An assistive handwashing system with emotional intelligence

Luyuan Lin

University of Waterloo

Supervisor:
Jesse Hoey

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Overview

Problem Statement - Motivation

The COACH system

- is an assistive system helping with an elder's daily activities
- monitors a user washing his/her hands
- detects when the user has lost track of what he/she is doing
- displays a prerecorded assistive prompt when needed
- works well for some persons, but not as well for others

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- study of human emotions
- computationally modelling affective HCIs

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Note: The last objective is ill-defined, as the question of how exactly tuning prompts to users will be most effective is not clear at this point.

Concepts - ACT

Affect Control Theory (ACT)

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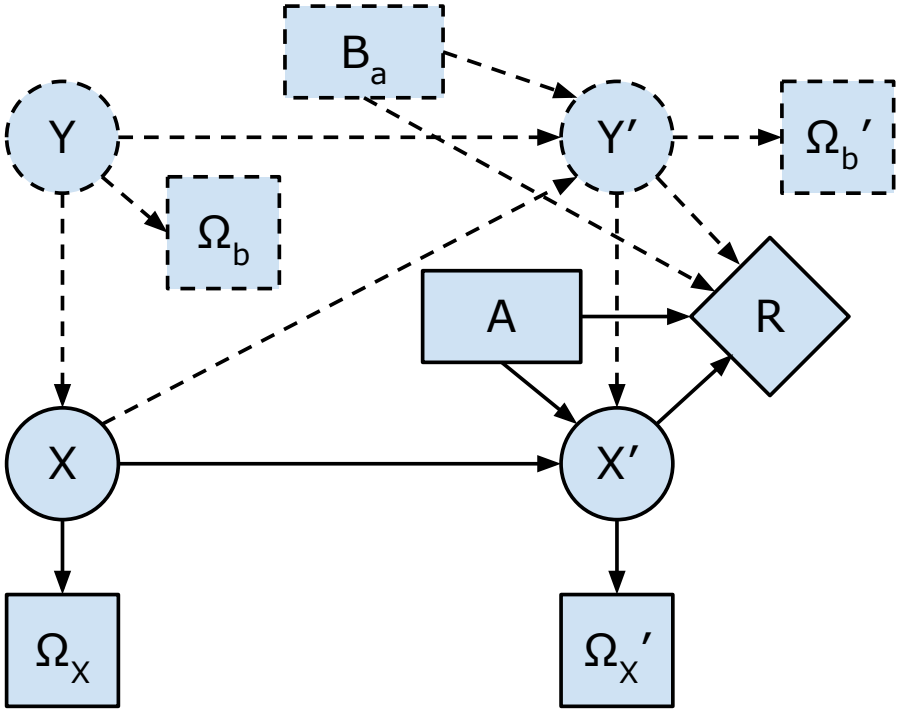
- "fundamentals" of identities and behaviours; shared between people within a same culture
- "transient impressions": emotional feelings of people evoked by a specific event

The ACT Principal

Actors work to experience transient impressions that are consistent with their fundamental sentiments.

Concepts - POMDP

Partially Observable Markov Decision Process (POMDP)



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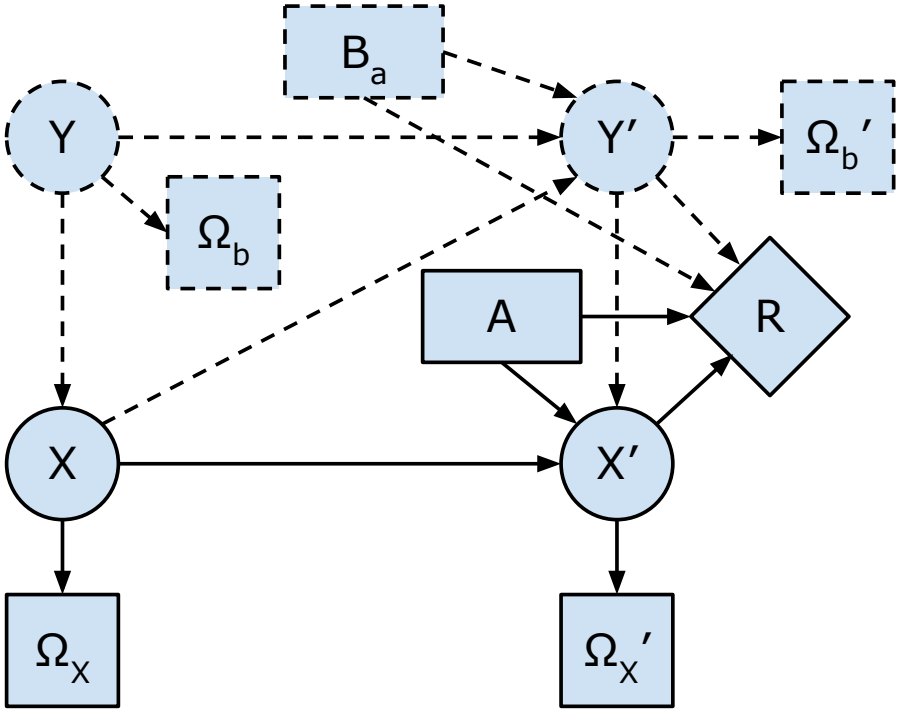

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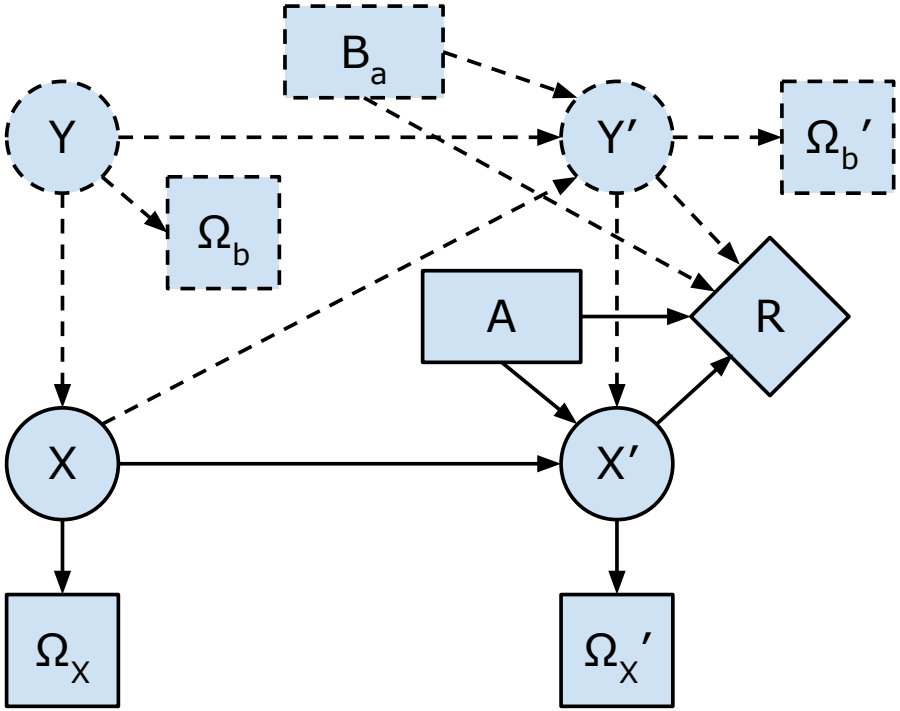

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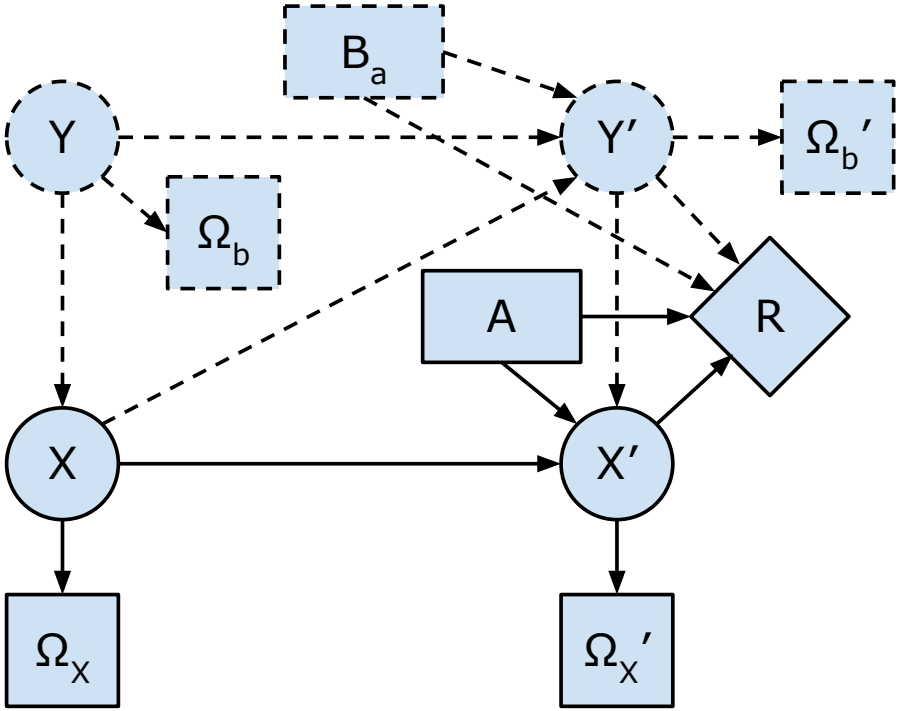

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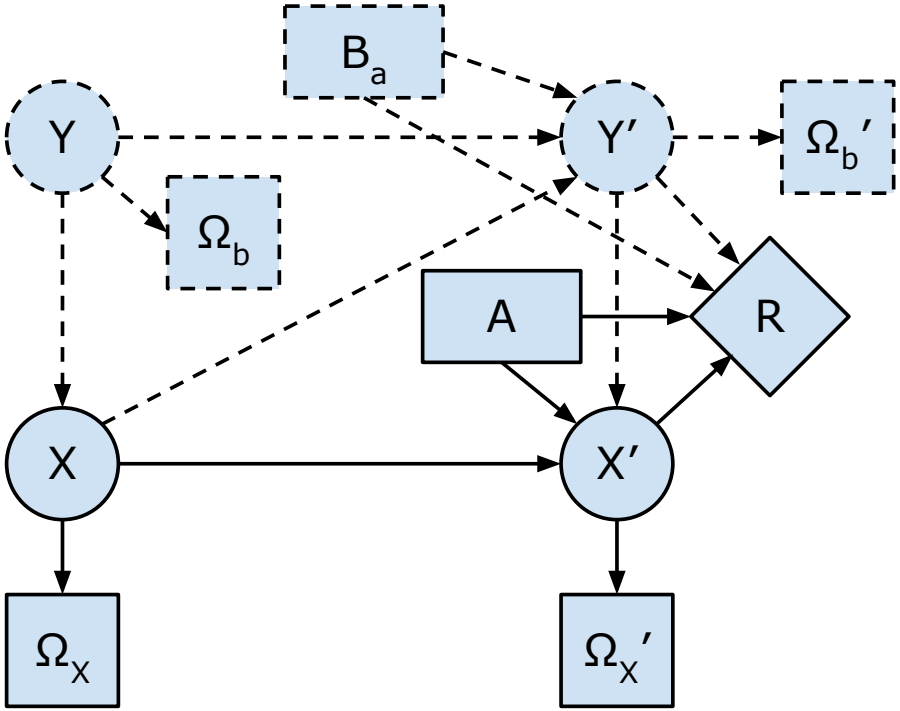

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- Reward Function: $R(A, X')$
- Augmented with affective states (dotted lines)

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- Combines the ACT with POMDP model so that can learn an interactant's identity

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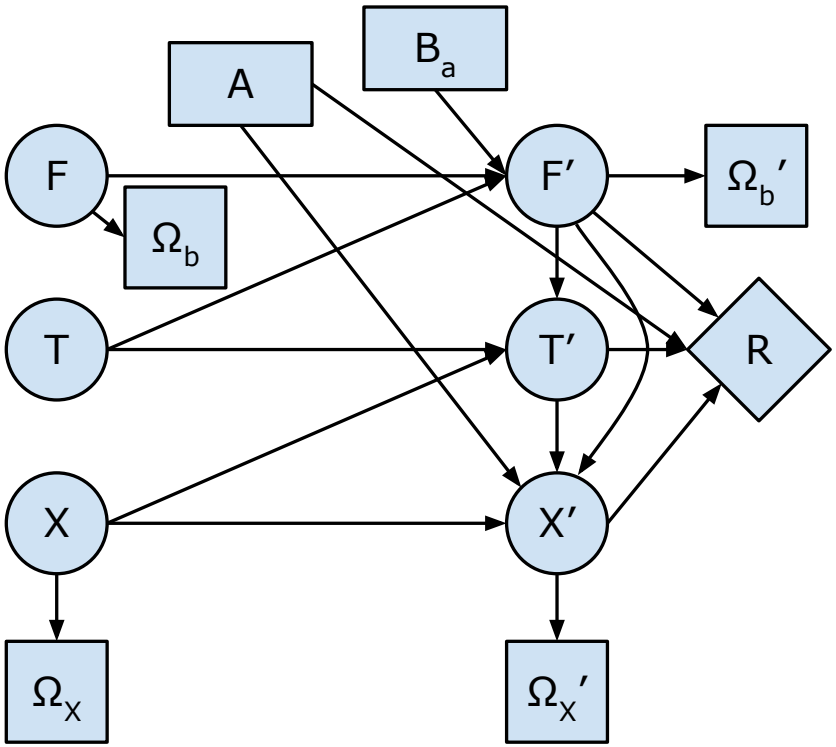

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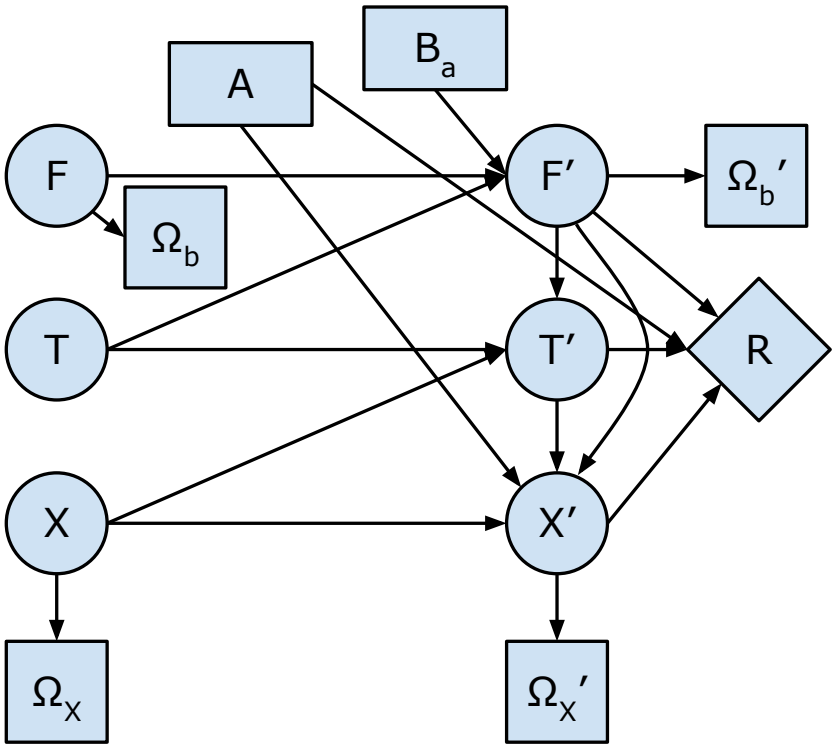

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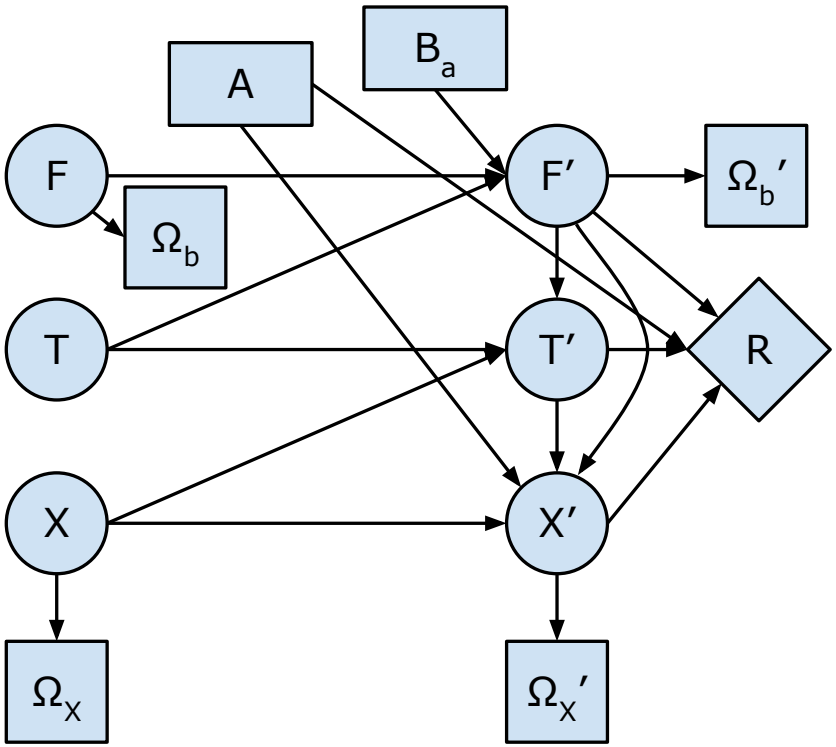

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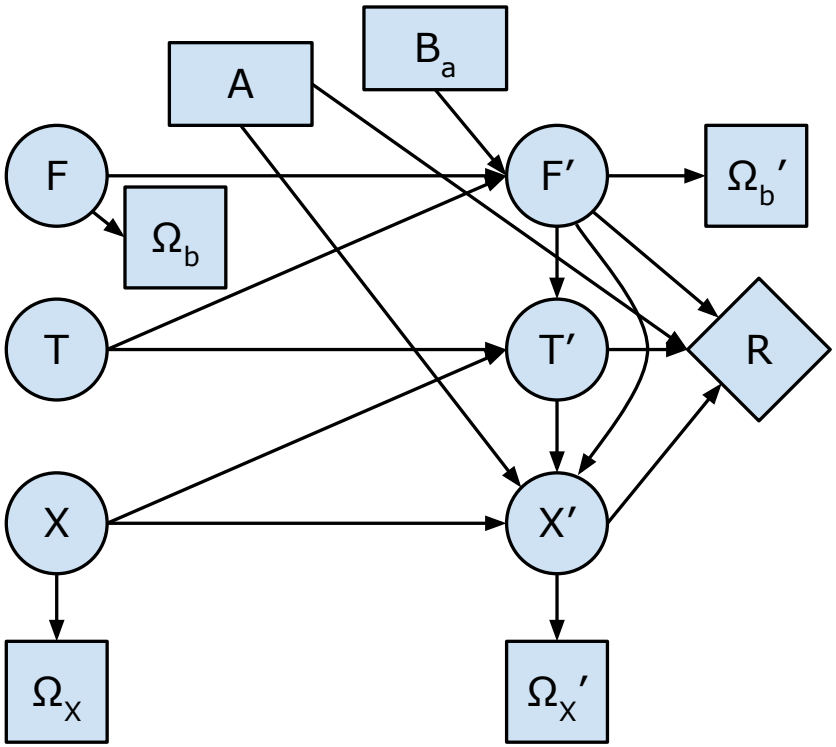

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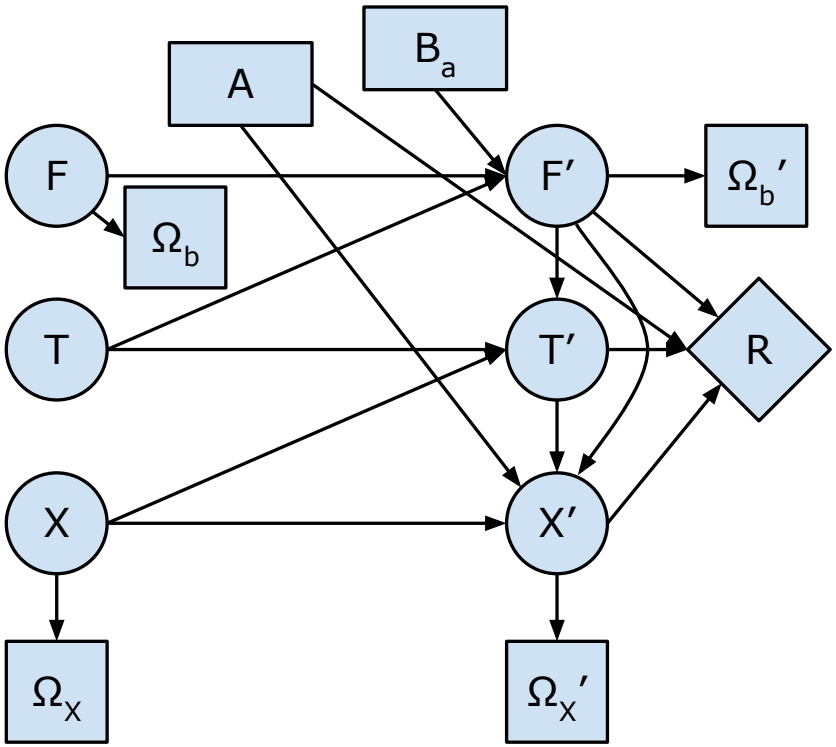

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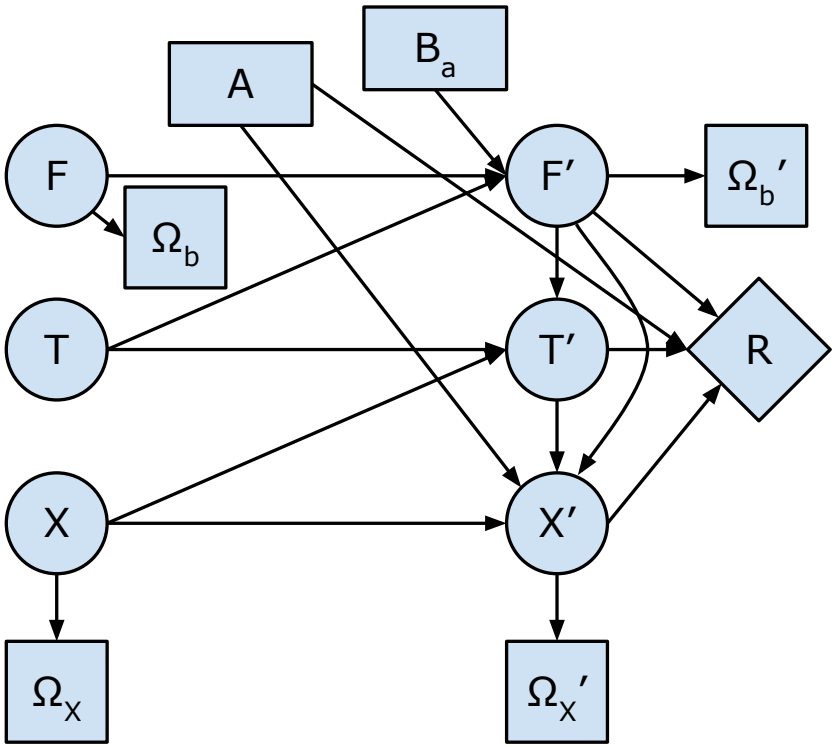

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- Calculate $\{A, B_a\}$ basing on $\{F, T, X\}$

Concepts - BayesACT cont.

Updates F and Calculates $\{A, B_a\}$ basing on $\{F, T, X\}$

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- The probability of a post-action fundamental sentiment f':

$$Pr(f'|f, t, x, b_a, \phi) \propto e^{-\phi(f',t')-\xi(f',f,b_a,x)} \tag{2}$$

where t' can be computed from $\{f', t, x\}$ by empirically derived prediction equations of ACT.

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- $Pr(x'|x, f', t', a)$: how the application progresses
- $Pr(\omega_b|f)$ and $Pr(\omega_x|x)$: observation functions for the client behaviour sentiment and system state

Solution - Overview

Solution - the Planstep and Emotion Updater

Solution - the Planstep and Emotion Updater cont.

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Solution - the EPA-Calculator

Solution - the Observer

Solution - the Output Part

Solution - the Buffer

Experiments - Variables and Parameters

* table defining all the parameters - explain the meanings of all the parameters

Experiments - Variables and Parameters cont.

Experiments - Test #1

Experiments - Test #1 cont.

Experiments - Test #2

Experiments - Test #2 cont.

Experiments - Conclusion

Discussion - Contribution

Discussion - Future Work

References

[1] The bayesact paper
[2] The tracker paper.
[3] The survey paper.

Acknowledgement

Jesse Hoey
James Tung and Peter van Beek
Xiao Yang, Chengbo Li and Enxun Wei

The end

Thank you!

- Questions?
- Comments?