Cheatography

Mereotopology Cheat Sheet

by apowers313 via cheatography.com/31528/cs/9577/

Ground Mereology Axioms

axiom	meaning	defn.
M	Ground Mereology	
Pxy	x is a part of y	
Reflexivity	x is a part of itself	Pxx
Antisymmetry	x and y can't be parts of each other, unless they are actually the same thing	Pxy ∧ Pyx → x=y
Transitivity	if x is a part of y, and y is a part of z, then x is a part of z	Pxy ∧ Pyz → Pxy

Ground Mereology Definitions

sym.	meaning	defn.
PP	Proper Part	PPxy := Pxy ∧ ¬Pyx
O	Overlap	Oxy := ∃z (Pzx ∧ Pzy)
U	Underlap	Uxy := ∃z (Pxz ∧ Pyz)
OX	Over-Crossing	OXxy := Oxy ∧ ¬Pxy
UX	Under-Crossing	UXxy := Uxy ∧ ¬Pyx
PO	Proper Overlap	POxy := OXxy ∧ OXyx
PU	Proper Underlap	PUxy := UXxy ∧ UXyx

Derived Statements

Overlapping is Reflexive	Oxx
Overlapping is Transitive	Oxy → Oyx
Proper Parts are not Reflexive	¬PPxx

Extensional Mereology

EM	Extensional Mereology
Supplementation Axiom	¬Pxy → ∃z(Pzx ∧ ¬Ozy)
Weak Supplementation	**EM** ⊢ PPxy → ∃z(PPzy ∧ ¬Ozx)

If all the proper parts of X are proper parts of Y, X is part of Y

If two objects have the exact same proper parts, they are the same object

Closed (Extensional) Mereology

CEM	Closed Extensional Mereology
ι	description operator ιx is "the unique x such that"
x+y	sum (or fusion) Oxy→∃x∀w(Pwz↔(PwxvPwy)) defined as: ιz∀w(Owz↔(OwxvOwy))
x×y	product Uxy→∃z∀w(Owz↔(OwxvOwy)) defined as: ιz∀w(Pwz↔(PwxvPwy))
x-y	difference ∃z(PzxA¬Ozy)→∃z∀w(Pwz↔(PwxA¬Owy)) defined as: ιz∀w(Pwz↔(PwxA¬Owy))
U	universe ∃z∀x(Pxz) defined as: ιz∀x(Pxz)
~x	compliment U-x

General (Extensional) Mereology

GEM	General Extensional Mereology
Fusion Axiom	∃xΦ → ∃z∀y(Oyz ↔ ∃x(ΦAOyx))

Ground Topology Axioms

T	Ground Topology	
Cxy	x is connect to y	
Reflexivity	x is connected to itself	Cxx
Symmetry		Cxy → C yx
Transitivity		Pxy → ∀z(Czx → Czy)

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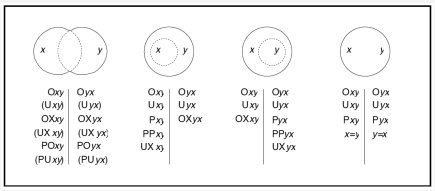
Ground Topology Definitions

EC	External Connection
TP	Tangential Part
TPP	Tangential Proper Part
IP	Internal Part
IPP	Internal Proper Part
E	Enclosure
IE	Internal Enclosure
TE	Tangential Enclosure
S	Superposition
PS	Proper Superposition
I	Coincidence
A	Abutting

Predicate Logic

¬	not
∧	and
∨	or
∀	for every
∃	there exists
→	implies
:=	definition
↔	iff
⊢	provable
⊨	entails
⊤	tautology
⊥	contradiction

Basic Patterns in Mereology



Credit: Varzi 1996, used without permission. The relations in parenthesis hold if there is a larger z including both x and y.

Basic Patterns in Mereotopology

Examples

Part	Your finger is part of your hand
Reflexivity	Your finger is part of your finger
Antisymmetry	Your finger is part of your hand, but your hand is not part of your finger
Transitivity	Your finger is part of your hand, and your hand is part of your body, so your finger is part of your body
Proper Part	A tail is a proper part of a cat
Overlapping	Two roads overlap at their intersection
Underlapping	Your finger and thumb are underlapping parts of your hand
Supplementation	Road A is not part of Road B, because there is at least some of Road A that doesn't overlap Road B
Weak Supplementation	Road A is not a proper part of Road B, because at least some of Road A is outside Road B

Alternate Notations

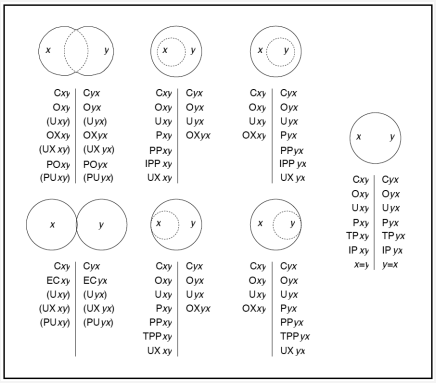
symbol	meaning	from
≪	is a proper part of	Simon 1987
≺	is an improper part of	Simon 1987
○	overlaps	Simon 1987
⌊	is disjoint from	Simon 1987
Pxx	is a part of	Smith

Mereological Operations

·	binary product	x·y
+	binary sum	x+y
-	difference	x-y
σx⌜Fx⌝	fusion	
πx⌜Fx⌝	nucleus	

Smith (1996) Mereology Definitions

sym.	meaning	ex.	defn.
P	is a part of	xPy	
O	overlaps	xOy	∃z(zPx ∧ zPy)
D	discrete	xDy	¬xOy
Pt()	is a point	Pt(x)	∀y(yPx→y=x)



Credit: Varzi 1996, used without permission. Seven basic patterns of the connection relationship.

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