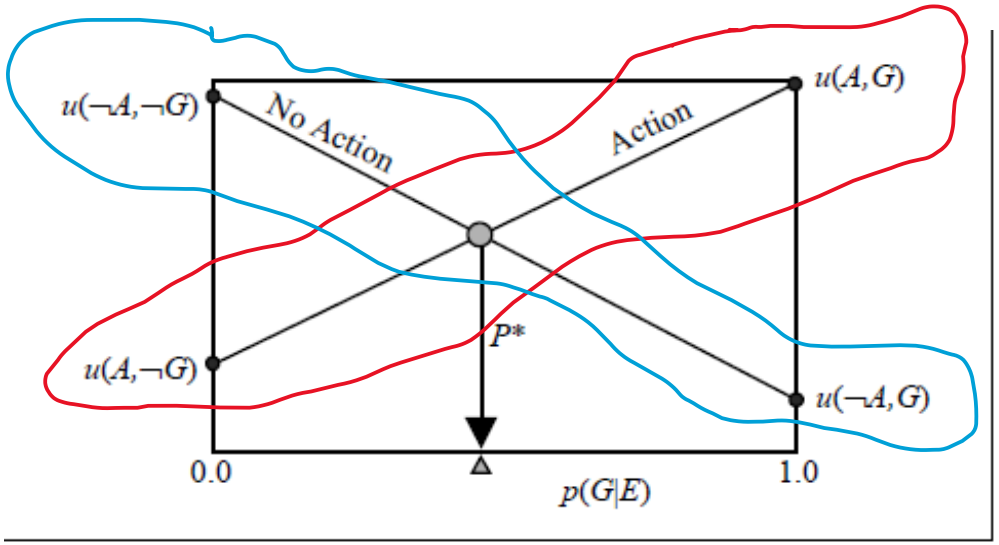
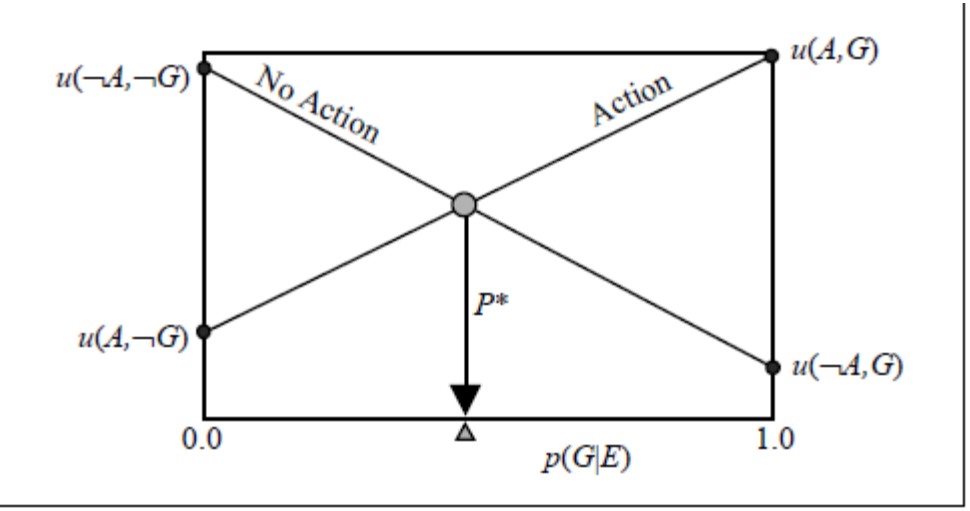


Figure 4. Graphical analysis of the expected utility of action versus inaction, yielding a threshold probability for action.

Similar equation for **No Action** (¬A)

Chose the behavior with Max Expected Utility (EU)

Inference for Model Application



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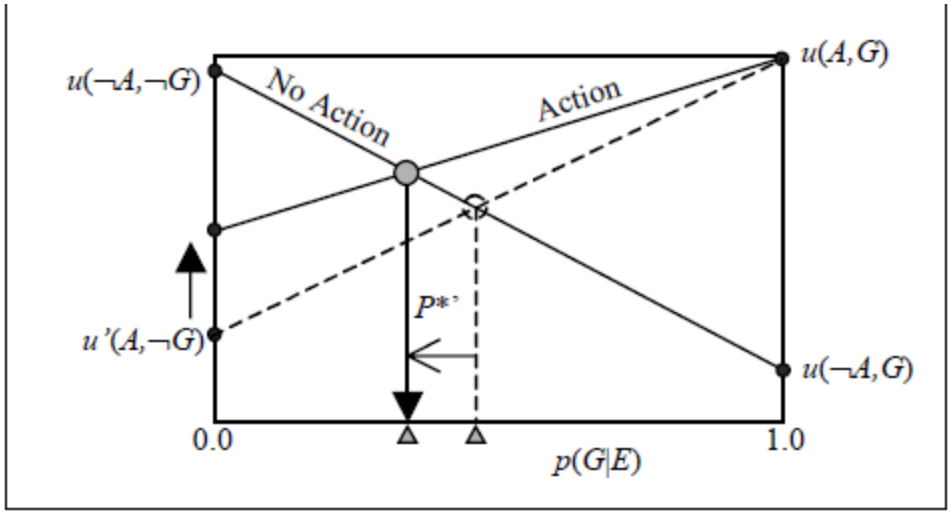
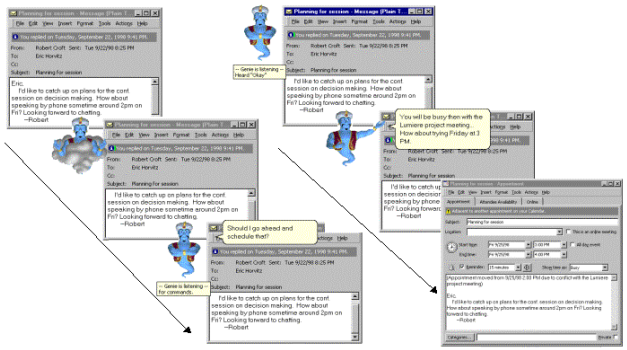


Figure 5. The result of increasing the value of taking erroneous action. Context-dependent shifts in any of the utilities can change the probability threshold for action.



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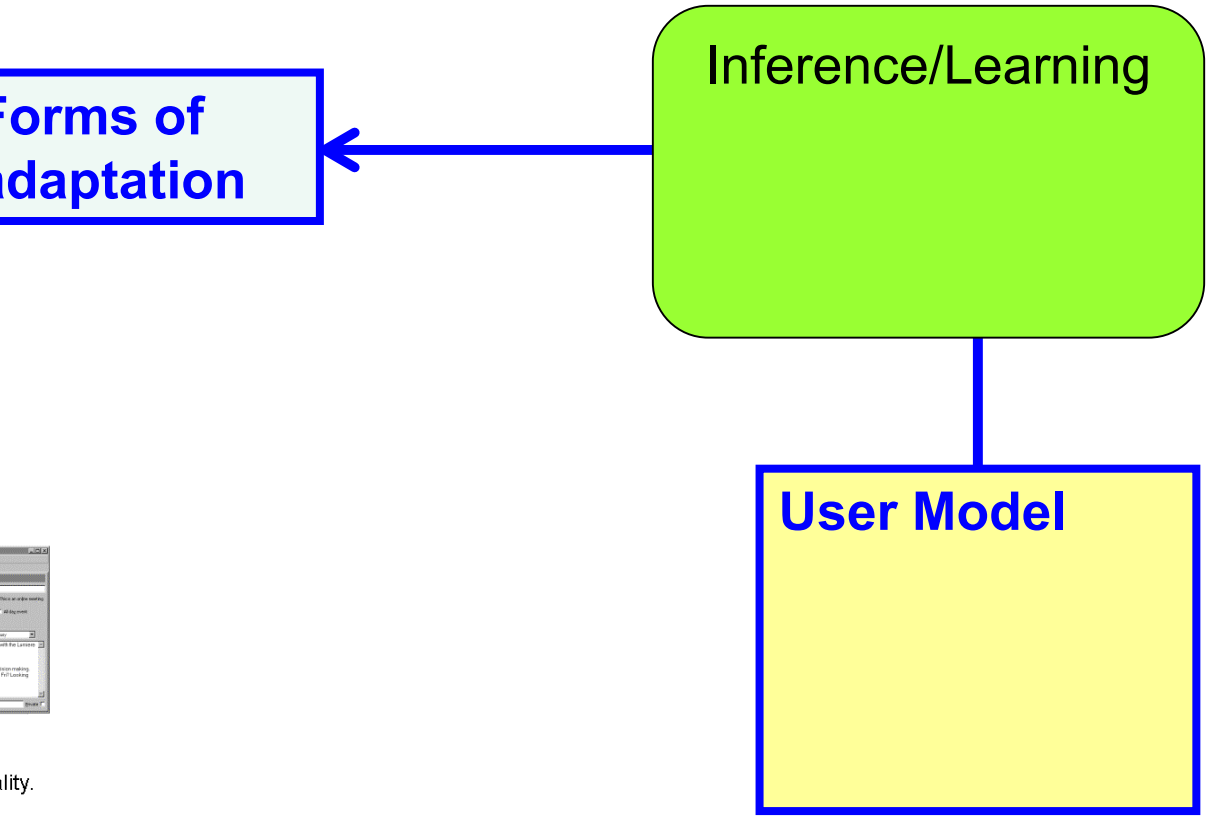

Let’s start from this part

Forms of adaptation

Inference/Learning

Find action with Max EU

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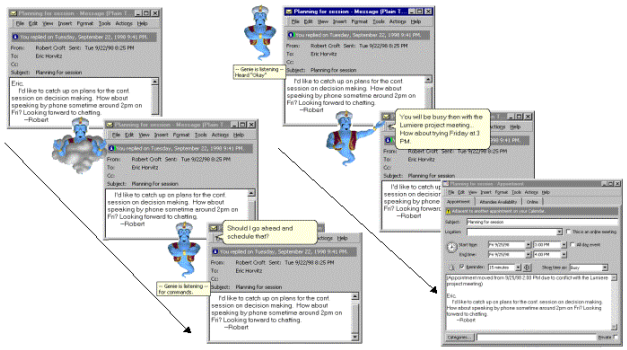
User Model

U(A, G),
U(A notG),
U(not A, G)
U(not A, notG)
P(G/E)



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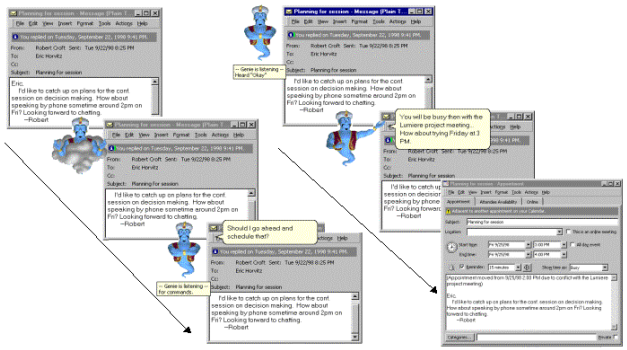
Inference/Learning

Find action with Max EU

Forms of adaptation



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Inference/Learning:

Inference/Learning

Find action with Max EU

Forms of adaptation

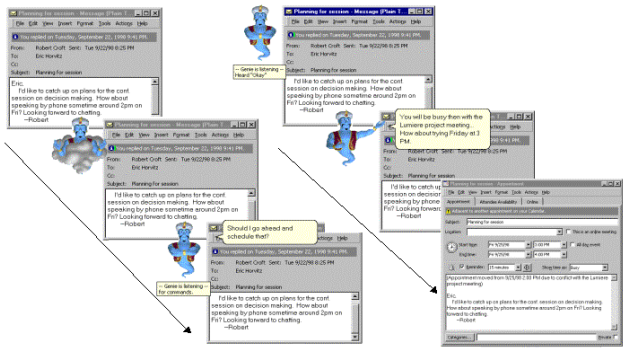

Figure: Lookout operating in its social user-interface modality.

User Model

U(A, G),
U(A notG),
U(not A, G)
U(not A, notG)

P(G/E)

scheduling/not scheduling behavior with previous emails

Inference/Learning:

SVM text classifier

Inference for Model Application

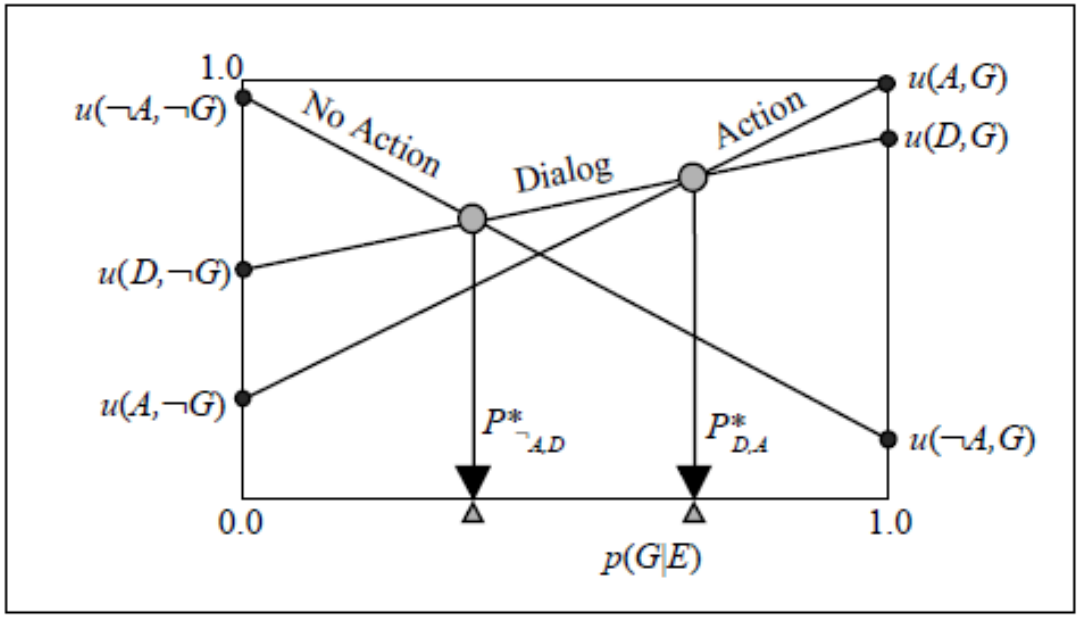

Figure 6. Adding a second action option consisting of dialog with users about their goals. In this case, the graphical analysis higlights the origin of two threshold probabilities for guiding the action of autonomous services.

User's input in LookOut

- Explicit
  - Self-reports on U(G, A)

- Non Explicit
  - Previous scheduling behaviors

Acquisition mechanisms in LookOut

- Knowledge-Based (or Expert-Based)
  - Define rules (deterministic or probabilistic) to identify relevant user properties based on existing theories/knowledge
- Data-Based
  - Learn relevant user features from data (e.g labeled or unlabelled example behaviors)
- Hybrid

Domain Model in LookOut

- *Closed World* (e.g. domain to be taught in educational application)
  - Usually well defined
  - Rich representations are possible
- *Open World* (e.g. the Web)
  - Ill defined
  - Requires to deal with lower levels of representation

Interface Features Important for Mixed Initiative

Interface Features Important for Mixed Initiative

- Multiple interaction modalities
- Variable dwell time for a response
- Don’t take final action without user approval