

Qualities in Dolce

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DOLCE

a Descriptive Ontology for Linguistic and Cognitive Engineering

- Strong cognitive/linguistic bias:
 - **descriptive** (as opposite to *prescriptive*) attitude
 - Categories mirror cognition, common sense, and the lexical structure of natural language.
- Emphasis on **cognitive invariants**
- Categories as **conceptual containers**: no “deep” metaphysical implications
- Focus on **design rationale** to allow easy comparison with different ontological options
- Rigorous, systematic, interdisciplinary approach
- **Rich axiomatization**
 - *37 basic categories*
 - *7 basic relations*
 - *80 axioms, 100 definitions, 20 theorems*
- Rigorous quality criteria
- Documentation

DOLCE's basic taxonomy

Object (endurant)

Physical

Amount of matter

Physical object

Feature

Non-Physical

Mental object

Social object

...

Event (perdurant)

Static

State

Process

Dynamic

Achievement

Accomplishment

Quality

Physical

Spatial location

...

Temporal

Temporal location

...

Abstract

Abstract

Quality region

Time region

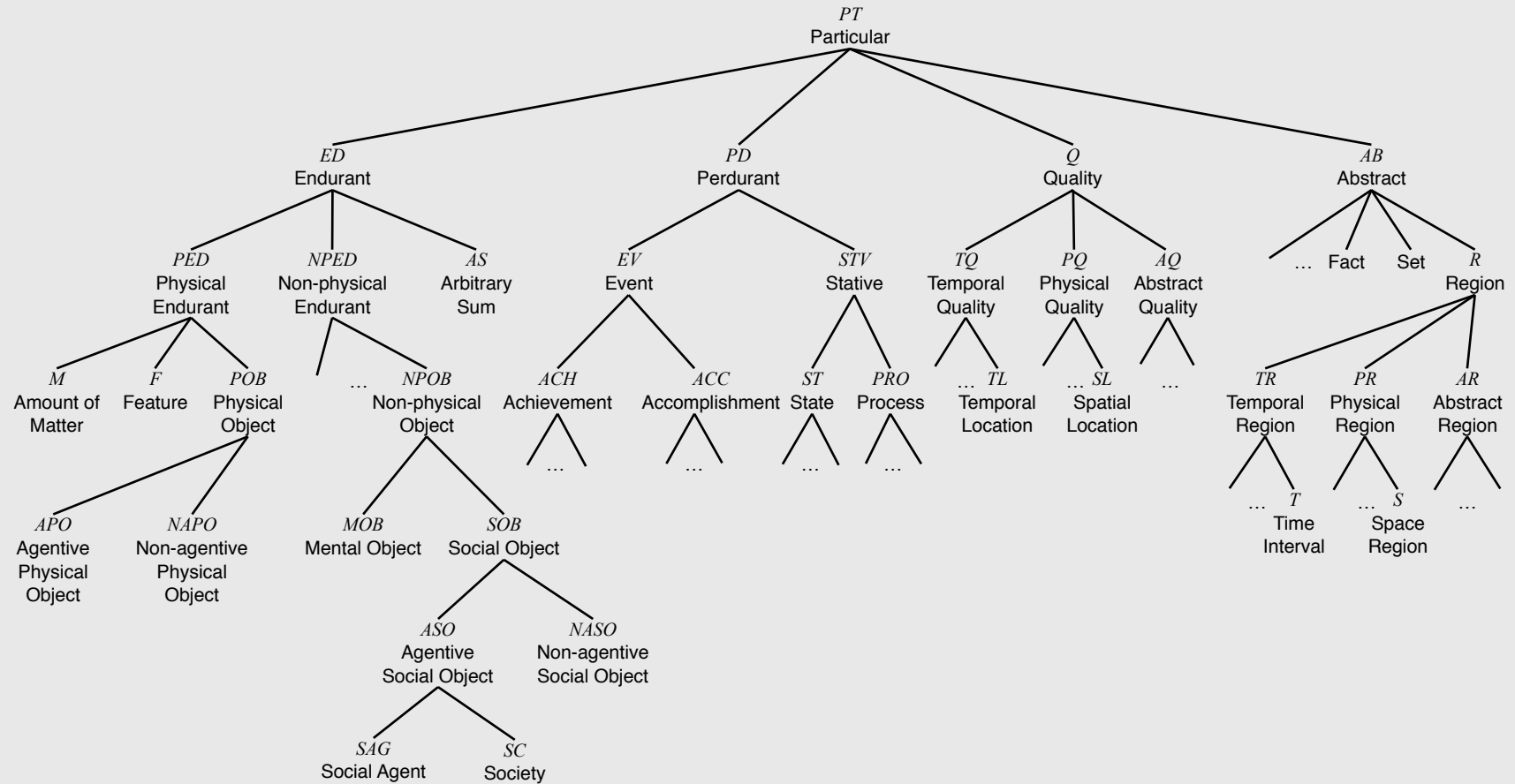
Space region

Color region

...

...

DOLCE taxonomy



DOLCE's Basic Ontological Choices

- **Objects** (aka *continuants* or *endurants*) and **Events** (aka *occurrences* or *perdurants*)
 - distinct categories connected by the relation of *participation*.
- **Qualities**
 - Individual entities *inhering in* Objects or Events
 - can live/change with the objects they inhere in
 - Instance of *quality kinds*, each associated to a **Quality Space** representing the "*values*" (*qualia*) that qualities (of that kind) can assume. Quality Spaces are neither in time nor in space.
- **Multiplicative approach**
 - Different Objects/Events can be spatio-temporally co-localized: the relation of *constitution* is considered.

Objects and Events

- Objects (*3D continuants*)
 - Need a time-indexed parthood relation
 - Exist in time
 - Can genuinely change in time
 - May have non-essential parts
 - All proper parts are present whenever they are present (wholly presence, no temporal parts)
- Events (*4D occurrences*)
 - Do not need a time-indexed parthood relation
 - Happen in time
 - Do not change in time (*as a whole...*)
 - All parts are essential
 - Only some proper parts are present whenever they are present (partial presence, temporal parts)
- Objects *participate to* Events

Qualities and qualia

- Linguistic evidence
 - *This rose is red*
 - *Red is a color*
 - *This rose has a color*
 - *The color of this rose turned to brown in one week*
 - *Red is opposite to green and close to brown*
 - *The patient's temperature is increasing*
 - *The doctor measured the patient's temperature*
- Each object or event comes with certain qualities that permanently **inhere** to it and are **unique** of it
- Qualities are perceptually mapped into **qualia**, which are regions of **quality spaces**.
- Properties hold because qualities have certain locations in their quality spaces.
- Each quality type has its own quality space

Qualities

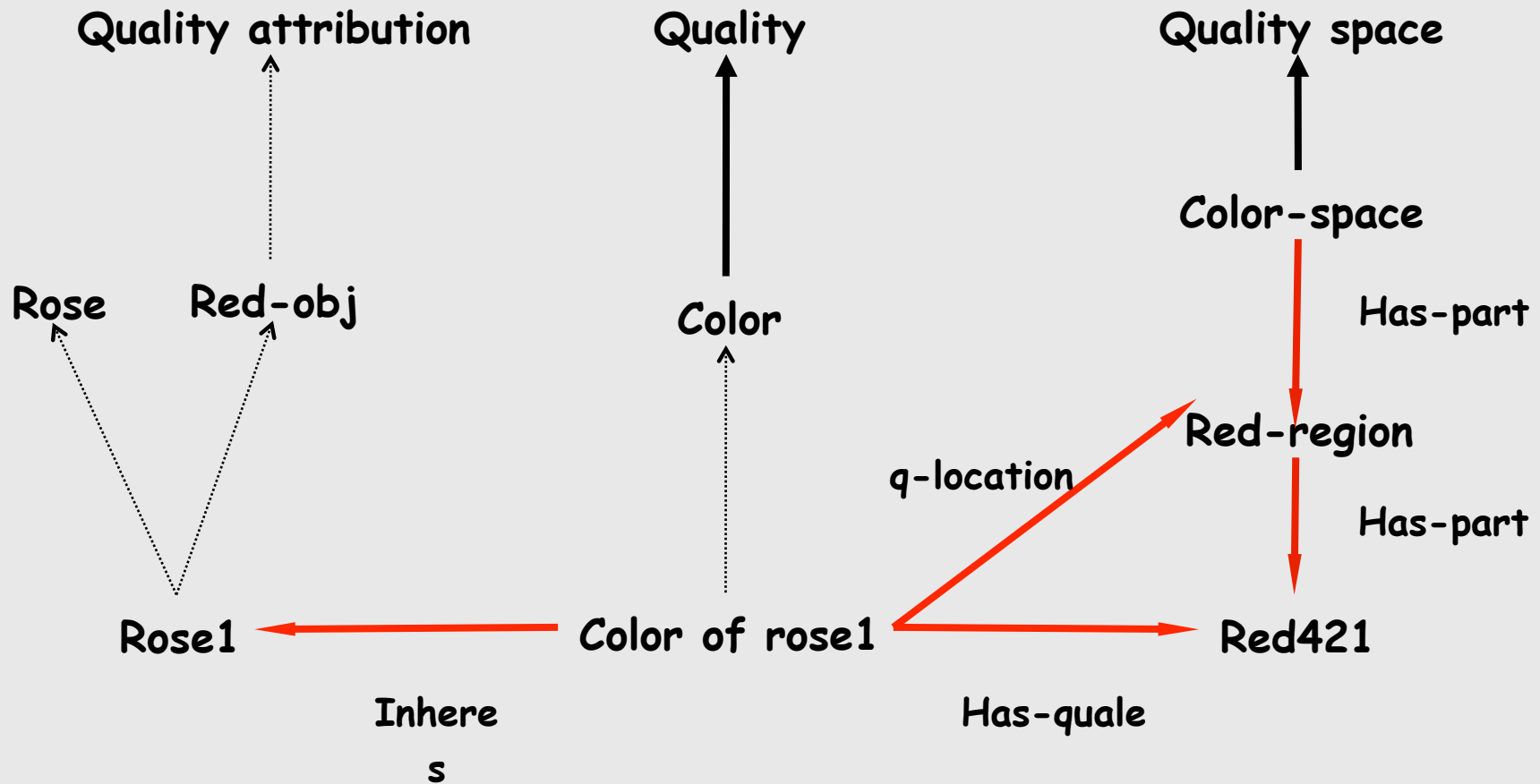


The rose and the chair have *the same color*:

- different color qualities inhere to the two objects
- they are located in the same quality region

Therefore, the same color attribute (red) is ascribed to the two objects

Qualities



What's special with qualities?

- A simple attribute-value structure is not enough as a representation formalism: you need to put *individual qualities* in the domain of discourse
- Differently from instances of other attributes, individual qualities are existentially dependent on their bearers
- The so-called *determinable/determinate issue* is not actually an issue:
 - All regions in a quality space correspond to *determinables*
 - Corresponding properties holding for objects with qualities in these spaces are *determinate*
 - Red-color vs. red-thing...
- *redness* (a quality type) is very different from *red* (a color region) and has a quality space very different from that of colors...

Qualities vs. Features



- **Features:** “parasitic” physical entities.
- **relevant parts** of their host...
... or **places**
- Features have qualities, qualities have no features.



Open issues

- Spatial and temporal location as qualities?
- Binary quality spaces?
- Multiple quality spaces allowed for a single quality kind?
- Relationships among qualities, dimension analysis
- Measurement

Abstract vs. Concrete Entities

- Concrete:
 - located (at least) in time
- Abstract - two meanings:
 - Result of an abstraction process (something common to multiple exemplifications)
 - ☞ ***Not located in space-time*** (no inherent spatial or temporal location)
- Examples: ***propositions, sets, symbols, regions***, etc.
 - ***Quality regions*** and ***quality spaces*** are abstract entities
 - Mereological sums (of concrete entities) are concrete, the corresponding sets are abstract...

Physical vs. Non-physical Objects

- Physical objects
 - Inherent spatial localization
 - Not necessarily dependent on other objects



- Non-physical objects
 - No inherent spatial localization
 - Dependent on agents
 - mental (depending on singular agents)
 - social (depending on communities of agents)
 - Agentive: a company, an institution
 - Non-agentive: a law, the Divine Comedy, a linguistic system...
 - Descriptions, an extension of DOLCE

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