Reference Class Functions

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A reference class function `f` is defined as following:

$$f : \text{Model} \times \text{ModelAction} \to \text{Distribution}$$

The model is a representation of the state space. For discrete states, the model is a graph where nodes are states and edges is the potential existence of some action connecting two states. For continuous states, the model is usually a scalar field, vector field or a manifold.

The model-action is a map of actions onto the state space. Usually, this is uniform for all states, except a goal boundary condition that usually terminates paths of observers reaching the goal, to not count them multiple times in the distribution.

The model-action is separated from the model to easier compare model-actions or models with each other. However, this is not always necessary. When the model-action is merged with the model (e.g. theoretically for theorem proving), discrete states are often represented using a Markov chain[1].

Another motivation to separate the model-action from the model is to simplify the description. A Markov chain does not assume uniform actions, so it often contains redundant data. By separating these two into separate objects, it gets simpler to program experiments.

The reference class function outputs a distribution which describes the density of observers over states. In some theories, this is an object that generates the distribution indirectly, e.g. using sampling. In simple theories this is e.g. a mathematical function describing the distribution.

The main purpose with reference class functions is to provide a helpful representation of reference classes that is easy to program.

References:

[1] “Markov chain”
Wikipedia
https://en.wikipedia.org/wiki/Markov_chain