A Semantics for Functional Efficacy

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Outline

1. Means-end relations and artifactual functions
    - From functions to means-end relations
    - Means-end relations and function fulfillment

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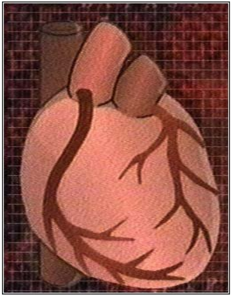
Functional ascriptions



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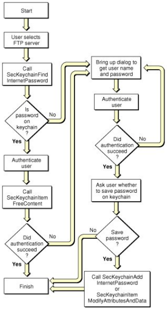
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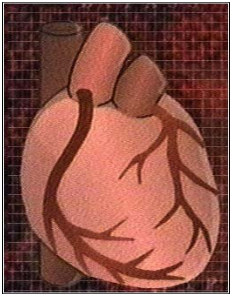

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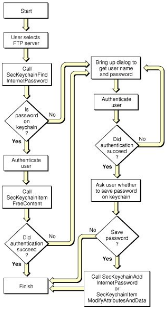
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We focus on *artifactual functions*.

How functions relate to means and ends

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- Aim: Use means-end semantics to analyze functions.

Weak and strong means-end relations

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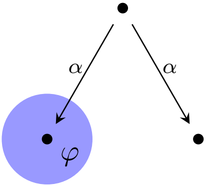

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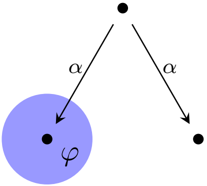

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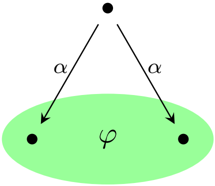

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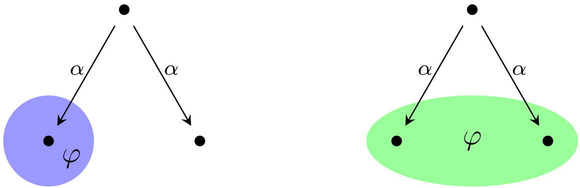

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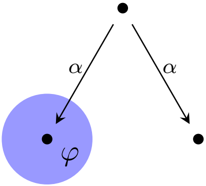

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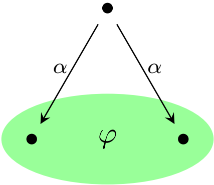

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Result: Formal definitions for "α is a (weak/strong) means to φ."

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A *functional ascription* f includes the following components.

- an artifact type T,

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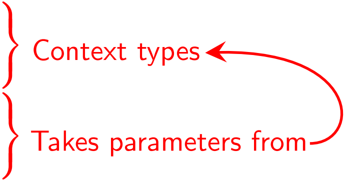

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One expects: $\alpha(o, \tau)$ is a means to $\varphi(o, \tau)$.

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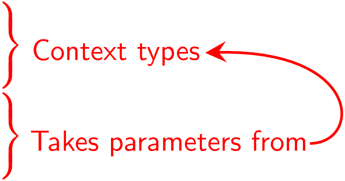

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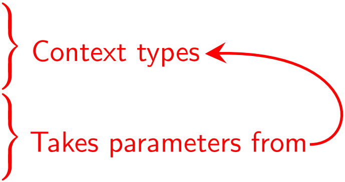

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Example: fire starters

Various artifacts are used to start fires.

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An *f-context* is given by

- a fire-starting device *o*,
- particular user *u*, weather conditions *c* and kindling *k*.

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An artifact o *(weakly/strongly) fulfills* f wrt τ

$$\Updownarrow$$

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When u ignites k via o in conditions c, kindling k burns.

Functions and subtypes

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$\mathcal{CarLighter} \leq \mathcal{Lighter} \leq \mathcal{FireStarter}$

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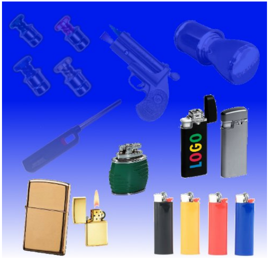

every "*normal*" $o \in T'$ fulfills f.

Normal tokens: the controversial bits

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Normal tokens are useful fictions. Express how T-things are expected to behave.

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Normal *CarLighters* are not normal *Lighters*.

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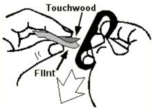

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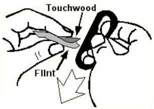

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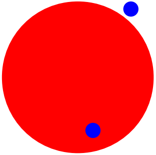
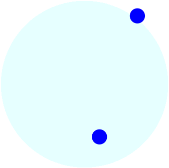


Crisp proposition



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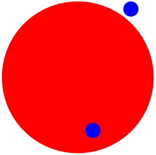

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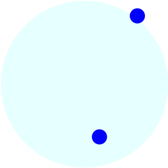

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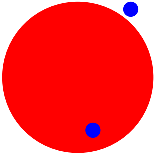
Efficacy of α in φ:
Truth degree of "α reliably realizes φ."



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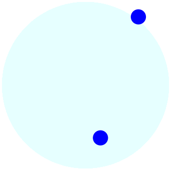

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f-efficacy of type T:
infimum $\{f\text{-eff. of } o \mid o \text{ is a normal } T\text{-token}\}$

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A *Lighter* malfunctions when it is ineffective at starting fires.

A *CarLighter* malfunctions when it is less effective than normal *CarLighters*.

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  - Relation between function and means-ends.
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  - Formal definition of one kind of malfunction.

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- Aim: Formal semantics for clarifying natural language.
  - Relation between function and means-ends.
  - Efficacy for token-token, type-type and token-type comparisons.
  - Formal definition of one kind of malfunction.
- Adapted PDL with fuzzy logic for "reliability".

Concluding remarks

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Thank you.

Outline

3 Function origins

4 Extra material on normal tokens

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