Why

We want to talk about making a sequence of decisions.

Definition

Let S and A be finite sets. Let $T : S \times A \to (S \to [0,1])$ so that for each $s \in S$ and $a \in A$, $T_{sa} : S \to [0,1]$ is a probability distribution over S. We call the ordered triple (S, A, T) a *finite state-action process*.

A *trajectory* in the *state set S* and *action set A* is a sequence in $S \times A$.

Let $r : S \times A \times S \to \mathbf{R}$, $N \in \mathbf{N}$.

A *decision process* is a sequence $(S, A, T, r, \gamma,$, consists of two sets, a function set, an action

Other terminology

Decision processes are commonly called *markov decision processes.*[1]

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[1]As usual, we avoid this terminology in connection with the projects guidelines against using particular names.

Decision Processes

Probability Distributions

Intervals

Real Line

Real Summation · Real Order

Real Numbers · Rational Order

Rational Numbers

Integral Line

Integer Arithmetic

Lists

Set Numbers

Natural Additive Identity · Natural Multiplicative Identity

Integer Products

Finite Sets · Direct Products

Identity Elements · Arithmetic

Equivalent Sets

Natural Summation · Natural Powers

Family Unions and Intersections

Function Inverses

Family Operations · Comparisons · Integer Order · Integer Sums · Natural Products

Function Composites · Function Images · Families · Operations · Orders · Integer Numbers · Natural Sums

Equivalence Relations · Functions · Converse Relations · Natural Order · Recursion Theorem

Relations

Peano Axioms

Set Products

Natural Induction · Uncertain Outcomes

Generalized Set Dualities · Set Powers · Natural Numbers

Partitions · Intersection of Empty Set · Set Dualities · Unordered Triples · Successor Sets · Set Symmetric Differences

Set Unions and Intersections

Set Intersections · Ordered Pairs · Pair Unions · Set Complements

Pair Intersections · Set Unions · Set Differences

Unordered Pairs · Empty Set

Set Specification

Geometry

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Identities · Sets

Names

Letters · Objects