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The Recognition Theorem, The Fundamental Theorem of Principal Bundles, and Two Variations Each

$\vec{\mathrm{E}} : \mathrm{Functor}\ (\mathrm{OperadicCategory}\ \infty\text{-Cat})\ \infty\text{-Cat}$
$\vec{\mathrm{B}} : \mathrm{Functor}\ (\mathrm{OperadicCategory}\ \infty\text{-Cat})\ \infty\text{-Cat}$
$\vec{\partial} : (\mathrm{C} : \mathrm{OperadicCategory}\ \infty\text{-Cat}) \to \infty\text{-Cat.hom}\ (\vec{\mathrm{E}}.\mathrm{obj}\ \mathrm{C})\ (\vec{\mathrm{B}}.\mathrm{obj}\ \mathrm{C})$
$\overleftrightarrow{\mathrm{E}} : \mathrm{Functor}\ (\mathrm{OperadicGroupoid}\ \infty\text{-Grpd})\ \infty\text{-Grpd}$
$\overleftrightarrow{\mathrm{B}} : \mathrm{Functor}\ (\mathrm{OperadicGroupoid}\ \infty\text{-Grpd})\ \infty\text{-Grpd}$
$\overleftrightarrow{\partial} : (\mathrm{G} : \mathrm{OperadicCategory}\ \infty\text{-Grpd}) \to \infty\text{-Grpd.hom}\ (\overleftrightarrow{\mathrm{E}}.\mathrm{obj}\ \mathrm{G})\ (\overleftrightarrow{\mathrm{B}}.\mathrm{obj}\ \mathrm{G})$
$\mathrm{E} : \mathrm{OperadicGroup}\ \infty\text{-Grpd}_{-1} \longrightarrow \infty\text{-Grpd}_{-1}$
$\mathrm{B} : \mathrm{OperadicGroup}\ \infty\text{-Grpd}_{-1} \longrightarrow \infty\text{-Grpd}_{-1}$
$\partial : (\mathrm{G}_{-1} : \mathrm{OperadicGroup}\ \infty\text{-Grpd}_{-1}) \to \infty\text{-Grpd}_{-1}.\mathrm{hom}\ (\mathrm{E.obj}\ \mathrm{G}_{-1})\ (\mathrm{B.obj}\ \mathrm{G}_{-1})$
$\vec{\mathrm{e}} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to \mathrm{Functor}\ (\mathrm{OperadicPresheaf}\ (\vec{\mathrm{O}}.\mathrm{obj}\ \mathrm{D}))\ (\infty\text{-Cat}/\mathrm{D})$
$\vec{\mathrm{b}} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to \mathrm{Functor}\ (\mathrm{OperadicPresheaf}\ (\vec{\mathrm{O}}.\mathrm{obj}\ \mathrm{D}))\ (\infty\text{-Cat}/\mathrm{D})$
$\vec{\nabla} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\vec{\mathrm{e}}.\mathrm{obj}\ \mathrm{F})\ (\vec{\mathrm{b}}.\mathrm{obj}\ \mathrm{F})$
$\overleftrightarrow{\mathrm{e}} : \{\mathrm{X} : \infty\text{-Cat}\} \to \{\mathrm{Y} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{X}\ \mathrm{Y}) \to \mathrm{Functor}\ (\mathrm{OperadicGroupoidAction}\ (\overleftrightarrow{\mathrm{O}}.\mathrm{obj}\ \mathrm{Y}))\ (\infty\text{-Grpd}/\mathrm{Y})$
$\overleftrightarrow{\mathrm{b}} : \{\mathrm{X} : \infty\text{-Grpd}\} \to \{\mathrm{Y} : \infty\text{-Grpd}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{X}\ \mathrm{Y}) \to \mathrm{Functor}\ (\mathrm{OperadicGroupoidAction}\ (\overleftrightarrow{\mathrm{O}}.\mathrm{obj}\ \mathrm{Y}))\ (\infty\text{-Grpd}/\mathrm{Y})$
$\overleftrightarrow{\nabla} : \{\mathrm{X} : \infty\text{-Grpd}\} \to \{\mathrm{Y} : \infty\text{-Grpd}\} \to (\mathrm{F} : \infty\text{-Grpd.hom}\ \mathrm{X}\ \mathrm{Y}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\overleftrightarrow{\mathrm{e}}.\mathrm{obj}\ \mathrm{F})\ (\overleftrightarrow{\mathrm{b}}.\mathrm{obj}\ \mathrm{F})$
$\mathrm{e} : \{\mathrm{X}_{-1} : \infty\text{-Grpd}_{-1}\} \to \{\mathrm{Y}_{-1} : \infty\text{-Grpd}_{-1}\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to \mathrm{Functor}\ (\infty\text{-Grpd}_{-1}/\mathrm{Y}_{-1})\ (\mathrm{OperadicGroupAction}\ (\mathrm{O.obj}\ \mathrm{Y}_{-1}))$
$\mathrm{b} : \{\mathrm{X}_{-1} : \infty\text{-Grpd}_{-1}\} \to \{\mathrm{Y}_{-1} : \infty\text{-Grpd}_{-1}\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to \mathrm{Functor}\ (\infty\text{-Grpd}_{-1}/\mathrm{Y}_{-1})\ (\mathrm{OperadicGroupAction}\ (\mathrm{O.obj}\ \mathrm{Y}_{-1}))$
$\nabla : \{\mathrm{G}_{-1} : \infty\text{-Grpd}_0\} \to \{\mathrm{Y}_0 : \infty\text{-Grpd}_0\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\mathrm{e.obj}\ \mathrm{F})\ (\mathrm{b.obj}\ \mathrm{F})$

E. Dean Young

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1. Contents

Section	Description
Unfinished	
Contents	
Unicode	
Introduction	
PART I: BASED CONNECTED ∞-GROUPOIDS	
Chapter 1: Operadic Groups and Operadic Group Actions	
OperadicGroups	
OperadicGroupActions	
Chapter 2: B and E	
E	
e	
B	
b	
∂	
∇	
Chapter 3: The Recognition Theorem	
Chapter 4: The Classifying Space Theorem	
PART II: ∞-GROUPOIDS	
Chapter 5: Operadic Groupoids and Operadic Groupoid Actions	
OperadicGroupoids	
OperadicGroupoidActions	
Chapter 6: $\overleftrightarrow{\mathrm{B}}$ and $\overleftrightarrow{\mathrm{E}}$	
$\overleftrightarrow{\mathrm{E}}$	
$\overleftrightarrow{\mathrm{e}}$	
$\overleftrightarrow{\mathrm{B}}$	
$\overleftrightarrow{\mathrm{b}}$	
$\overleftrightarrow{\partial}$	
$\overleftrightarrow{\nabla}$	
Chapter 7: The Recognition Theorem for ∞-Groupoids	
Chapter 8: The Classifying Space Theorem for ∞-Groupoids	
PART III: ∞-CATEGORIES	
Chapter 9: Operadic Categories and Operadic Presheaves	
OperadicCategory	
OperadicPresheaves	
Chapter 10: The Recognition Theorem for ∞-Categories	

$\vec{\mathrm{E}}$	
$\vec{\mathrm{e}}$	
$\vec{\mathrm{B}}$	
$\vec{\mathrm{b}}$	
$\vec{\partial}$	
$\vec{\nabla}$	
`Chapter 11:` The Recognition Theorem for ∞-Categories	
`Chapter 12:` The Classifying Space Theorem for ∞-Categories	

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Introduction

In “‘TheWhiteheadTheoremandTwoVariations”’, we will define six ”internal” structures based on the ones found in “‘Galois Theories”’ by Janelidze and Borceux, as well as six “‘operadic”’ structures.

$\vec{\mathrm{E}} : \mathrm{Functor}\ (\mathrm{OperadicCategory}\ \infty\text{-Cat})\ \infty\text{-Cat}$
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$\overleftrightarrow{\mathrm{E}} : \mathrm{Functor}\ (\mathrm{OperadicGroupoid}\ \infty\text{-Grpd})\ \infty\text{-Grpd}$
$\overleftrightarrow{\mathrm{B}} : \mathrm{Functor}\ (\mathrm{OperadicGroupoid}\ \infty\text{-Grpd})\ \infty\text{-Grpd}$
$\overleftrightarrow{\partial} : (\mathrm{G} : \mathrm{OperadicCategory}\ \infty\text{-Grpd}) \to \infty\text{-Grpd.hom}\ (\overleftrightarrow{\mathrm{E}}.\mathrm{obj}\ \mathrm{G})\ (\overleftrightarrow{\mathrm{B}}.\mathrm{obj}\ \mathrm{G})$
$\mathrm{E} : \mathrm{OperadicGroup}\ \infty\text{-Grpd}_{-1} \longrightarrow \infty\text{-Grpd}_{-1}$
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$\partial : (\mathrm{G}_{-1} : \mathrm{OperadicGroup}\ \infty\text{-Grpd}_{-1}) \to \infty\text{-Grpd}_{-1}.\mathrm{hom}\ (\mathrm{E.obj}\ \mathrm{G}_{-1})\ (\mathrm{B.obj}\ \mathrm{G}_{-1})$
$\vec{\mathrm{e}} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to \mathrm{Functor}\ (\mathrm{OperadicPresheaf}\ (\vec{\mathrm{O}}.\mathrm{obj}\ \mathrm{D}))\ (\infty\text{-Cat}/\mathrm{D})$
$\vec{\mathrm{b}} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to \mathrm{Functor}\ (\mathrm{OperadicPresheaf}\ (\vec{\mathrm{O}}.\mathrm{obj}\ \mathrm{D}))\ (\infty\text{-Cat}/\mathrm{D})$
$\vec{\nabla} : \{\mathrm{C} : \infty\text{-Cat}\} \to \{\mathrm{D} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{C}\ \mathrm{D}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\vec{\mathrm{e}}.\mathrm{obj}\ \mathrm{F})\ (\vec{\mathrm{b}}.\mathrm{obj}\ \mathrm{F})$
$\overleftrightarrow{\mathrm{e}} : \{\mathrm{X} : \infty\text{-Cat}\} \to \{\mathrm{Y} : \infty\text{-Cat}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{X}\ \mathrm{Y}) \to \mathrm{Functor}\ (\mathrm{OperadicGroupoidAction}\ (\overleftrightarrow{\mathrm{O}}.\mathrm{obj}\ \mathrm{Y}))\ (\infty\text{-Grpd}/\mathrm{Y})$
$\overleftrightarrow{\mathrm{b}} : \{\mathrm{X} : \infty\text{-Grpd}\} \to \{\mathrm{Y} : \infty\text{-Grpd}\} \to (\mathrm{F} : \infty\text{-Cat.hom}\ \mathrm{X}\ \mathrm{Y}) \to \mathrm{Functor}\ (\mathrm{OperadicGroupoidAction}\ (\overleftrightarrow{\mathrm{O}}.\mathrm{obj}\ \mathrm{Y}))\ (\infty\text{-Grpd}/\mathrm{Y})$
$\overleftrightarrow{\nabla} : \{\mathrm{X} : \infty\text{-Grpd}\} \to \{\mathrm{Y} : \infty\text{-Grpd}\} \to (\mathrm{F} : \infty\text{-Grpd.hom}\ \mathrm{X}\ \mathrm{Y}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\overleftrightarrow{\mathrm{e}}.\mathrm{obj}\ \mathrm{F})\ (\overleftrightarrow{\mathrm{b}}.\mathrm{obj}\ \mathrm{F})$
$\mathrm{e} : \{\mathrm{X}_{-1} : \infty\text{-Grpd}_{-1}\} \to \{\mathrm{Y}_{-1} : \infty\text{-Grpd}_{-1}\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to \mathrm{Functor}\ (\infty\text{-Grpd}_{-1}/\mathrm{Y}_{-1})\ (\mathrm{OperadicGroupAction}\ (\mathrm{O.obj}\ \mathrm{Y}_{-1}))$
$\mathrm{b} : \{\mathrm{X}_{-1} : \infty\text{-Grpd}_{-1}\} \to \{\mathrm{Y}_{-1} : \infty\text{-Grpd}_{-1}\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to \mathrm{Functor}\ (\infty\text{-Grpd}_{-1}/\mathrm{Y}_{-1})\ (\mathrm{OperadicGroupAction}\ (\mathrm{O.obj}\ \mathrm{Y}_{-1}))$
$\nabla : \{\mathrm{G}_{-1} : \infty\text{-Grpd}_0\} \to \{\mathrm{Y}_0 : \infty\text{-Grpd}_0\} \to (\mathrm{F} : \infty\text{-Grpd}_{-1}.\mathrm{hom}\ \mathrm{X}_{-1}\ \mathrm{Y}_{-1}) \to (\infty\text{-Cat}/\mathrm{D}).\mathrm{hom}\ (\mathrm{e.obj}\ \mathrm{F})\ (\mathrm{b.obj}\ \mathrm{F})$

and “‘ThePuppeSequenceandTwoVariations”’. In “‘InternalUniverses”’, I considered straightening and unstraightening and three variations of it, which were each considered before and after the application of D(-). This made for the six diagrams depicted on page ???. In this repository, we consider the classifying space B.

Let $\mathrm{F} : \mathrm{C} \longrightarrow \mathrm{D} : \infty\text{-Cat.hom C D}$ be an ∞-functor. Given either the C-infinity presheaf in ∞-Cat/C arising from $\mathrm{F} : \infty\text{-Cat}/\mathrm{D}$ or the C-infinity presheaf in ∞-Cat/D arising from $\mathrm{Id}_C : \infty\text{-Cat}/\mathrm{C}$, we obtain in both cases an internal presheaf in the corresponding derived category. However, not all internal categories D : InternalCategory D(∞-Cat/C) arise from and not all internal presheaves S : InternalPresheaf D D(∞-Cat/C) arise from C-infinity presheaves over some C-infinity category in ∞-Cat/C.

In “‘InternalUniverses”’, we showed the straightening/unstraightening categorical equivalence and three variations using the six Ω-functors and six E-functors, treating the situations before and after the application of D(-) seperately for a total of six goals.

In this section, we consider classifying spaces as well as a perspective about remembering information concerning a right or left adjoint applied to a particular functor or object in the following way: E and Ω and their respective five variations give “‘remembrant”’ functors E-infinity and Ω-infinity, which each produce internal presheaves in respective derived categories.

Plans to prove three variations of the

`Whitehead theorem of homotopy groups in`
`Lean 4, with extensive use of Mathlib 4`

$\vec{\mathrm{E}} : \infty\text{-Cat} \longrightarrow \infty\text{-Cat}$	$\vec{\mathrm{B}} : \infty\text{-Cat} \longrightarrow \infty\text{-Cat}$	$\vec{\partial} : \infty\text{-Cat} \longrightarrow \infty\text{-Cat}$	$\vec{\mathrm{e}} : (\mathrm{C} : \infty\text{-Cat}) \to (\mathrm{D} : \infty\text{-Cat}) \to \mathrm{Adjunc}$
$\vec{\mathrm{E}} : \infty\text{-Grpd} \longrightarrow \infty\text{-Grpd}$	$\vec{\mathrm{B}} : \infty\text{-Grpd} \longrightarrow \infty\text{-Grpd}$	$\vec{\partial} : \infty\text{-Grpd} \longrightarrow \infty\text{-Grpd}$	$\vec{\mathrm{e}} : (\mathrm{X} : \infty\text{-Grpd}) \to (\mathrm{Y} : \infty\text{-Grpd}) \to \mathrm{Adju}$
$\mathrm{E} : \infty\text{-Grpd}_0 \longrightarrow \infty\text{-Grpd}_0$	$\mathrm{B} : \infty\text{-Grpd}_0 \longrightarrow \infty\text{-Grpd}_0$	$\partial : \infty\text{-Grpd}_0 \longrightarrow \infty\text{-Grpd}_0$	$\mathrm{e} : (\mathrm{X} : \infty\text{-Grpd}_0) \to (\mathrm{Y} : \infty\text{-Grpd}_0) \to \mathrm{Ac}$

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By the time this repository is seen to in 2025, I will have filled out a certain six operadic structures to do with ∞-categories and ∞-groupoids. Each of these structures will be made to work together with $\mathrm{Pow}\,\mathrm{X} : \mathrm{Type} : \lambda(\mathrm{n} : \mathbb{N}), \mathrm{X} \to \mathrm{X}$. The six operadic structures are endofunctions of one of six mathematical objects, here with an option for 12 based on models A (simplicial set model) and B (point-set model).

$\mathtt{B}^1$ `: Functor (Pow OperadicGroup 2) ??? (Pow OperadicGroup 2) ???`

$\mathtt{B}^n$ `: Functor (Pow OperadicGroup 2) ??? (Pow OperadicGroup 2) ???`

In this repository I construct six categorical equivalences:

1. Between certain operadic categories and
2. Between certain internal categories and
3. Between certain operadic presheaves and
4. Between certain internal presheaves and
5. Between certain operadic groupoids and
6. Between certain internal groupoids and
7. Between certain operadic groups in ??? and ???
8. Between certain internal groups and
9. Between certain operadic group actions
10. Between certain internal group actions

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PART 1: BASED CONNECTED ∞-GROUPOIDS

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Operadic Groups and Operadic Group Actions

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The Classifying Space and the Total Space

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PART 2: ∞-GROUPOIDS

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Operadic Groupoids and Operadic Groupoid Actions

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The Recognition Theorem for ∞-Groupoids

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The Classifying Space Theorem for ∞-Groupoids

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PART 3: ∞-CATEGORIES

ND

Operadic Categories and Operadic Presheaves

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The Recognition Theorem for ∞-Categories

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The Classifying Space Theorem for ∞-Categories

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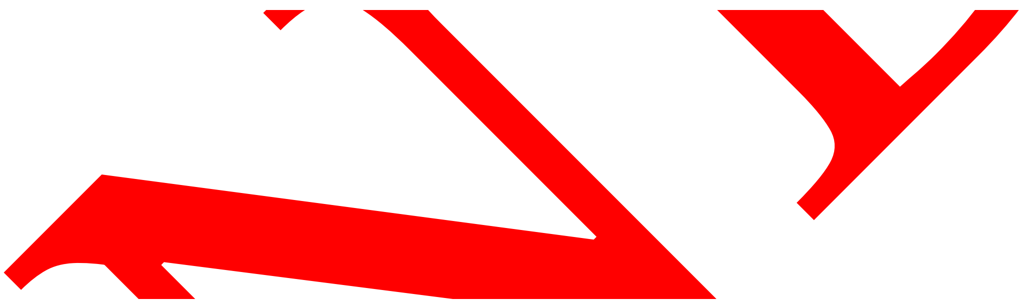
Implementation	2024 ∞-category project identity		Lax		Strict	
	ND	Filling Number	Unitial	Actional	Unitial	Actional
First	ND00	Filling number (n : Nat)	C-infinity categories	C-infinity presheaves	Internal categories	Internal presheaves
	ND01	Filling number (n : Nat)	∞-Cat	∞-Cat ⁄ C	D(∞-Cat)	D(∞-Cat/C)
Second	ND10	Filling number (n : Nat)	The lax lifted Whitehead theorem	The lax lifted Puppe sequence	The strict Whitehead theorem	The strict Puppe sequence
	ND11	Filling number (n : Nat)	The lax lifted B-Ω equivalence	The lax lifted b-ω equivalence	The strict strict B-Ω equivalence	The strict b-ω equivalence

In “‘Internal Universes”’ I thought about the six variations of straightening and unstraightening featured in the diagrams below:

$$\begin{tikzcd}[column sep=huge, row sep=large]
D([X^{op},\infty_(\infty\text{-}Grpd_0)]) \arrow[r, shift left, "D((e.hom\ F)^{\cdot})"] \arrow[d, shift left, "D((\chi_{\cdot}).obj\ C)"] & D(\ [Y^{op},\infty_(\infty\text{-}Grpd_0)]\ ) \arrow[l, shift left, "D((e.hom\ F)_{\cdot})"] \arrow[d, shift left, "D((\chi_{\cdot}).obj\ Y)"] \\
D(\infty_(\infty\text{-}Grpd_0)/X) \arrow[u, shift left, "D((\chi^{\cdot}).obj\ X)"] \arrow[r, shift left, "D((\omega.hom\ F)^{\cdot})"] & \infty_(\infty\text{-}Grpd_0)/Y \arrow[u, shift left, "D((\chi^{\cdot}).obj\ Y)"] \arrow[l, shift left, "D((\omega.hom\ F)_{\cdot})"]
\end{tikzcd}$$



$$\begin{tikzcd}[column sep=huge, row sep=large]
D([X^{op},\infty_(\infty\text{-}Cat)]) \arrow[r, shift left, "D((\vec{e}.hom\ F)^{\cdot})"] \arrow[d, shift left, "D((\vec{\chi}_{\cdot}).obj\ X)"] & D(\ [Y^{op},\infty_(\infty\text{-}Cat)]\ ) \arrow[l, shift left, "D((\vec{e}.hom\ F)_{\cdot})"] \arrow[d, shift left, "D((\vec{\chi}_{\cdot}).obj\ Y)"] \\
D(\infty_(\infty\text{-}Cat)/X) \arrow[u, shift left, "D((\vec{\chi}^{\cdot}).obj\ X)"] \arrow[r, shift left, "D((\vec{\omega}.hom\ F)^{\cdot})"] & \infty_(\infty\text{-}Cat)/Y \arrow[u, shift left, "D((\vec{\chi}^{\cdot}).obj\ Y)"] \arrow[l, shift left, "D((\vec{\omega}.hom\ F)_{\cdot})"]
\end{tikzcd}$$

$$
\begin{tikzcd}[column sep=huge, row sep=huge]
D([X^{op},\infty\_(\infty\text{-Grpd})]) \arrow[r, shift left, "D((\overleftrightarrow{e}.\mathrm{hom}\ F)^{\cdot})"] \arrow[d, shift left, "D((\overleftrightarrow{\chi}_{\cdot}).\mathrm{obj}\ X)"] & D([Y^{op},\infty\_(\infty\text{-Grpd})]) \arrow[l, shift left, "D((\overleftrightarrow{e}.\mathrm{hom}\ F)_{\cdot})"] \arrow[d, shift left, "D((\overleftrightarrow{\chi}_{\cdot}).\mathrm{obj}\ Y)"] \\
D(\infty\_(\infty\text{-Grpd})/X) \arrow[u, shift left, "D((\overleftrightarrow{\chi}^{\cdot}).\mathrm{obj}\ X)"] \arrow[r, shift left, "D((\overleftrightarrow{\omega}.\mathrm{hom}\ F)^{\cdot})"] & \infty\_(\infty\text{-Grpd})/Y \arrow[l, shift left, "D((\overleftrightarrow{\omega}.\mathrm{hom}\ F)_{\cdot})"] \arrow[u, shift left, "D((\overleftrightarrow{\chi}^{\cdot}).\mathrm{obj}\ Y)"]
\end{tikzcd}
$$

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$$\begin{tikzcd}[column sep=huge, row sep=huge]
{[X^{op},\infty_(\infty\text{-Grpd}_0)]} \arrow[r, shift left, "(e.\mathrm{hom}\ F)^{\cdot}"] \arrow[d, shift left, "(\chi_{\cdot}).\mathrm{obj}\ X"] & {[Y^{op},\infty_(\infty\text{-Grpd}_0)]} \arrow[l, shift left, "(e.\mathrm{hom}\ F)_{\cdot}"] \arrow[d, shift left, "(\chi_{\cdot}).\mathrm{obj}\ Y"] \\
\infty_(\infty\text{-Grpd}_0)/X \arrow[u, shift left, "(\chi^{\cdot}).\mathrm{obj}\ X"] \arrow[r, shift left, "(\omega.\mathrm{hom}\ F)^{\cdot}"] & \infty_(\infty\text{-Grpd}_0)/Y \arrow[l, shift left, "(\omega.\mathrm{hom}\ F)_{\cdot}"] \arrow[u, shift left, "(\chi^{\cdot}).\mathrm{obj}\ Y"]
\end{tikzcd}$$

$$\begin{tikzcd}[column sep=huge, row sep=huge]
{[C^{op},\infty_(\infty\text{-Cat})]} \arrow[r, shift left, "(\vec{e}.\mathrm{hom}\ F)^{\cdot}"] \arrow[d, shift left, "(\vec{\chi}_{\cdot}).\mathrm{obj}\ C"] & {[D^{op},\infty_(\infty\text{-Cat})]} \arrow[l, shift left, "(\vec{e}.\mathrm{hom}\ F)_{\cdot}"] \arrow[d, shift left, "(\vec{\chi}_{\cdot}).\mathrm{obj}\ D"] \\
\infty_(\infty\text{-Cat})/C \arrow[u, shift left, "(\vec{\chi}^{\cdot}).\mathrm{obj}\ C"] \arrow[r, shift left, "(\vec{\omega}.\mathrm{hom}\ F)^{\cdot}"] & \infty_(\infty\text{-Cat})/D \arrow[l, shift left, "(\vec{\omega}.\mathrm{hom}\ F)_{\cdot}"] \arrow[u, shift left, "(\vec{\chi}^{\cdot}).\mathrm{obj}\ D"]
\end{tikzcd}$$

6 goals 6 structures
With these goals I want to create several "'remembrant"' adjunctions:

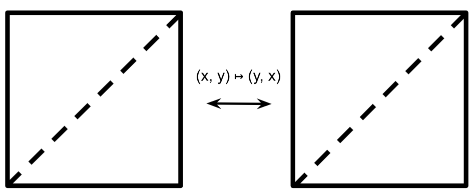
1. $\vec{\gamma}$ $\overleftrightarrow{\gamma}$ γ
2. $\vec{\Sigma}$ $\overleftrightarrow{\Sigma}$ Σ
3. $\vec{\sigma}$ $\overleftrightarrow{\sigma}$ σ
4. Pullback of two homs and a single hom vs. a pushout of two products and a single product

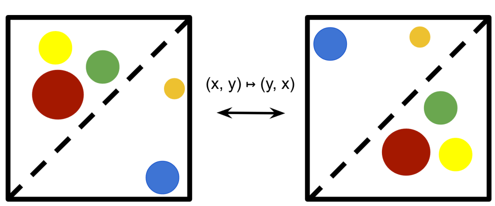
$$\vec{o} : (C : \infty\text{-Cat}) \to \infty\text{-Cat}/C \longrightarrow \text{OperadicPresheaf}\,(\vec{O}.\text{obj } C)$$

defining B

1. It is possible that the B lifts under slightly different conditions than those under which it is an endomorphism.
2. After use of the ∞-box, whose product is difficult, we can invert certain maps to obtain complexes. For this to work we need both biproducts and minus.
3. Not only must these spaces be based; B necessitates that they be A∞ or E∞ (plus some other thing about grouplike, for me).
4. After this we can consider the "free ???", but the product is a bit difficult.

$[\mathbb{N}, \vec{\gamma}\ \ , X]$





2. Bibliography

1. Serre, Jean-Pierre. ”Homologie singulière des espaces fibrés. Applications.” Annals of Mathematics 54, no. 3 (1951): 425-505.

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