Theory and Applications of *Tentacular AI*

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Overview

Problem

Artificial agents capable of problem solving ethically with justification, at the theory-of-mind level, throughout the IoT.

Advantages

- Proof-based: All conclusions are justified and human-understandable.
- Cognitive IoT: Models theory-of-mind at an arbitrarily deep level.

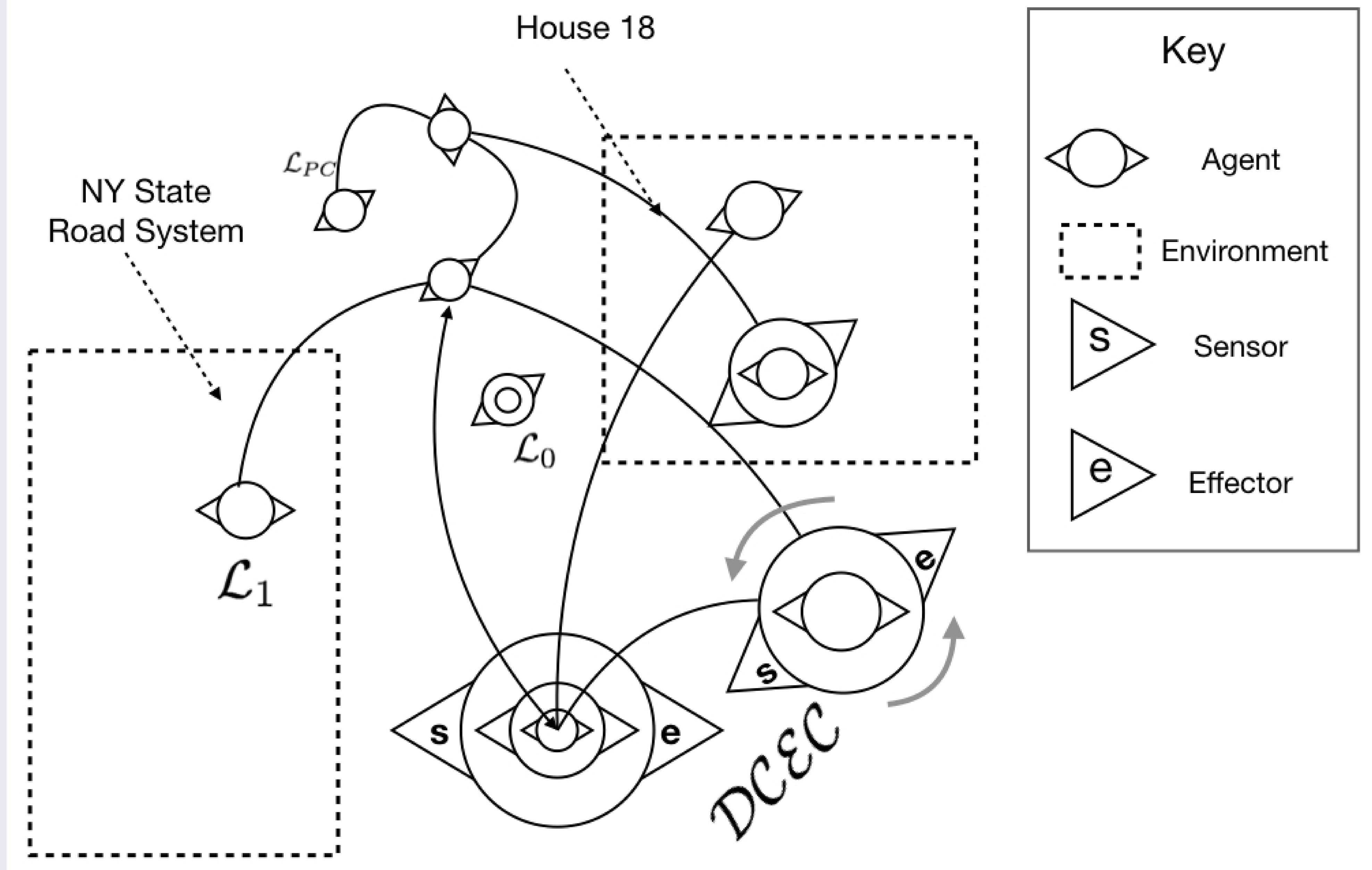
Reasoning

- Sufficiently expressive domain formalization at the theory-of-mind level.
- Efficient automated reasoners over this knowledge.

Approach

- Modal first-order 'cognitive' calculus for expressive formalization
- In-house automated reasoner (`ShadowProver`) and planner (`Spectra`)

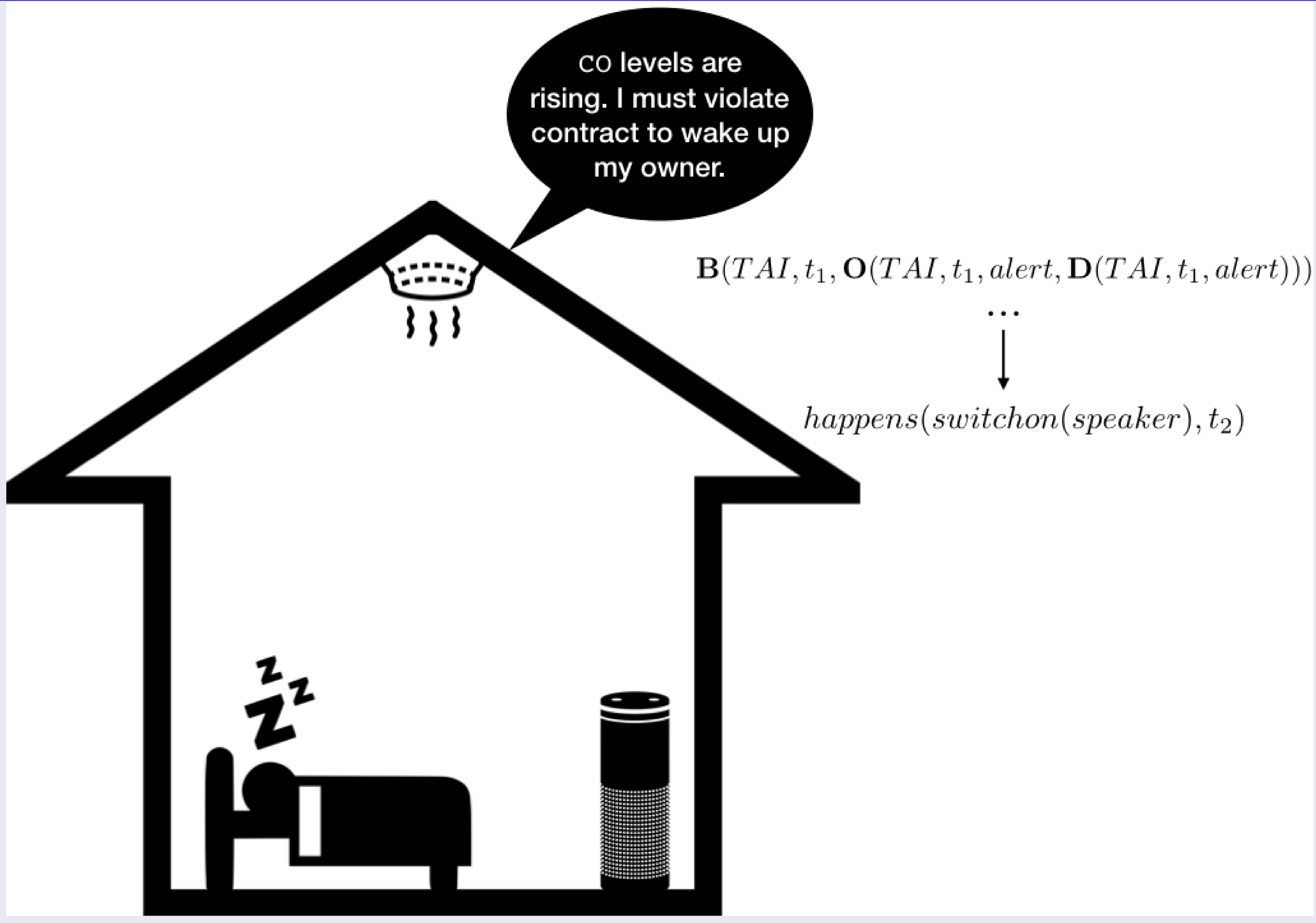
Architecture



Publications

- Bringsjord, S., G., Naveen S., Sen, A., Peveler, M., Srivastava, B., Talamadupula, K. (2018). Tentacular Artificial Intelligence, and the Architecture Thereof, Introduced. In the Proceedings of the 1st International FAIM Workshop on Architectures and Evaluation for Generality, Autonomy & Progress in AI (AEGAP 2018), Stockholm, Sweden, 2018, held in conjunction with IJCAI-ECAI 2018, AAMAS 2018 and ICML 2018.
- Sen, A., Srivastava, B. et al. For AIs, Is it Ethically/Legally Permitted That Ethical Obligations Override Legal Ones? Forthcoming in the Proceedings of the International Conference on Robot Ethics and Standards (ICRES 2018), Troy, NY, USA, 2018.
- Sen, A., G., Naveen S., Bringsjord, S., Ghosh, R., Mayol, P., Srivastava, B., Talamadupula, K. (2018). Toward a Smart City using Tentacular AI. In the Proceedings of the 2018 European Conference on Ambient Intelligence, Larnaca, Cyprus, 2018, Lecture Notes in Computer Science (Springer LNCS), Vol. 11249.

Smart Homes



Formal System

Inference Schemata (Fragment)

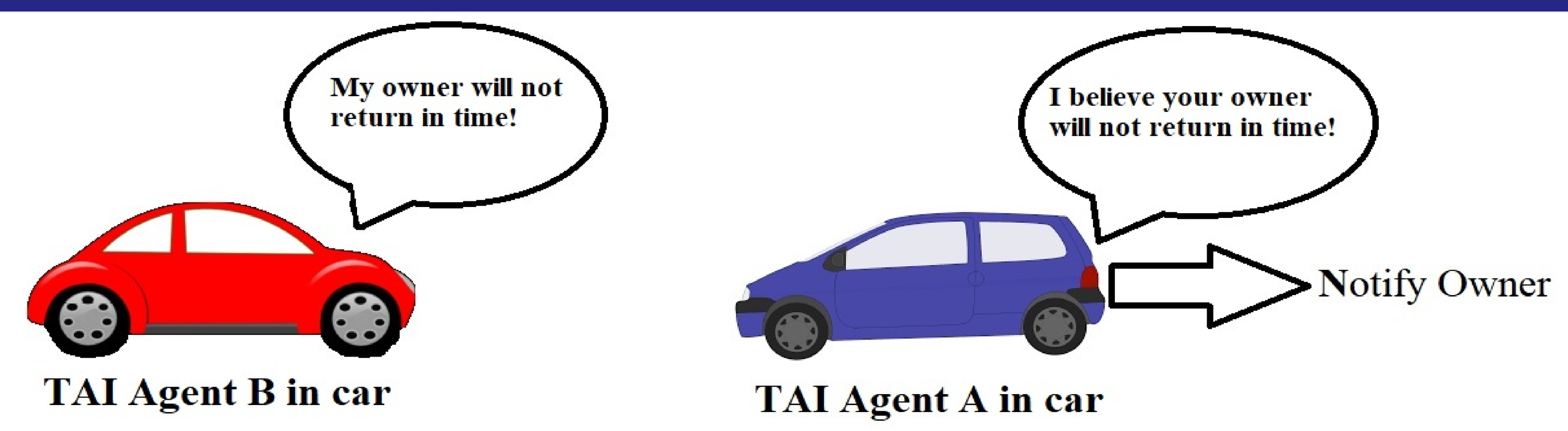
$$\frac{\mathbf{K}(a, t_1, \Gamma),\ \ \Gamma \vdash \phi,\ \ t_1 \leq t_2}{\mathbf{K}(a, t_2, \phi)}\ [I_{\mathbf{K}}]$$

$$\frac{\mathbf{B}(a, t_1, \Gamma),\ \ \Gamma \vdash \phi,\ \ t_1 \leq t_2}{\mathbf{B}(a, t_2, \phi)}\ [I_{\mathbf{B}}]$$

$$\frac{\mathbf{K}(a, t, \phi)}{\phi}\ [I_4] \qquad \frac{t < t',\ \ \mathbf{I}(a, t, \psi)}{\mathbf{P}(a, t', \psi)}\ [I_{13}]$$

$$\frac{\mathbf{B}(a, t, \phi)\quad \mathbf{B}(a, t, \mathbf{O}(a, t, \phi, \chi))\quad \mathbf{O}(a, t, \phi, \chi)}{\mathbf{K}(a, t, \mathbf{I}(a, t, \chi))}\ [I_{14}]$$

Smart Cities



Reasoner Input

$\mathbf{r}_1$: Car A perceives Car B saying that its owner won't return on time

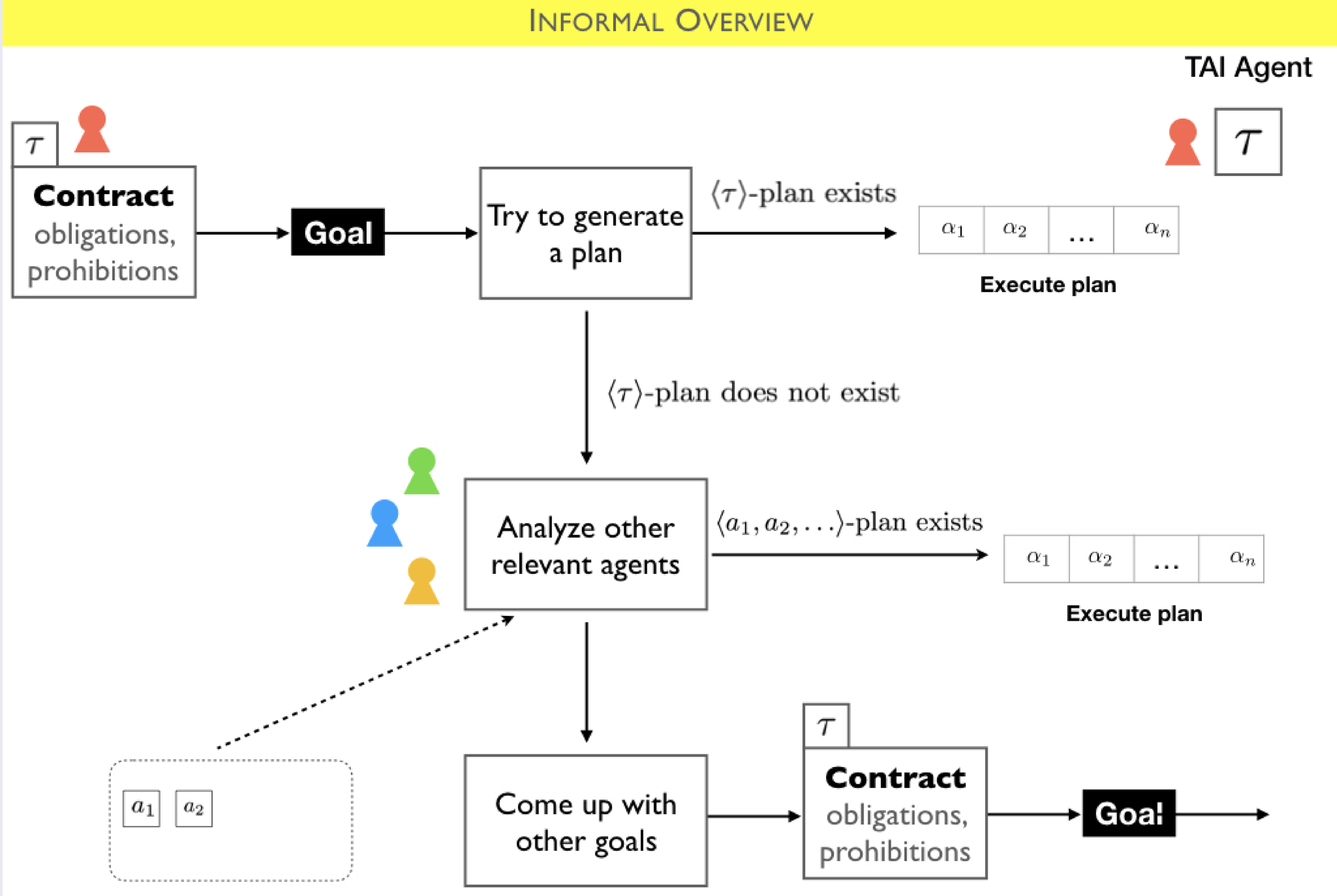
$$\mathbf{P}(car_A, \text{now}, \mathbf{S}(car_B, \neg holds(\text{location}(ownerB, S), t_{13}))) \tag{1}$$

$\mathbf{r}_2$: If Car A believes that Car B believes that its owner won't return at time then Car A believes the same too.

$$\mathbf{B}(car_A, \text{now}, \mathbf{S}(car_B, \neg holds(\text{location}(ownerB, S), t_{13}))) \rightarrow \mathbf{B}(car_A, \text{now}, \neg holds(\text{location}(ownerB, S), t_{13})) \tag{2}$$

Defining TAI

Informal Overview



More Information

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