

# The Problem of Describing What is Happening

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The problem of describing what is happening consists of two parts:

1. Forming a predictive hypothesis about a running process
2. Recognize a running process by testing predictions according to the hypothesis

Since there can be many hypotheses, they need some description to be organized efficiently. The description used to reference the hypothesis is equivalent to the description used to describe what is happening if that hypothesis' predictions turn out to be correct.

Consider two rational agents, Alice and Bob. Alice wants to describe what is happening in a way such that Bob understands what to do and how to react:

- Alice wants to avoid guessing the wrong hypothesis (she wants to be confident)
- Alice wants to communicate clearly to Bob (she wants to use a common language)
- Alice wants Bob to react quickly (she wants to communicate efficiently)

Another example is a lion hunting a gazelle. The gazelle can either run straight forward, turn left or turn right. The lion must predict what the gazelle is doing quickly and react to that. Even though a lion can not speak, it has three hypotheses predicting what it will see next and concentrates on observing accurately so it can select the hypothesis that is likely to be true.

A process can be described in the language of declarative AI behavior trees. Describing what is happening can be thought of as inferring the declaration of some behavior based on observations.

For example, “buying a coffee” can be done in many ways and many places, yet it feels intuitive to use the same description. It can thought of as an AI behavior tree that has a Select-node for each learned way of buying a coffee.

When one parent is raising a child, the child learns descriptions of what is happening from the parent. This is how children learn to speak languages. The child is aware of what is happening, but describing it and understanding it requires integration with the culture of the parent. Not only must a child be able to guess the right hypothesis from observations, but also reverse engineer what kind of hypothesis the parent meant when saying something.

Recognizing a process can be hard because observations can start in the middle of action. It is also necessary to predict future observations in order to distinguish one action from another. Based on the complexity of these tasks, an efficient agent might need custom designed algorithms for common patterns, which to some degree makes reactions involuntary and exploitable by other agents.